# STIMULATING CIRCULAR HOSPITALS FROM THE PERSPECTIVE OF A HEALTH INSURER

*A search for possible interventions for health insurers within a system perspective*

**Master thesis EPA**

Julie Wijffels

# STIMULATING CIRCULAR HOSPITALS FROM THE PERSPECTIVE OF A HEALTH INSURER

## A search for possible interventions for health insurers within a system perspective

By

Julie Wijffels

In partial fulfilment of the requirements for the degree of:

**Master of Science**

in Engineering and Policy Analysis

at the Delft University of Technology,

to be defended publicly on Thursday February 13, 2025 at 14:00 PM.

| | | |
|---|---|---|
| Supervisor: | Dr. S. (Saba) Hinrichs-Krapels | |
| Thesis committee: | Dr. S. (Saba) Hinrichs-Krapels, | TU Delft |
| | A.R. (Andrea) Gammon, | TU Delft |
| | I. (Ilyes) Machkor, | Zilveren Kruis |

*This thesis is confidential and cannot be made public until February 13, 2025.*

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# PREFACE

Here in front of you, I present the master thesis that I have been working on since September. This past half year has been the last chapter of completing my Masters in Engineering and Policy Analysis. To be honest, this was something I somewhat looked up to beforehand. However, a thesis internship at Zilveren Kruis gave me the opportunity to deepen my knowledge of the fascinating healthcare sector and the challenges it faces. In hindsight, I can say that this made the time fly by and I enjoyed writing this thesis more than I could have anticipated.

Therefore, I am proud to be able to present the research results, especially on this societal very relevant subject of circular hospitals. I hope this master thesis will be a valuable contribution to the necessary transition towards circularity in healthcare.

During the process of the creation of this master thesis, I dived deep into the complexities of stimulating circular hospitals, which has taught me a lot about the complex system and the relevant actors involved. This master thesis, including the internship, has provided me valuable insights.

Nevertheless, I could not have done it without the support of my graduation committee.
Saba Hinrichs-Krapels, thank you for the fruitful feedback meetings and your positive visions, which always brought me a lot of inspiration and left me with renewed motivation, even at moments when I beforehand felt a bit lost in the process.
Andrea Gammon, thank you for the rich philosophic insights and comments, which helped me to see my finding from other perspectives, resulting in valuable additions.
Paula Götz, thank you for helping me in sharpening my thesis and helping me with useful feedback during the creation of the system diagram.
Ilyes Machkor, I want to thank you for your supervision and the opportunity to work on the interesting topic of sustainability at Zilveren Kruis. I also greatly appreciate all the valuable meetings, conferences, and connections you facilitated during my internship.
Furthermore, I want to thank Zilveren Kruis and the team I worked in, where the other interns and I had the opportunity to fully participate, giving me a meaningful first work experience.
Additionally, I want to thank all the interview participants who were willing to participate in my research. Without the insightful conversations with you, I would not have been able to present these findings.

Lastly, I also want to thank my wonderful family, friends and roommates, for supporting me at all times. Thank you for believing in me during stressful times, which helped me stay confident, and for spending time with me, sharing joyful moments serving as a welcome distraction or as celebration of small milestones in this whole process.
Looking back, I am grateful and proud that I was able to balance my thesis work with my other personal achievements, including creating a culinary Christmas menu and training for my sporting goals. These activities helped me clear my mind and return to my thesis reenergized.
In the same way, I hope that this thesis will be a stepping stone, allowing me to enter my professional career with fresh creativity and energy.

Altogether, I hope you will enjoy reading this master thesis.

*Julie Wijffels*
*Rotterdam, February 2025*

# EXECUTIVE SUMMARY

The Dutch healthcare sector has a significant environmental impact, accounting for 7 percent of the national carbon footprint, with hospitals being major contributors. This is alarming in face of a climate crisis, especially with increasing negative health effects as a consequence. As the government also aims for a fully circular economy by 2050, the necessary transition towards circular hospitals represents a great challenge. However, the specific role of health insurers in facilitating this transition remains underexplored. As a key actor in Dutch healthcare procurement, their potential impactful role is addressed by current research, but this does not go further then recommendations for further elaboration on their role in future research. Therefore, this master thesis research seeks to address this knowledge gap of the role of health insurers in stimulating circularity in hospitals in the Netherlands, by answering the question: "*How can a health insurer stimulate circular hospitals?*".

Within a master thesis internship at Zilveren Kruis (largest Dutch health insurer organisation), this research will take a complex systems perspective to answer this main question. The findings will deliver a contribution to smooth the transition towards circular hospitals, by studying the role of health insurers and identifying potential opportunities in this transition
The substantiated definition of a circular hospitals within this thesis is "*a hospital that maximizes the use of highest R strategies possible, aiming at reduce and reuse*".

The methodological framework included three phases, where the main approach was the use of a system diagram to map the complex system, with the main data collection method being conducting semi-structured interviews. Within the first phase, 6 interviews with health insurers, complemented with the limited available literature sources, led to useful and realistic findings on the complex system of stimulating circular hospitals from a health insurer perspective, presented within the Insurer-driven Circular Hospitals model. The second phase started by discussing a preliminary list of possible interventions, following from the first round of interviews, in a second round of interviews with 6 health insurers and 4 hospitals. This resulted in findings on the effects of enhanced possible interventions and perceived barriers in the complex system. The third phase also used the second round of interviews to substantiate the responsibility roles of a health insurer in stimulating circular hospitals.

The main findings of this research showed that health insurers can use their financial, facilitating and connecting roles from their perceived responsibility, and highlighted eight possible interventions for stimulating circular hospitals.
The three most promising interventions, directly focused on hospitals, include *going into conversations* with hospitals to offer suitable and concrete help, *sharing good examples* with an obligation for implementation to increase knowledge exchange and circularity, and *offering financial support* to lower the financial threshold.

Other possible discussed interventions are *improving measurability* with a measuring tool suitable for every hospital, *including circularity criteria* to directly set requirements, *collaborating with suppliers* to help create a circular healthcare product market, *collaborating with all health insurers* to form one strong direction towards hospitals and prevent competition on circularity between health insurers and lastly, *involving patients/insured* to indirectly stimulate circular hospitals.

In these ways, by executing these interventions, health insurers can stimulate circular hospitals, and also reduce or take away several perceived barriers, being financial barriers, healthcare product market, medical procedures/standards, lack of knowledge at hospitals, multitude of

scattered initiatives, differing focus (procurers) and different interest in collaboration health insurers. To enforce the effects of the separate interventions and create synergy, health insurers can even execute combinations of the possible interventions.

It was also pointed out that eventually, realising circular hospitals is seen as a shared responsibility of all parties involved in the healthcare sector, where hospitals have the main responsibility for execution, but cannot do it alone. Therefore, a collaborative approach remains necessary to truly enforce the transition towards circular hospitals.

The gathered knowledge in this research, presented several additions to the current knowledge base, including the use of system thinking approach on circular healthcare, which has proven valuable in mapping the complex system and by providing insight into perspectives on different responsibility roles of health insurers in stimulating circular hospitals. Furthermore, multiple findings of existing literature were verified, amongst others related to the existence of financial barriers and medical procedures/standards as obstacles to circular healthcare, and on the importance of knowledge, awareness and collaborative approaches in the transition towards circular hospitals.

For future research, it is recommended to involve more differing participants in interviews, from all actors in the healthcare sector and not only sustainability experts, to substantiate current findings and broaden the perspectives on the complex system and possible interventions. Furthermore, it is recommended to elaborate on a necessary system change for realising circular healthcare, by using a system transformation approach, instead of a fixed system perspective. This can provide insight into stimulating circular hospitals on another system level. Additionally, future research could quantify the Insurer-driven Circular Hospitals model to enable a quantitative comparison between the impact of different interventions.
Also, it is recommended to focus on a follow-up survey in future research to elaborate on the findings of this research, for instance by further studying the expected successfulness of the eight possible interventions.
Lastly, future research should broaden the definition of circular hospitals, by including the recycle category of circularity. This could indicate how findings related to interventions and perceived responsibility roles differ within this broader concept of circularity within hospitals.

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# 1. INTRODUCTION

Fully circular hospitals in 2050, is this a realistic goal or a distant dream? At the moment, seven garbage bags of waste are produced per intensive care patient, which is only a fraction of the total impact of hospitals on the environment (Van Raaij et al., 2023). Circularity could change this and is in line with the target of the Dutch government to have a fully circular economy in 2050 (Ministerie van Infrastructuur en Waterstaat, 2024). However, for the healthcare sector and specifically hospitals, this promises to be a grand challenge…

The healthcare sector plays a significant role in the environmental impact of our society. Research shows that hospital care has the biggest impact together with elderly care (Gupta Strategists, 2022). In the Netherlands the entire healthcare sector is responsible for 7 percent of the total carbon footprint (RIVM, 2023). This number is alarming, certainly in the face of a global climate crisis, which only puts more pressure on the healthcare due to numerous negative health effects (WHO, n.d.). These effects include an increased risk of infectious diseases, new pathogens and other climate-related health risks resulting from the climate change, which contribute to a growing disease burden (RIVM, 2023). In light of both national and global climate targets, related to the Paris agreement (Ministerie van Klimaat en Groene Groei, 2024), it is crucial for the healthcare sector to reduce its environmental burden. Therefore, a transition towards a more sustainable and circular healthcare system is urgently needed.

The Dutch government has already started to act upon this challenge, with initiatives like the Green Deal for Sustainable Healthcare (Ministerie van Volksgezondheid, Welzijn en Sport, 2024a). This deal is a collaboration between the government, healthcare industry associations, health insurers and banks, to work in a result-oriented way to realize sustainable healthcare (*Green Deal Duurzame Zorg*, 2024). Within this Green Deal there are five themes to make the mission more concrete: health promotion, knowledge & awareness, CO2 reduction, circularity and medicine (*Green Deal Thema's*, 2022). Thus, circularity, related to limiting resource use and waste production, is a separate area of focus here.

More specifically, this master thesis will be executed within an internship at Zilveren Kruis, which is a Dutch health insurer. Therefore, this research will take the perspective of a health insurer, which is a relevant actor in stimulating the transition towards circular hospitals, as they are responsible for care procurement (Zorgverzekeraars Nederland, 2024). This responsibility makes their role noteworthy in stimulating circular hospitals, as they can exert a certain influence on hospitals in the healthcare procurement process. However, the importance and the potential of their role is not yet clearly defined in the transition towards circular healthcare (Gupta Strategists, 2022). For this reason, more research on their perspective is more than welcome to health insurers.

## *1.1 Societal and policy relevance*

The relevance of circular hospitals as research topic became clear, given the environmental impact of the healthcare sector and the global climate crisis as a grand challenge. Additional challenges in the Dutch healthcare are the staffing shortages and the ageing of the population, threatening the healthcare capacity even further (NOS, 2024). This stresses the urgency of the problem once again.

The complexity in this system can be highlighted on one side with the multiple insurmountable values of the quality, safety, availability and affordability of healthcare, which have to be balanced with circularity (Donata, 2021; Nivel, n.d.), for instance in the case of disposables versus reusables. The presence of multiple actors and their responsibilities explains the

complexity of the system on the other side, as the hospitals are directly connected to their patients who need care, but also to the health insurers who procure care and to the government whose laws and regulations everyone must comply with. The latter also signifies the policy relevance of this situation, as hospitals and healthcare procurement are embedded within the regulatory environment. Additionally, health insurers have their own healthcare procurement policy, where circularity could possibly be included more (Zorgverzekeraars Nederland, 2024). However, up to this point it remains unclear on how health insurers can exactly use their potentially impactful role in stimulating circular hospitals (Gupta Strategists, 2022). This indicates a limiting factor for them in taking the necessary steps towards circular healthcare.

Given these challenges within the complex healthcare system, the objective of this study is to investigate how health insurers can stimulate circular hospitals, to get more insight into the role of health insurers within this process. This objective falls within the theme circularity of the Green Deal for Sustainable Healthcare, which is aligned with the national coalition agreement to reduce the use of raw materials and waste production (*Circulair*, 2024). Eventually, this research could also lead to policy relevant recommendations on circular hospitals on two different policy levels; for the healthcare procurement policy of health insurers, but also for government policy on the role of health insurers.

## 1.2 Scientific relevance

Research on stimulating circular hospitals from a health insurer perspective falls into the research areas of circular healthcare and healthcare policy (D'Alessandro et al., 2024). Furthermore, this research will be contributing to the existing ESCH-R research project, which is studying how hospitals can make a transition towards circularity (ESCH-R, 2024). This research's contribution will be on the role of health insurers, which is not yet included there.

The nature of the contribution will be knowledge about the role of health insurers in stimulating circular hospitals and also more knowledge about circular hospitals within the complex system of healthcare. This is valuable for the research area of circular healthcare, as it can give more insights into the role of health insurers in realizing circular healthcare. Additionally, it can contribute to the research area of healthcare policy, by shedding a light on the current regulatory environment where circular hospitals are to be part of.

The intended findings could have the potential to smooth the transition towards circular hospitals and eventually also a circular healthcare system.

## 1.3 EPA relevance

A study on stimulating circular hospitals from a health insurer perspective is particularly suitable from the background of the Engineering and Policy Analysis Master's Program. Analytical techniques such as actor analysis and creating a system diagram are especially appropriate for investigating the role of actors within a complex system and mapping this system, to make it more comprehensible to explore possible interventions for health insurers.

Furthermore, relevant research is being subsidized by the National Science Agenda, such as the ESCH-R project (Drexhage, 2023). This project is set up to investigate how the transition towards circular hospitals can be made, touching upon circularity as one of the themes of the Green Deal. The ESCH-R project is a consortium of Dutch hospitals and universities, under which also the TU Delft researchers, whose focus is on medical consumables and it will study the whole system change and barriers and possibilities on the policy and governance (TU Delft, 2023). As

this is a very relevant subject in light of the Engineering and Policy Analysis Master, this Master Thesis will be aiming to contribute to this project by research on stimulating circular hospitals.

## *1.4 Statement on use of AI tools*

During the writing of this master thesis, ChatGPT was solely used at times as inspiration source, regarding for instance the structuring of content or expansion of texts. Nothing is thus copied directly from AI tools. Furthermore, an AI tool was used to create a visual for the front page.

# 2. STATE OF THE ART AND RESEARCH QUESTIONS

## *2.1 Search strategy*

In the following section, a brief literature study is executed. The aim is to find out more about the current findings within academic literature related the role of health insurers within healthcare circularity to identify the main research gap and to substantiate the necessary background information on "circular hospitals".

Scopus is consulted as search base for looking into the existing academic literature related to this topic. The exact search strings that are used for this can be found in appendix A.
The total number of articles found was 395, however, this number was brought down to 26 articles that were relevant to use. As the circularity subject gained more importance in the last years, it was decided to be most useful to look at articles dating back of the last 10 years. However, eventually it was not even necessary to apply this strict limit for the recentness of articles as a search criterium, as older articles mostly did not pass the scan for relevance.

The articles that resulted from the search query, were first scanned on their title and abstract, to evaluate their appropriateness for this research. If the article still seemed to be useful then, the introduction and conclusion of the article were also read. Search criteria that were used here, are that the articles had to be English or Dutch, and that the articles had to be related enough to the current research topic. The articles that were evaluated in this stage to have potential were saved with notes, regarding the main findings. In the end, this collection of articles was read more thoroughly for the writing of the literature synthesis.

## *2.2 Theoretical background*

The current existing studies that are found, are most of the times, quite specifically addressing one certain effort which is related to circularity in healthcare and they often encompass either of the topics waste management or resource use in relation to circular healthcare. The findings will be discussed below in more detail.

***Circularity and sustainability in healthcare***

Within the transition towards a more circular healthcare system, the term sustainability is also often mentioned. Therefore, it is useful to clarify the difference of these terms that is used within this research. Sustainable healthcare practices are mostly focused on reducing environmental impact in general, mostly by reducing the carbon footprint (Johnson et al., 2024). Circular healthcare practices can be seen as a more specific part within this, as they refer to implementing the principles of a circular economy within the healthcare sector (Van Straten et al., 2023). Eventually, this also limits the environmental impact. The circular economy principles are based on closed loop systems, where waste is minimized and resource use is reduced, by keeping materials in circulation (Van Straten et al., 2023). As opposed to sustainability, circularity is thus mainly concerned with material flows and the closing of loops within the healthcare sector.

An often used framework in circular economy theories, as well as in healthcare circularity, is the 10R framework (Van Boerdonk et al., 2020). The 10R framework, displayed in figure 1, has multiple R-strategies, to achieve less resource and material consumption within product chains: *refuse, rethink, reduce, re-use, repair, refurbish, remanufacture, repurpose, recycle* and *recover* (Potting et al., 2017). This framework can be useful to categorize different circular strategies and determine their circular value, which is higher at a lower R-number.

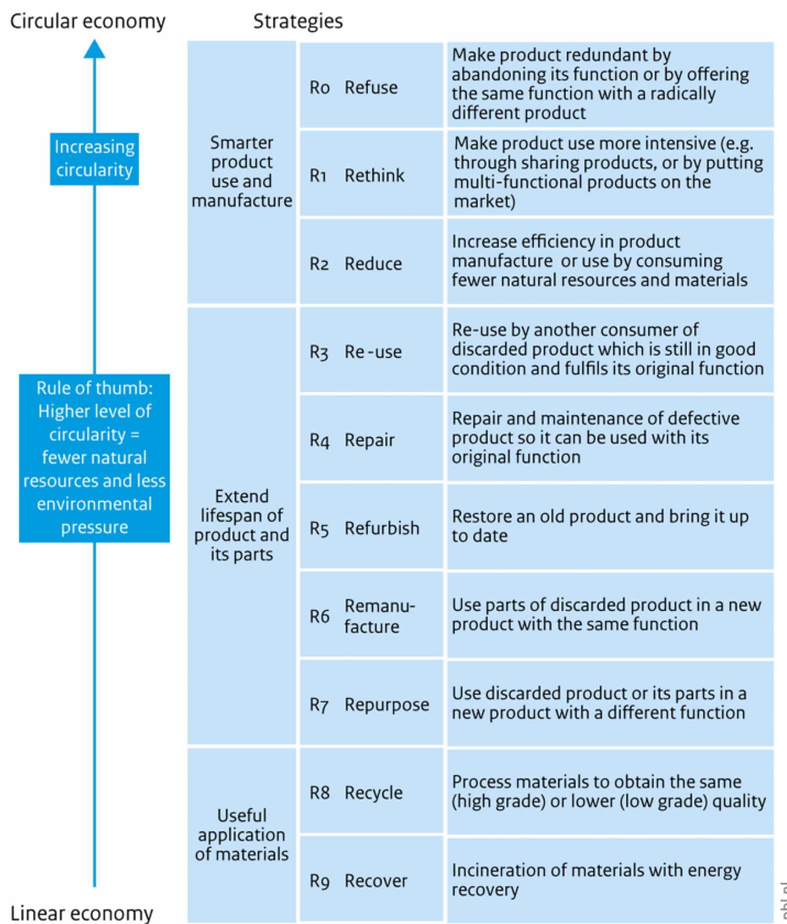


***Figure 1.*** *10R framework (Potting et al., 2017*

***Circularity in healthcare***

At the moment, it can be stated that the healthcare sector is certainly not fully circular, as there are still a lot of raw materials used, symbolizing new input, and a lot of waste is produced, which can be seen as output. Therefore, current circular economy practices within healthcare can most of the times be separated into the main broad aspects of limiting input and output; reducing resource use (*input*) and reducing waste and its adequate management (*output*) (Soares et al., 2023). Relevant academic literature often also encompasses one of those research areas, while reflecting a growing focus on the broader term of sustainability (D'Alessandro et al., 2024). To enable a rough ordering of the findings of this literature review, this distinction between studies on waste management and on resource use. However, it is interesting to note that these aspects of circularity can actually not be seen totally separate from each other. Less resource use means also a reduction of waste, impacting the waste management process, where recycling can again result in using less resources. This reflects the concept of a circular economy which consists of an ongoing value stream, striving for no net effect on the environment (Soares et al., 2023).

Overall, there are some interesting remarks to be made about the relevant studies on healthcare circularity. Although financial constraints are frequently mentioned as a barrier in to circularity in healthcare (Fletcher et al., 2021; Hoveling et al., 2024), other studies actually found that it could have financial savings (Van Straten et al., 2021; Morris & Murray, 2024). Furthermore, it is concluded that there is need for a system perspective, or in other words a more holistic approach for circularity in healthcare, where both technological and behavioural factors are included (Hoveling et al., 2024; MacNeill et al., 2020; Vaccari et al., 2017).

***Circular healthcare studies on waste management***
There are a multitude of studies focusing on circular medical waste management. Besides illustrating the urgent need of circular practices in healthcare, there are some interesting take-aways. Apparently, current circular approaches that are implemented mainly consist of well-known historic practices, such as return to multi-use instead of single use (Zandberga et al., 2024). This signifies the need for novel and innovative circular solutions and technologies (Soyler et al., 2024; Fletcher et al., 2021; Zandberga et al., 2024). For instance, efficient information systems could be an interesting development for streamlining waste storage, transportation and disposal processes (Soyler et al., 2024).

In other research articles, the importance of collaborative approaches and the inclusion of stakeholders, including hospital staff, medical goods suppliers, waste collecting companies and governments is noted (Fletcher et al., 2021; Leissner & Ryan-Fogarty, 2019; MacNeill et al., 2020). This also resonates in the statement of Soyler et al. that change will only happen if circular principles are universally adopted and ingrained in societal norms (2024).

Multiple studies on medical waste stress the need to also focus on processes preceding the waste production, such as changing current practices in healthcare and changing healthcare products (Fletcher, 2021; Leissner & Ryan-Fogarty; Vaccari et al., 2017), pointing more towards the circularity aspect of the input.

***Circular healthcare studies on resource use***
Another part of the relevant studies focuses more on circularity of products used in healthcare, where the resource use takes place. Interestingly, it is found here that a lack of awareness is often still a boundary for implementing circularity principles (Gaberščik et al., 2020; Hoveling et al., 2024; Ville et al., 2023). Therefore, it is also stated this could be changed by knowledge and recognition of the value of circularity amongst people responsible for producing goods or procurement in the healthcare sector (Morris & Murray, 2024; Gaberščik et al., 2020; Ville et al., 2023).

Additionally, studies discuss the concern that the transition towards more circularity in healthcare products, could possibly increase safety risks (Ville et al., 2023; Hoveling et al., 2024; Hu et al., 2022). Ville et al. (2023) pose that this decision making related to this is challenging due to the directly perceived negative effects, the increased safety risks, in contrast to the now invisible future benefits, the increased circularity. For instance, this could be the case for reusable items versus disposables, or increasing the lifespan of medical devices instead of replacing them earlier.

***Hospitals and circularity***
There are not many studies to be found on embedding circularity practices specifically in hospitals as a whole, which is also noticed within one relevant article (Soares et al., 2023). However, this study did identify an interesting set of domains for implementing circularity practices in hospitals: waste management, energy, water, travel/transportation/telemedicine, procurement, food and behaviour (Soares et al., 2023).

***Health insurers and circularity: research gap***
The role of health insurers within healthcare circularity is actually not a main subject of study in any of the articles found. Healthcare systems differ across countries, and so does the role of health insurers in it, but both their role within the Netherlands or in other countries is not often focused on in current research. However, there are a few articles mentioning health insurers in some way. One study stresses the responsibility of health insurers to enforce the move towards more circularity upon healthcare manufacturers and providers (Vanholder et al., 2022). In

another study it is mentioned that health insurers should review policies to influence the circularity of healthcare providers (Duane et al., 2020). The possibility of the health insurer to put pressure on a hospital to implement more circularity is also identified in yet another study, although they also state that such top-down pressure is not present yet and their role need to be studied further (Van Boerdonk et al., 2020).

***Circular hospitals: a definition***

An interesting finding within the literature search is that "circular hospital" gives no results of academic articles. Therefore, the circular hospital still need to be defined further here, as this is an important subject area within this research. This will be done based on current knowledge and efforts of circularity in the healthcare system, published in online sources.

The Green Deal for Sustainable Healthcare has *Circularity* as one of the five themes. Within this Circularity theme, four areas of focus are mentioned (*Green Deal Thema's*, 2022):
- practices leading to less consumption of medical products
- prioritizing reusables over disposables
- procurement criteria for circular medical products
- sustainable and healthy nutrition

While more circular nutrition can contribute to circular healthcare, it is not uniquely relevant to the healthcare sector itself. It can be applied to many industries and is thus less relevant to focus on in this research. In contrast, the three other areas are more noteworthy, as they are more directly related to hospital-specific healthcare. Improving hospital practices in a circular manner can lead to less consumption of medical products, and thus less resource use. Given that this research will study the role of health insurers in stimulating circular hospitals, circular procurement is also a relevant area to focus on. Prioritizing reusables instead of disposables within hospital healthcare is also interesting as it can minimize waste production, and it can actually be seen as part of circular procurement. When a hospital will make a transition towards mostly reusable products, they will procure more of these circular medical products instead of disposable products.

Another initiative that is currently taking place is "De Groene OK", targeting at the realisation of a more sustainable "Green Operation Room" (De Groene OK, 2024). One of their themes is also working circular, which concerns making operation rooms more efficient and using medical instruments more sustainably. The responsible group on this subject aims to look into which uses can be omitted and where disposables can be replaced by reusables (De Groene OK, 2024). This resonates with the discussed circularity focus areas from the Green Deal for Sustainable Healthcare of practices leading to less consumption and prioritizing reusables.

Furthermore, a circular hospital should of course be based on the principles of the circular economy. The 10R framework has been mentioned before and includes multiple strategies to aim for less resource and material consumption: refuse, rethink, reduce, re-use, repair, refurbish, remanufacture, repurpose, recycle and recover (Potting et al., 2017). These strategies represent a higher circular value at a lower R number and are visualised in figure 2. Here a distinction is visualised between three different R strategies categories (RVO, 2020):

- R0-R2: **REDUCE** (dark blue); reducing production and consumption of products, and producing and using products smarter
- R3-R7: **REUSE** (mid blue); lengthening the lifespan of products and its parts
- R8-R9: **RECYCLE** (light blue); applying materials useful in some way, which would otherwise end up as waste

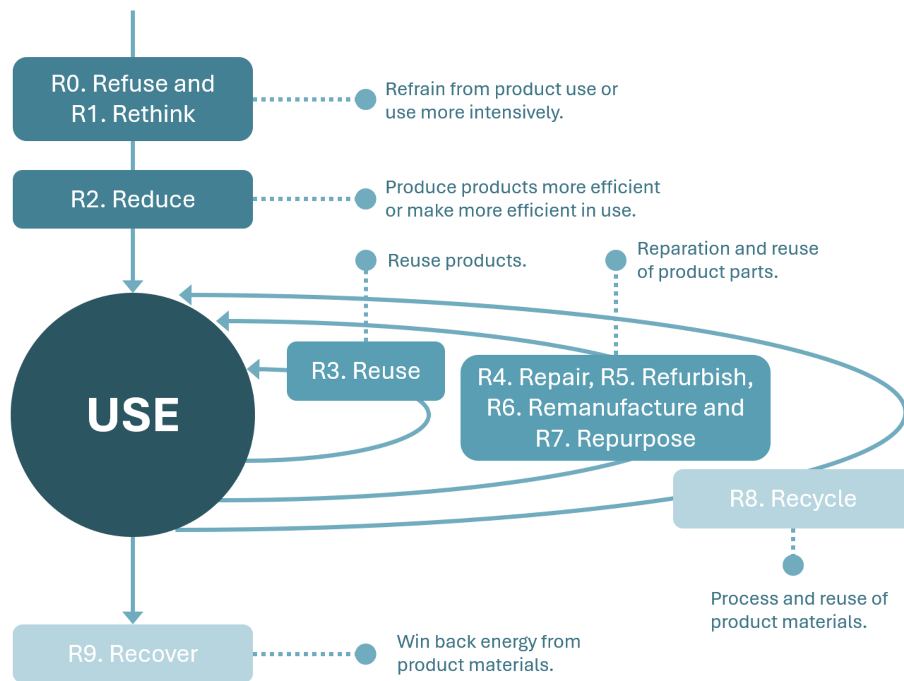


***Figure 2.*** 10R strategies, high circular value at low R number and darker blue (adjusted from: (RVO, 2020))

When looking back at the discussed efforts of circularity in healthcare from the Green Deal and "De Groene OK", it can be stated that those initiatives mostly fall into the first two categories of reduce and reuse. Practices leading to less consumption and the aim of the project group to look into omitting certain uses tie in with the reduce category. The focus of both initiatives on reusables over disposables is clearly part of the reuse category. As these two categories have a higher circular value than the recycle category, it is interesting to go further with those reduce and reuse circular strategies for defining circular hospitals. Additionally, recycling or recovering of product materials is only necessary when higher R strategies are not applied instead.

Therefore, based on these approaches on circularity, and to enable a more comprehensible definition of circular hospitals within the scope of this research, it is chosen to focus on these two categories of R-strategies. Therefore, a "**circular hospital**" can be defined here as:

"*a hospital that maximizes the use of highest R strategies possible, aiming at reduce and reuse*".

The scoping of definition is visualised in figure 3. This definition implies that the a more circular hospital implements higher circular strategies (low R number), which are aimed at reducing production and consumption of medical products where possible, and otherwise at the reuse of these products or parts to lengthen their lifespan.

However, it should be noted that the recycle and recover categories are left out of this scope of the definition, while these remain important categories to be able to realize circularity in healthcare. The reason that it is left out here is that these are lower R strategies, which are only necessary if the waste that is produced could not be prevented in other ways. This implies that it was not possible to implement higher R strategies, such as the reduce and reuse.

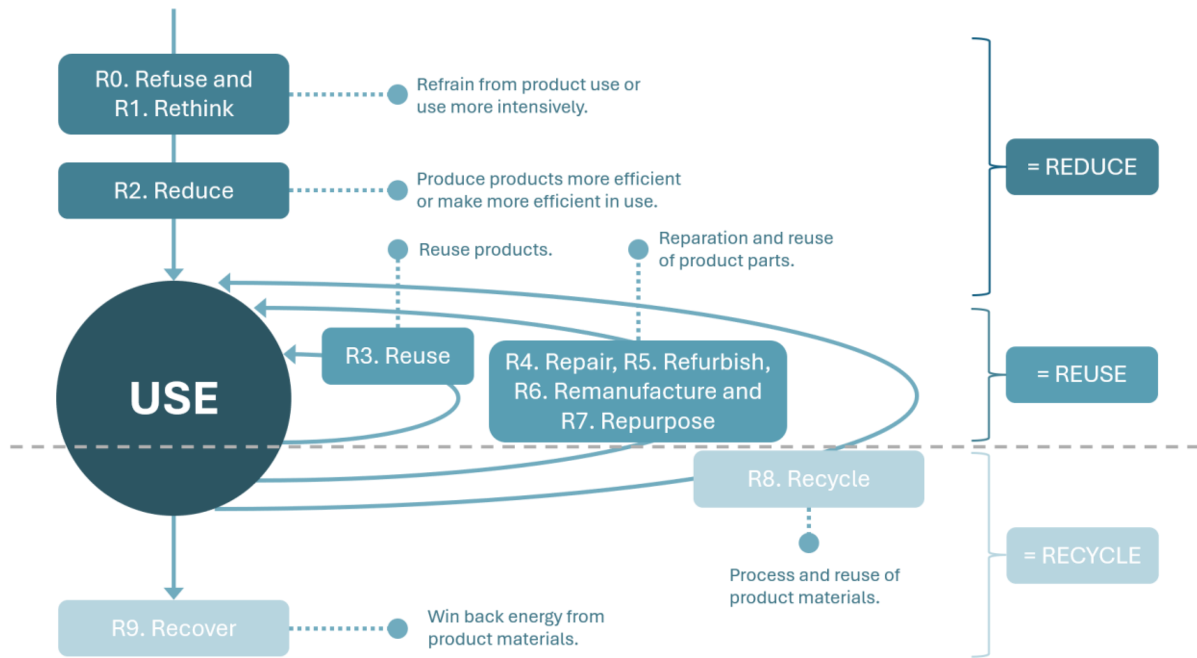


***Figure 3.*** 10R strategies, focus on REDUCE and REUSE for circular hospital definition (adjusted from: (RVO, 2020))

Furthermore, the recycle and recover categories are less healthcare specific, as recycle strategies are more related to waste processing organisations, and are less directly related to specific healthcare treatments and methods, which is more the case for the reduce and reuse categories. For instance, to reduce the use of medical products within a certain medical treatment, content specific knowledge is needed, which also holds true for replacement of medical products by more circular variants, as in such cases these changes might also be affecting the way this treatment will be executed. This might also point out that recycle and recover are less directly linked to the healthcare, which implies that other actors than health insurers might be more responsible for taking up responsibility for these R categories.

Additionally, the definition of circular hospitals focusing mostly on reduce and reuse, makes the scope more realistic and feasible for a master thesis research.
Thus, the used definition of circular hospitals for this master thesis research has its limitations. The research has thus be looked at with the side note that eventually to realise circular healthcare in hospitals, reduce and recover categories also will play a part somewhere, to fully close the loop. On this limitation will also be reflected upon later in the discussion chapter of this thesis.

Altogether, the focus is here on stimulating the implementation of reduce and reuse categories. Eventually, the ultimate goal of this is to minimize the use of resources and to reduce waste, reflecting the principles of the circular economy within healthcare. This definition with the demarcation of reduce or reuse strategies within hospitals also clarifies the research objectives for stakeholders who will be interviewed in light of this research. This will ensure that these different stakeholders are discussing the same circularity aspects, which will enable to get more plausible and coherent results.

## 2.3 Articulation of knowledge gap

It became clear that circularity in healthcare is studied on different aspects, from more input to output focused circularity. Nevertheless, these aspects remain closely linked, reflecting a circular ongoing value stream striving for no net effect on the environment (Soares et al., 2023). Overall, in the transition towards more healthcare circularity there seemed to be a need for a holistic, system thinking approach (Hoveling et al., 2024; Vaccari et al., 2017).

There is not much research executed yet on healthcare circularity specifically in hospitals, instead of focusing on the whole healthcare sector (Soares et al., 2023). The term "circular hospitals" in this thesis will thus refer to the definition substantiated in the previous section. Remarkably, the role of health insurers in healthcare circularity is also still understudied, while the important potential of their role is addressed in some studies. Here it is also recommended to elaborate further on the role of health insurers in future research (Van Boerdonk et al., 2020).

Altogether the main research gaps are the role of health insurers in stimulating circular hospitals, and the systems perspective upon this problem situation.
Therefore, this research aims to address the knowledge gap of the role of health insurers in stimulating circularity in hospitals in the Netherlands, while taking a systems approach. The scope of the hospitals contributes to the limited knowledge that was found related to circularity practices specifically in hospitals as a whole, and ties in with ESCH-R research scope (ESCH-R, 2024). For the ESCH-R project, this research will aim to deliver a unique contribution in its focus on the role of a health insurer. From the needed systems perspective, this research has the objective to study the role of health insurer in stimulating circular hospitals, and to identify potential successful opportunities for health insurers in stimulating circular hospitals. This will be helpful for Zilveren Kruis as health insurer (where this thesis internship takes place) to deliver their contribution to smoothening the necessary transition towards circular healthcare. In a broader sense, more knowledge of the role of a health insurer in stimulating circular hospitals will be a valuable in making the transition towards circular healthcare in the Netherlands, and potentially also outside of it.

## 2.4 Main research question

Eventually, the addressed research gap leads to the following research question:
*How can a health insurer stimulate circular hospitals?*

With this question it is the aim to study the role of health insurers in stimulating circular hospitals, by substantiating the complex system context of circular hospitals from the perspective of a health insurer. Next to this, potential successful interventions for health insurers to stimulate circular hospitals will be identified and it will be researched how these influence circular hospitals in the substantiated system context. The anticipated findings will be useful for doing recommendations on how health insurers can fulfil a valuable role in stimulating circular hospitals.

## 2.5 Sub questions

In order to facilitate the research for answering the main research question, the following four sub questions are formulated:

- *What is the complex system context of stimulating circular hospitals from the perspective of a health insurer?*
- *What are possible interventions for a health insurer to stimulate circular hospitals?*
- *What are the perceived barriers and effects of the possible interventions on the complex system of circular hospitals?*

- *What is the responsibility of a health insurer in stimulating circular hospitals?*

The first sub question will substantiate the complex system of circular hospitals from the perspective of a health insurer, to be able to understand what the objectives around a circular hospitals are and how a health insurer perceives the system context around it, including relevant stakeholders in it. A system approach will be taken for this and with the use of a literature study and semi-structured interviews for data collection.

Then, the second sub question will identify possible interventions which a health insurer can execute to stimulate circular hospitals. This will also be done through literature sources and interviews.

Subsequently, in the third sub question perceived barriers are identified and the exact effects of the possible interventions, identified in the second question. This is will be done while building further upon the system context, that is substantiated in the first question.

Lastly, the fourth sub question will study the responsibility role of a health insurer in stimulating circular hospitals. Studying the responsibility aspect is included to enlarge the social acceptance, when the interventions will potentially be implemented in the future. The information of the executed interviews will be the main data source here.

In this way, the findings of the four subsequent sub questions will together indicate how a health insurer can stimulate circular hospitals, enabling to answer to the main research question.

# 3. RESEARCH METHODS

## 3.1 Research phases

This research will consist of three separate research phases, where each phase has the aim to answer one or more sub questions. The first research phase will broadly explore the complex system of circular hospitals, the second research phase will focus on possible interventions, their effects and perceived barriers in the complex system, and the third research phase will study the responsibility of health insurers in stimulating circular hospitals.

The use of a system diagram is the main method, central to the research in this master thesis. The methods that will be used for data collection within this study are mainly semi-structured interviews, next to a small literature study. Other methods that will be applied include causal mapping and eventually creating a system diagram. Figure 4 shows the research flow with the corresponding sub question, methods and resulting data of the three phases, which will each be explained in more detail further on. The data analysis and data validation for the collected data and the limitations of the used research methods will also be discussed.

Furthermore, as this study concerns the collection of personal data during the semi-structured interviews, the data needs to be handled carefully. For that reason, several documents are produced, being a Risk Assessment Checklist from the Human Research Ethics Committee of the TUD (HREC), a consent document that will be presented to the participants of the interviews and a data management plan (DMP).

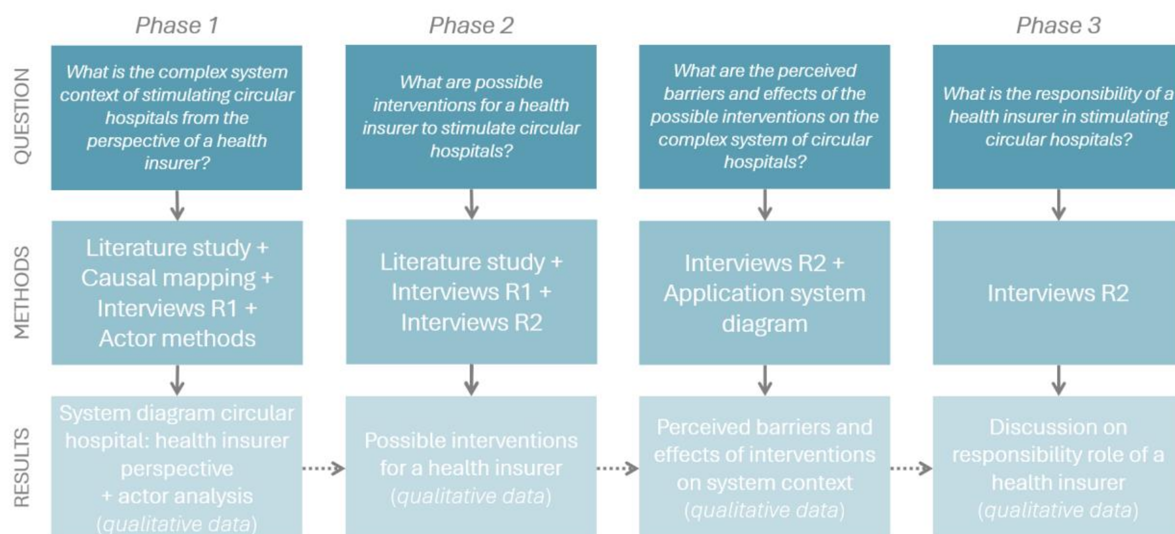


***Figure 4.*** *Research flow*

***Phase 1***

The first research phase will aim to answer the sub question: "*What is the complex system context of stimulating circular hospitals from the perspective of a health insurer?*".

To be able to answer this question, a **system diagram** will be created to capture the complex system of stimulating circular hospitals and analyse it, as it can provide structure to the conceptualisation hereof (Van Der Lei et al., 2010). As the objective here is to eventually come to a system diagram, a mental model will be made for this as a first draft version (Enserink et al., 2022). This will be done based on common knowledge after some experience during the first

weeks as a thesis intern at the health insurer Zilveren Kruis, complemented by information from literature sources.

Therefore, a small **literature study** will be executed, also to gather more information about the role of health insurers in the Dutch healthcare system. The aim of this literature study will thus be to find out more about the role of health insurers in the Dutch healthcare system, and about their main objectives, perspective on, and possible interventions in stimulating circular hospitals. This will lead to a first version of the system diagram.

Then, **semi-structured interviews** with 6 employees at the health insurer Zilveren Kruis will be held to improve the draft system diagram, the main objectives and the external factors. The full interview questions can be found in appendix B. Additionally, relevant stakeholders in the system context will be identified with the interviewees. To ensure to capture the specific perception of the system context from the perspective of a health insurer, it is chosen to conduct interviews here solely with employees at Zilveren Kruis. See table 1 for the interview participants and their roles within the health insurer organisation. The participants are approached by mail, and are selected by purposive sampling, on fulfilling different roles within the organisation (Tong et al., 2007). The interviews will have a duration of around 30 to 45 minutes. To obtain data saturation, interviews will be conducted until no new findings come out of the interviews and the most results of an interview are already found within previous interviews (Tong et al., 2007).

Based on the interviews, the main objectives and system factors and relations found in the literature will be verified with the interview results. Next to this, additions and potential adjustments will be made to the first literature based version of the system diagram.

Furthermore, a first identification of barriers will follow from the interview results. Although the barriers are already part of sub question 3, they are also an important part of the system context that is studied here. Therefore, a preliminary identification from the first round of interviews will be discussed here, leaving room for a more in-depth discussion in the next research phase.

Lastly, the most relevant actors will be identified and discussed, also related to the power and interest they perceived to have in the system context of stimulating circular hospitals.

A second version of the **system diagram**, will serve as the systems approach result of this first research phase, displaying the complex system of stimulating circular hospitals from a health insurer perspective, including main objectives, external factors, system barriers and a qualitative discussion of relevant actors.

***Table 1.*** Interview round 1 participants role

| ***Interviewee*** | ***Organisation*** | ***Role within organisation*** |
|---|---|---|
| **1** | Health insurer Zilveren Kruis | Senior Healthcare Procurer |
| **2** | Health insurer Zilveren Kruis | Senior Healthcare Procurer |
| **3** | Health insurer Zilveren Kruis | Healthcare Procurer |
| **4** | Health insurer Zilveren Kruis | Policy Advisor Healthcare |
| **5** | Health insurer Zilveren Kruis | Strategy and Business Development |
| **6** | Health insurer Zilveren Kruis | Product Design Manager |

***Phase 2***
The second research phase will aim to answer two sub questions. The first is: "*What are possible responsible interventions for a health insurer to stimulate circular hospitals?*"

A preliminary list of possible interventions will be made, based on the findings from the phase 1 **interviews** and **literature**. This list will serve as input for a second round interviews.

A total of 10 interviews will be held with 6 employees at different health insurer organisations, and 4 interviews will be held with employees at hospitals. See table 2 for the interview participants and the role within their organisations. This will enable to capture a broader perspective and may also identify possible interventions that will potentially require a collaboration between these actors. In appendix D the full interview questions can be found. The participants are approached by mail, and are selected by purposive sampling, on working at different healthcare insurer or hospital organisations (Tong et al., 2007). The interviews will have a duration of around 30 to 45 minutes. To obtain data saturation, interviews will be conducted until no new findings come out of the interviews and the most results of an interview are already found within previous interviews (Tong et al., 2007).

In this second round of interviews, the preliminary list of interventions will be finetuned by a discussion of interventions and lead to the final list of possible interventions. It is important to note here that, as the interviews are semi-structured, not all interventions can be discussed with every participant. During the interview the participants are asked about promising interventions and related to the conversation, the interventions that came up were discussed and sometimes they were asked about other interventions, suitable for the direction of the conversation and their input. Therefore, in this explorative way of discussing several interventions and due to time limitations, not everyone could share their perspective on all the different interventions.

Eventually, the qualitative results of this sub question will be a list with possible interventions for a health insurer to stimulate circular hospitals.

***Table 2.*** Interview round 2 participants role

| ***Interviewee*** | ***Organisation*** | ***Role within organisation*** |
|---|---|---|
| **1** | Health insurer | Policy Advisor Sustainable Healthcare |
| **2** | Health insurer | Policy Advisor Sustainable Healthcare |
| **3** | Health insurer | Policy Advisor Sustainable Healthcare |
| **4** | Health insurer | Programme Manager (Sustainable) Healthcare |
| **5** | Health insurer | Expert Sustainable Healthcare |
| **6** | Health insurer | Policy Advisor Sustainable Healthcare |
| **7** | Hospital | Advisor Facilities and Sustainability |
| **8** | Hospital | Coordinator Sustainable Healthcare |
| **9** | Hospital | Coordinator Sustainable Healthcare |
| **10** | Hospital | Coordinator Sustainable Healthcare |

The third sub question will also be answered in the second phase: "*What are the perceived barriers and effects of the possible interventions on the complex system of circular hospitals?*".

In this sub question, the systems approach will again be central and the results will build upon a first version of the system diagram created for the first sub question.

This starts by describing the perceived barriers and the effects of possible interventions identified by the previous sub question, based on the **interview** results of round 2 for which the full questions can be found in appendix D. The inclusion of both health insurers and hospitals in these interviews, will ensure the expected effects to be as realistic as possible, as different actors all have their own valuable perspectives and experience on which they can base their expectations of the possible interventions.

A qualitative description of the perceived barriers and effects per intervention will be part of the result of this sub question. Furthermore, the other part of the result will consist of an application of these findings to a new version of the **system diagram** that resulted from the first research phase. This shows where the perceived barriers are situated, which system factors are influenced by the possible interventions and how this eventually affects the main objectives for stimulating circular hospitals.

***Phase 3***
The last sub question that will be answered in the third phase is: *"What is the responsibility of a health insurer in stimulating circular hospitals?"*.

During the **interviews** conducted in round 2, additionally, more reflective questions will be posed to the participants, related to the responsibility role of health insurers in stimulating circular hospitals. This will enable to capture how health insurers and hospitals perceive the role of health insurers and their responsibility for stimulating circular hospitals. The full interview questions can be found in appendix D.

Eventually, the results for this last sub question will be a qualitative discussion on the responsibility of the role of a health insurer in stimulating circular hospitals, resulting from the conducted interviews.

## 3.2 Data analysis

The data sources used within the three research phases exist of interview data and literature. These data sources were both be analysed in a specific manner.

For the **literature study**, the data analysis simply consisted of the basic process for this, which included first reading the title and abstract of potential relevant academic articles and if they passed this first scan, also the conclusion. The resulting articles were then read fully and notes were made of the findings that were found to be relevant, in this case for substantiating the system context. Subsequently, these notes were also sorted and coupled to summarise the findings which resulted in the eventual system factors and relations.

The data collection method that was used within all three research phases is conducting **semi-structured interviews.** The eventual results summary of the first interview round can be found in appendix C and for the second interview round in appendix E.

The data analysis process for these interviews was globally similar, and therefore this process is explained here. All of the interviews were recorded if the participants gave consent for this, to be able to automatically transcribe the discussed information verbatim, which means that these parts were fully written out word for word via Miscrosoft Teams, to ensure reliability, validity and veracity of the qualitative data (Halcomb & Davidson, 2006).

The next step was coding the interview transcript, which implies that short descriptions were written of the content of these relevant interview parts (Busetto et al., 2020). Here the raw interview data was be connected with theoretical terms. The interviews were coded with the use of Atlas.ti, to categorize the information per main subject. In phase 1 this related to the system factors and their causal relations and relevant actors. In phase 2 this concerned the identification of possible interventions or system barriers, and the effects per intervention. After all the data was coded in each phase, the last step of synthesis and abstraction took place by sorting the data in a logical manner and coupling the information from different interviews with each other (Busetto et al., 2020). This implied that the quotes per subject were translated into English and categorized into smaller topics within one code.

Eventually, the translated quotes are to be found categorized in these sub topics per main subject in appendices C and E. These are thus still objective literal findings, and the eventual findings that result from interpretation of these quotes are substantiated within the chapter where the interview results are discussed. The final results of the interviews within all three research phases were obtained in this way.

## 3.3 Data validation

The data gathered within this research also needs to be validated. For the results of the semi-structured interviews, respondent validation will be applied (Torrance, 2012). This implies the findings of each phase will be summarised and will be sent to the interviewees that took part in that research phase. If they agree with the results to be plausible and resonating with their experience, this will ensure the validity of the interview data.

For the literature study, the gathered data is validated by checking whether the findings from one literature source are corresponding to findings from at least one other literature source. In phase 1 of this research this implies that a system factor or relation found within one relevant article, is in some way also recurring in at least one other article. The plausibility and validity is increased by applying this data validation process.

## 3.4 Methods and limitations

Conducting semi-structured interviews is the main data collection method used within this study. This method is chosen for the direct information that can be obtained from the actors, by conversations with these people, based on their own perception of the system context in reality. For instance, this implies that the perspective from health insurers is expected to be best studied by direct contact with the health insurer.

However, a limitation to interviews is that the findings could possibly be a personal perception instead of a shared perspective, representative for the whole actor (the health insurer as company). Another method which could discover a more shared perspective is focus groups (Plummer, 2008). Nevertheless, as participation of all relevant actors together is required, these are harder to realize. Additionally, more experience and expertise is needed for leading a focus group opposed to conducting interviews, for which experience is gained during study courses.

Thus, semi-structured interviews are still considered well suitable within this research. To diminish the limitations of capturing only a personal perspective, in most research phases there are at least two persons interviewed per actor. Furthermore, the semi-structured character of the interviews provides enough structure to the interview, while there remains the possibility during the interview to steer the questions into interesting directions (Kallio et al., 2016).

Then, the first research phase includes a small literature study to substantiate the complex system context of circular hospitals from a health insurer perspective. This method is chosen because it can be helpful in analysing, sorting and ordering information that is available on the study subject, and to come to the most essential part of it (Lin, 2009). A limitation of this method is that the findings within a specific literature source might not always be intended for application outside the original context of the study. However, by focusing on the identification of more general findings and making a combination from insights of different literature sources, this limitation will be reduced.

Lastly, as this study focuses on the system context of circular hospitals, a system diagram is created. This method is chosen to be able to study the system and effects of interventions within it. To capture relevant system factors and their interactions, it is needed to make simplifications. The limitations of this method is thus that it could be the case that some things are oversimplified, which may lead to unrealistic outcomes. To diminish this limitation, the created system diagram with its simplifications is verified by multiple actors, to assure it is as realistic as possible.

# 4. SYSTEM CONTEXT OF STIMULATING CIRCULAR HOSPITALS

Within the first research phase, the first sub question that is aimed to answer is: "*What is the complex system context of stimulating circular hospitals from the perspective of a health insurer?*".

First, to study the role of Dutch health insurers related to circular hospitals, background information on their general role within the healthcare system in the Netherlands is given in 4.1. Then, a first version of a system diagram will be created in 4.2 to visualise the main objectives, system factors and causal relations, and also the interventions for health insurers that are currently used or known. This will be done based on the information found in literature sources, which are mostly strategy documents from a collaborative organisation from Dutch health insurers, and a research report made by a consultant company.

Subsequently in 4.3, this version will be verified and complemented with the information gathered within the first round of interviews with health insurers. This will lead to a second version of the system diagram. Here additional system factors and relations will be included. Then, 4.4 will discuss a preliminary identification of system barriers.

Additionally, other relevant actors that are present in the system context and have an important role will also be identified and discussed within the interviews. An actor analysis will be performed in 4.5 based on this input, to further explore important roles and possibilities.

Lastly, in 4.6 an answer to the first sub question will be formulated based on the findings of this chapter, regarding the complex system context of stimulating circular hospitals from the perspective of health insurers.

## *4.1 Dutch health insurers: background information on their role*

To be able to answer the main question of how health insurers can stimulate circular hospitals, the role of Dutch health insurers within the healthcare system needs to be clarified. Before going into their role within this specific situation of circular hospitals, more information about their general role within the healthcare system, related to hospital care, is useful. The relevant information related to this is derived from the source of the Ministry of Health, Wellbeing and Sports (2016). This source is cited multiple times at the end of the paragraphs, but not repeated after every sentence, so therefore it is stated here that this source was used for the main part of this whole section.

**Health insurance law**

In the Netherlands, the health insurance law regulates that everyone is obliged to have a health insurance for a basic package, including amongst others standard hospital care. The exact content of this basic package is determined by the government and complementary healthcare packages can be determined and offered by health insurers themselves. Every citizen can choose their own health insurer and health insurers must then accept them without making a difference in their premium, regardless of their health status. Health insurers have a duty of care, which implies they have to guarantee that all the healthcare within the basic package is available to their insured people (Ministerie van Volksgezondheid, Welzijn en Sport, 2016).

**Three main actors and markets**
The Dutch health insurers and healthcare providers, such as hospitals, are private parties. However, health insurers are not profit-seeking cooperative organisations. Next to the health insurer, healthcare providers and citizens also have an important role within the health insurance law (see figure 5). Citizens can choose their health insurer and switch every year, to a better or cheaper one. This stimulates the competition between different health insurers.

Subsequently, health insurers can arrange by who and where healthcare is provided. They do this by negotiating with healthcare providers and selective contracting, based on information on quality, efficiency and customer experiences. During this procurement process, they make sure that the delivered healthcare is up to certain standards by their procurement policy. Lastly, healthcare providers are eventually responsible for determining how they deliver the healthcare. Here they are also acting according to quality guidelines, drawn up by the healthcare professions (Ministerie van Volksgezondheid, Welzijn en Sport, 2016).

In this way, with the presence of multiple health insurers and providers in the system, there remains enough room for competition and market forces which preserve the quality and efficiency of healthcare for citizens (Ministerie van Volksgezondheid, Welzijn en Sport, 2016). The three separate markets which result from this and the coherent actors are shown in figure 5.

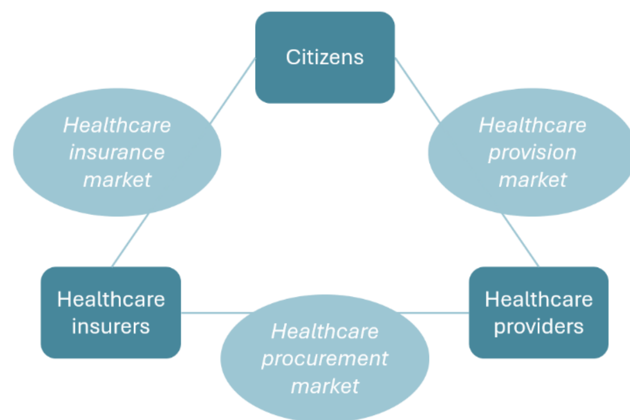


***Figure 5.*** Three markets and actors within the healthcare system (adjusted from: (Zó werkt de zorg, n.d.))

**Financing healthcare**
Lastly, financing of healthcare is another important part of the system. Every adult citizen pays a nominal premium to the health insurer. Next to this, an income-dependent contribution for every citizen is paid by their employers, which goes to the Health Insurance Fund, together with the government contribution for children under 18 years old. Eventually, health insurers receive the premium from their insured and a certain amount from the Health Insurance Fund. The latter is a risk equalisation, and is determined by information on the health status of their insured people, as this poses more or less risks to a health insurer for the amount of healthcare costs.

Healthcare providers are paid for the delivered healthcare by health insurers, and partly by citizens, as they first need to pay the obligatory deductible excess before the health insurer reimburses their costs (Ministerie van Volksgezondheid, Welzijn en Sport, 2016).

**The role of health insurers in stimulating circular hospitals**
It became clear that the role of health insurers is substantiated within the health insurance law, and that they are situated in different market interplays with healthcare providers and citizens. Health insurers are financed by the paid premium of their insured, complemented with a risk equalisation paid by a Health Insurance Fund.

For the healthcare system market and actor situation (figure 5) related to circular hospitals, it is useful to know that hospitals fulfil the role of healthcare providers. They are situated in the

healthcare provision market with the health insurers, where they negotiate and conclude contracts about providing healthcare which falls largely within the basic package. During this health procurement process, health insurers assure that the healthcare must meet certain quality standards. It is interesting to note that in the situation of circular hospitals, this could also include standards related to circularity. This could refer in this research to the implementation of reduce or reuse strategies. However, how this exactly will and can be included will be investigated further within this research.

Additionally, it is useful to know that health insurers will have to meet new regulatory requirements related to reporting about sustainability from 2025, the CSRD (Corporate Sustainability Reporting Directive). This is an extra incentive for them to stimulate the transition towards more sustainable healthcare and circular hospitals, as this falls within their long chain from healthcare procurement to provision (Zorgverzekeraars Nederland, 2023). Within this obligation to report about their operations, health insurers identified two different subthemes on circularity, including waste and material-inflow and -use. The latter reflects the reduce and reuse strategies from the substantiated definition of circular hospitals.

**Different health insurers in the Netherlands**

There are at the moment 10 health insurers concerns in the Netherlands (see figure 6), which are controlling different health insurers brands. These are all operating individually and are competing with each other, but the risks are mostly shared within their concern (Zorgwijzer, 2024). The health insurer organisation of this thesis internship, Zilveren Kruis, falls within the concern of Achmea, which currently has the largest market share, as shown in figure 6.

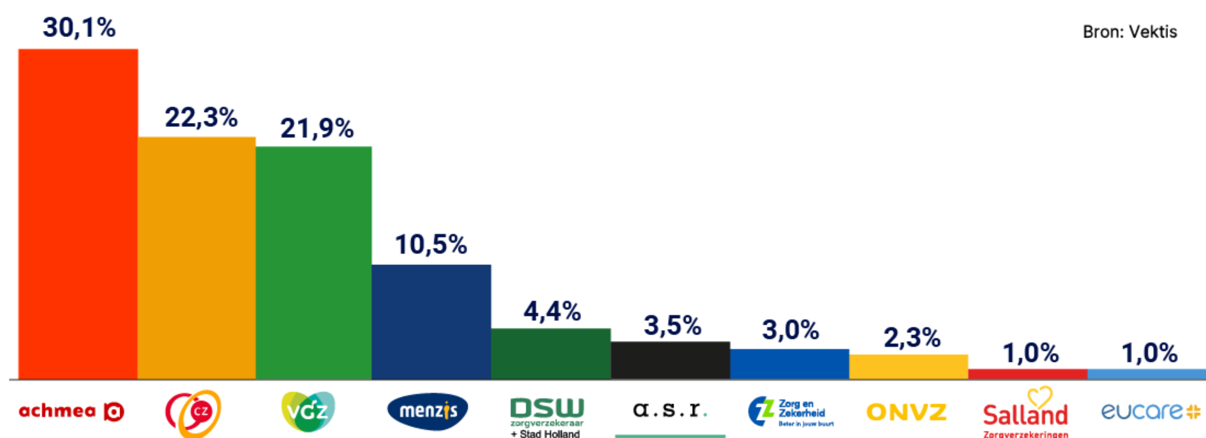


***Figure 6.*** Market shares of the 10 health insurer concerns in the Netherlands (Zorgwijzer, 2024)

## *4.2 System context based on literature sources*

First, a literature based version for the system diagram, representing the system context of stimulating circular hospitals from the perspective of a health insurer will be made. For this, information will be gathered on their main objectives within this situation. Then, factors are identified which are affecting these objectives, which will be the system factors and external factors. Also, the current means or interventions for health insurers will be studied, which are often already being executed to some extent, or discussed more often in relation to this subject. However, more means will be identified later within the interviews, as these are the subject of the following part of this study.

### *4.2.1 Main objectives of health insurers in stimulating circular hospitals*

Health insurers have multiple objectives that are important for them in stimulating circular hospitals. To be able to create a system diagram, it is necessary to capture their main objectives within the system context of stimulating circular hospitals.

**Circularity objectives**

First of all, health insurers want to obtain more sustainable healthcare to be able to continue to fulfil their duty of delivering healthcare (Zorgverzekeraars Nederland, 2022) and to meet the obligation of the CSRD (Zorgverzekeraars Nederland, 2023). The aim of stimulating circular hospitals falls within more sustainable healthcare, and is the scope within this research. To translate this to an measurable objective, the definition of circular hospitals that is substantiated in the previous section can be used. With the definition of circular hospitals implying that the implementation of high R strategies is maximised, focusing on reducing and reusing, there can be two objectives formulated related to this. These are the maximisation of the implementation of respectively, reduce and reuse strategies.

**Healthcare objectives**

Next to the circular aspect of hospitals, health insurers are responsible for maintaining the quality of the healthcare they procure at healthcare providers, such as a hospital. Thus, their objective in this is a high quality of healthcare. Furthermore, health insurers have a duty of care, which became clear from the health insurance law. This implies they have to keep healthcare accessible and affordable for everyone, which are other important objectives in making healthcare more sustainable (Zorgverzekeraars Nederland, 2022).

Thus, in the end there are four identified objectives for health insurers in the system context of stimulating circular hospitals, which is visualised in figure 7. As a system diagram includes factors which can increase or decrease, these objectives are translated into the following four measurable criteria:

- *amount of R strategies implemented*
    - AGGREGATED: including amount of REDUCE and REUSE strategies implemented
- *quality of healthcare*
- *accessibility of healthcare*
- *costs of healthcare*

It is chosen to capture both reduce and reuse strategies in one aggregated criterium in the system diagram, as it is expected that most system factors that can influence these are mostly affecting both. Including these reduce and reuse together under R strategies will thus prevent the system diagram from becoming unnecessarily complicated, enhancing the diagram's understandability.

***Figure 7.*** Main objectives of health insurers

### *4.2.2 System factors and causal relations from a health insurer perspective*

There are several important factors playing a role in the system context of stimulating circular hospitals, which may influence the main objectives of the health insurer. These are visualised in a first version of the system diagram, which can be found in figure 8. To present the system diagram as unique creation of this master thesis, it is called the "*Insurer-driven Circular Hospitals model*". As there will be built upon this first version throughout this master thesis, also the version is indicated by V1, and V2, etc. in the following version of this thesis.

In the process of creating this system diagram literature sources were used to substantiate the causal relations between system factors, and also some assumptions were made. These assumptions followed from logic reasoning in the system context. In figure 8, the literature based relations are shown with green arrows and the assumptions are shown with black arrows. More explanation will be given here on how the factors are affecting each other and the main objectives, according to the literature and the assumptions.

The awareness of hospitals on the necessity of becoming more circular is very important to put hospitals into action (Zorgverzekeraars Nederland, 2022; Gaberščik et al., 2020; Hoveling et al., 2024; Ville et al., 2023). If their awareness on this aspect increases, eventually they will be driven to actually take action and implement more R strategies. Also the existing circularity strategies can stimulate hospitals to take action (Zorgverzekeraars Nederland, 2022; Soyler et al., 2024; Fletcher et al., 2021; Zandberga et al., 2024). In other words, when the availability of circular strategies increases, by which the strategies are meant that are known by hospitals and ready to be implemented, this contributes to the eventual amount of R strategies that are implemented.

These strategies have to be developed in collaboration with the hospitals as they know how different medical treatments and procedures currently take place and what is possible in changing this. Therefore, it can be expected that the awareness of hospitals also contributes to this availability of circular strategies.

On the other hand, knowledge and facts about circularity in hospitals, which may be originating from research projects or from other organisations in the healthcare sector, also contribute to the development of circular strategies. At the moment, there is often still a lack of knowledge which hinders the implementation of R strategies (Zorgverzekeraars Nederland, 2022; Morris & Murray, 2024; Gaberščik et al., 2020; Ville et al., 2023).

Furthermore, if these strategies make use of new circular products, the availability of circular products on the market could also lead to an increase of the implemented and the available circular strategies (Zorgverzekeraars Nederland, 2022; Soyler et al., 2024; Fletcher et al., 2021; Zandberga et al., 2024). Some circular strategies could make use of circular products and thus more products can stimulate hospitals to develop more strategies. The other way around it might also be the case that more circular strategies that are available, as they are developed by hospitals and maybe stress the need for certain circular products, eventually this will also increase the availability of circular products, as suppliers could be responding to this need of circular products of hospitals. This creates a small positive causal loop within the system.

As this points to the market of healthcare products, the awareness of suppliers on this market also influences the availability of circular products, similar to how this works for hospitals (Gaberščik et al., 2020; Hoveling et al., 2024; Ville et al., 2023). As they are more aware of the necessity of circular products and they think the demand for these will grow, they are more incentivised to increase the circular products they supply. Additionally, similarly to this causal relation within hospitals, it can also be expected that when suppliers have more knowledge

regarding circularity, this will also contribute to the availability of circular products (Morris & Murray, 2024; Gaberščik et al., 2020; Ville et al., 2023).

Subsequently, when more circular products are available on the market, related to economic market theory, the prices of these products will eventually lower and thus lead to lower investment costs for implementation of the use of these products as part of the R strategies. Currently, the investment cost for hospitals of circular strategies are often quite high, which is still a barrier for implementation (Gupta Strategists, 2022; Fletcher et al., 2021; Hoveling et al., 2024), resulting in less R strategies being implemented. However, when R strategies with high investment cost are still being implemented, this could lead to higher costs of healthcare.

Lastly, the law and regulations on respectively circular healthcare and circular healthcare products are seen as external factors to the system, as these are drawn up by the government. Such regulations could result in certain obligations for hospitals and healthcare suppliers, forcing them to be more circular. If hospitals and suppliers have more obligations to be circular, due to such regulations, laws or for example other contracts or agreements, this will force them to implement more R strategies.

An example of such regulations is the Corporate Sustainability Reporting Directive (CSRD), which was already mentioned before related to health insurers, but it will be obliging all sort of companies to report about sustainability (Zorgverzekeraars Nederland, 2023). The CSRD will thus eventually also apply to other companies in healthcare, such as hospitals and suppliers. Other regulatory standards which medical suppliers and hospitals have to comply with is the Medical Device Regulation (MDR), related to medical devices and their use within healthcare organisations (Ministerie van Volksgezondheid, Welzijn en Sport, 2024b).

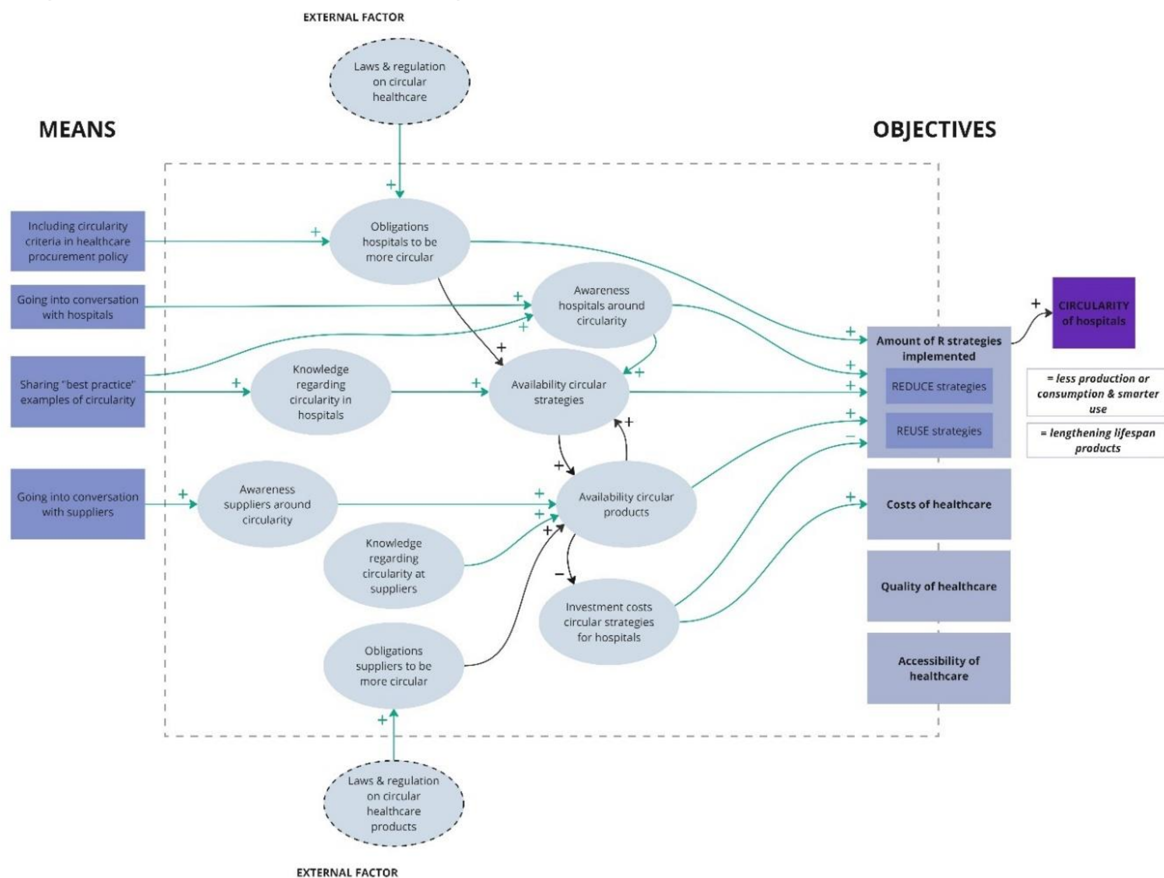


***Figure 8.*** Insurer-driven Circular Hospitals model V1
(based on literature sources (green arrows) and assumptions (black arrows))

### *4.2.3 Current interventions for a health insurer in stimulating circular hospitals*

At the moment, the health insurers are already acting in ways to stimulate circular hospitals or there are some interesting directions for actions mentioned. These are also already included in the Insurer-driven Circular Hospitals model in figure 8, and here they will briefly be discussed and it will be explained how these affect the system context.

**Including circularity criteria in healthcare procurement policy**

As health insurers are the ones that procure healthcare for their insured, they are able to set some criteria to the healthcare providers. This implies they can include criteria related to circular healthcare in their procurement policy to set specific requirements to the procured healthcare (Zorgverzekeraars Nederland, 2022). This possibility of as reviewing their policies to influence healthcare providers was also mentioned within the literature (Duane et al., 2020).

Within the Insurer-driven Circular Hospitals model, this will result in more obligations that are set to hospitals to be able to deliver the healthcare to health insurers. This will stimulate them to implement more R strategies, but will also drive them to develop more circular strategies, thus increase the availability of circular strategies.

**Sharing "good practice" examples of circularity**

Health insurers are actively collecting "good practices", together with healthcare providers, and actively sharing them transparently within the whole healthcare sector (Zorgverzekeraars Nederland, 2022). This is expected to contribute to developing more knowledge and making it easily accessible. Also, this enables to learn from each other, as everyone is facing the same sustainability challenges (Zorgverzekeraars Nederland, 2022).

For the Insurer-driven Circular Hospitals model, this solution implies that the knowledge increases, effecting in a higher availability of circular strategies, which eventually also increases the amount of R strategies implemented.
This intervention can be seen as a collaborative approach of hospitals and health insurers, by which the importance is noted by Fletcher et al. (2021) and Leissner & Ryan-Fogarty (2019).

**Going into conversation with hospitals**

To create more awareness at hospitals around circularity, health insurers should go into conversation with hospitals where they point out the importance of circularity, to increase their awareness. This is necessary to realise the needed behavioural change for circular healthcare (Zorgverzekeraars Nederland, 2022). In some way, this puts pressure to a hospital for implementing circularity (Van Boerdonk et al., 2020). This can stimulate the implementation and creation of more circular strategies. It also might lead to collaboration between hospitals and health insurers, which can be valuable in this transition towards more circular healthcare (Fletcher et al., 2021; Leissner & Ryan-Fogarty, 2019).

**Going into conversation with suppliers**

In a similar way as with hospitals, health insurers could also go into conversation with healthcare product suppliers, for increasing their awareness (Zorgverzekeraars Nederland, 2022). With this intervention it might be possible to enforce a move towards more circularity upon healthcare product suppliers (Vanholder et al., 2022). This can stimulate the availability of circular products on the market, which will eventually lead to more implemented R strategies. Also here, possibly a collaboration between suppliers and health insurers might follow from these conversations, which can be important in the transition (Fletcher et al., 2021; Leissner & Ryan-Fogarty, 2019).

## *4.3 System context complemented by health insurer interviews*

After the Insurer-driven Circular Hospitals model V1 is created, this version is verified and complemented by conducting interviews with health insurers, to ensure that their perspective is thoroughly captured within a second version of the Insurer-driven Circular Hospitals model V2. To enable this, interviews were executed where the first version of the Insurer-driven Circular Hospitals model was used as input. Participants were asked about the main objectives, whether there were factors or causal relations missing, based on their perception of the system context.

The full interview questions for these semi-structured interviews are to be found in appendix B. In the following, the interview results related to the verification and addition of the system context will be discussed, based on the summary of interview results in appendix C.

### *4.3.1 Verification and addition of the system factors and relations*

Altogether, the main additions to the Insurer-driven Circular Hospitals model resulting from the interviews are the system factors of intrinsic motivation, actionability of patients on circular healthcare, transparency in circularity progress of hospitals, steering options for health insurers and the external factor societal importance of sustainability. Additionally, the addition that resulted from the interviews on the objectives was the causal relations between them.

The most system factors that were identified by health insurers were already included in the Insurer-driven Circular Hospitals model. This verifies the first version of this model with the system factors and the influence relations between them. Furthermore, the additional system factors and relations identified within the interviews, are shown in pink in figure 9. These are also influencing the system context from the perspective of a health insurer and are thus added to the Insurer-driven Circular Hospitals model V2. The main interview findings, resulting in relevant additions to the Insurer-driven Circular Hospitals model, will be discussed here.

In general, multiple participants in the interview justified that the Insurer-driven Circular Hospitals model V1 is similar to the situation they experience around circularity, and that all elements are quite much included. A health insurer quoted: "*The system you display is indeed like how we currently talk about it.*"
One system factor that stood out in the interviews with health insurers is the awareness of hospitals, as a lot of them recognized the importance of this when undergoing real change.

However, it was noteworthy that some health insurers also addressed the need for the current healthcare system to change, as it lacks the necessary incentives to really enforce change, in order to enable a transition towards more circularity. As one health insurer quoted: "*The healthcare system needs to change and we need to start thinking differently about this sort complex problems, and act like we really see this as a problem and act upon it*". While this is certainly an interesting perspective, this does not capture the view of health insurers on the system context as it currently is. A fixed system perspective is central to the creation of a system diagram, which is a main method used in this thesis research. Therefore, this finding of the perceived need for change of the system was shortly mentioned here, but not further included in the discussion of the several system factors and relations.

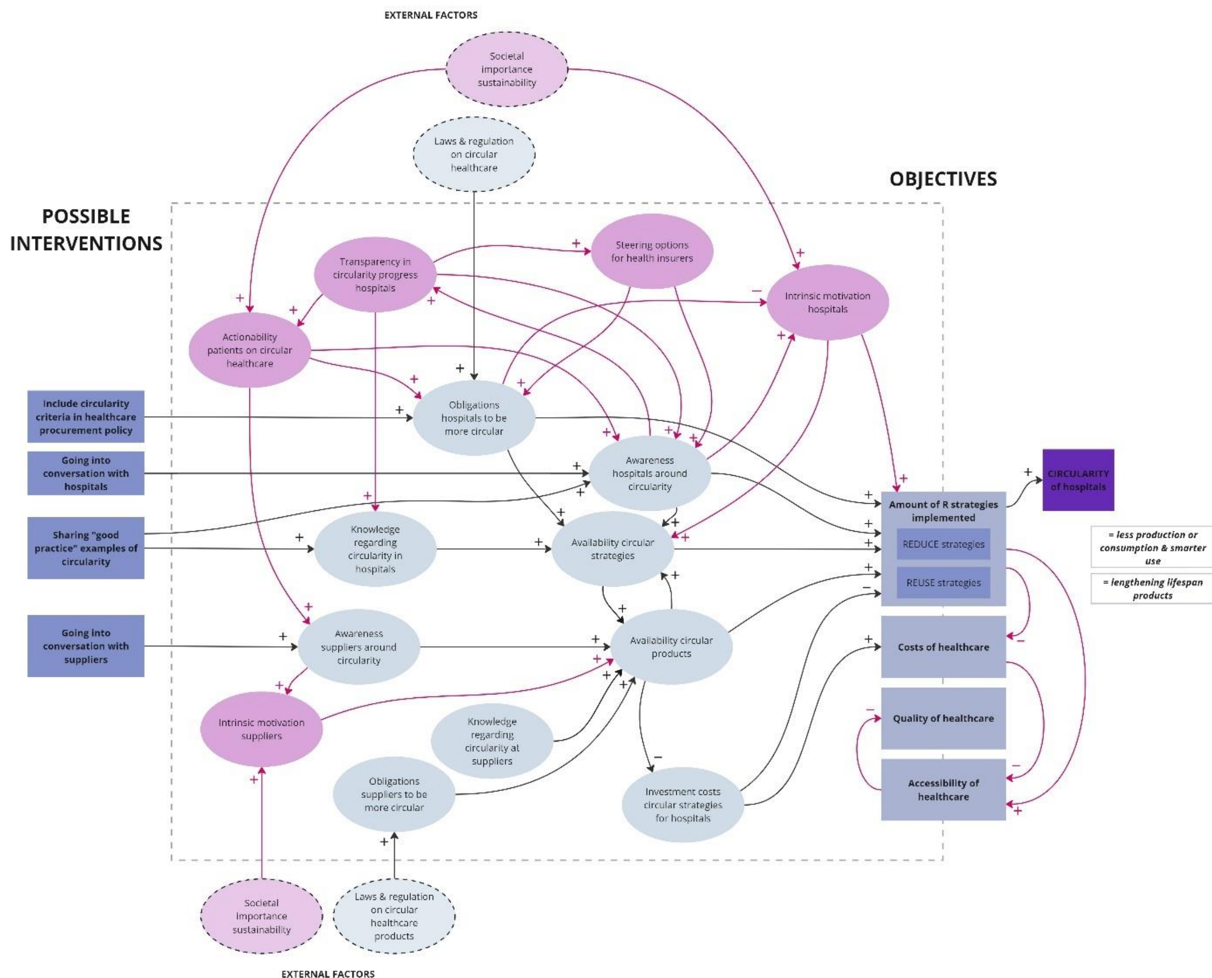


***Figure 9.*** Insurer-driven Circular Hospitals model V2 (additions from interviews round 1 in pink)

***Intrinsic motivation hospitals / suppliers***

An interesting addition is the intrinsic motivation as system factor within the diagram. Health insurers noticed different views from hospitals on circularity and the interest they have in the topic. They said that it appealed more to some than to others, and a certain vision and background is needed from hospitals and directors to really take action on making hospitals more circular. It was also stated: "*Some things are such big investments and then you really have to believe in it and dare to make the choice, so therefore you got to have a certain vision and background from a director*".

This could be included in the Insurer-driven Circular Hospitals model as the intrinsic motivation of hospitals, which could increase the amount of R strategies implemented, but also increase the availability of circular strategies. The intrinsic motivation of hospitals could grow by more awareness around circularity.

A similar factor and relations hold true for suppliers, as health insurers noticed that there are a few suppliers that are really interested into the circularity topic and are trying to be more circular, but these are the exceptions. This can lead to a higher availability of circular products, and can be increased by more awareness of suppliers on circularity and the importance.

However, according to health insurers, the intrinsic motivation for hospitals could also decrease by too much obligations that are placed on them to be circular. Health insurers articulated the

possibility to simply oblige hospitals to be more circular by enforcing them through their healthcare criteria in the procurement process, or by governmental law and regulations.

However, they also noted that this kind of obligations could be pressuring and possibly lead to a loss of their "energy" on the subject, and thus less intrinsic motivation. As it was stated: "*We don't want hospitals to lose their 'energy' on this subject by putting them under big pressure.*" To keep this energy and intrinsic motivation alive, less obligations and more freedom to figure it out themselves could be better according to health insurers.

A sidenote that has to be made for this factor is that the intrinsic motivation can be differing for different actor groups within the system actors, as defined within 4.5. For instance, sustainability experts are often already more motivated than hospital employees within an organisation.

***Societal importance sustainability***
Another newly identified external factor, related to the intrinsic motivation, is the societal importance of sustainability. This finding resonates with the statement of Soyler et al. that change will only happen if circular principles are universally adopted and ingrained in societal norms (2024).

Health insurers stated : "*I can imagine that patients are starting to value sustainable healthcare more*", and "*it is also something from the younger generation*". They discussed that circularity and sustainability in general, sometimes seems to be maybe something more from the young and new generations, as they are valuing it as more and more important. In general, they think the importance of sustainability is growing in the society. This is an external factor as it cannot be influenced by health insurers, but it is a factor that also stimulates the intrinsic motivation of hospitals and suppliers, as the people working there are also part of society.

***Actionability of patients on circular healthcare***
This societal importance of sustainability is also positively influencing another new system factor, the actionability of patients on circular healthcare. Health insurers identified the role of patients influencing the system context, as they are increasingly valuing the importance of circularity and sustainability. As it was stated: "*I think the patients also pays a role in this and can imagine that patients also value sustainability increasingly more. Therefore, it is important that the patient knows what a hospital does about it, and that they can see that one hospital does more than the other, so that they can make this decision*."

This leads to the possibility that as patients get more aware and they also become more capable of taking action, captured in their "actionability", they might be demanding more circular healthcare from hospitals. Partly this could be increasing the obligations of hospitals, as maybe the patients will pay for circular healthcare or they could always choose the circular healthcare option, forcing hospitals to deliver more circular healthcare. Additionally, this actionability of patients could also just make hospitals more aware and willing to become more circular for their patients.

Eventually, this actionability of patients might also be noticed by healthcare suppliers as it creates demand for circular healthcare. One health insurer stated: "*There can also be a demand created, in the way that patients also want to have sustainable healthcare*." Such a demand on the market activates suppliers and increases their awareness of the importance of circularity.

***Transparency in circularity progress hospitals***
Furthermore, the transparency in circularity progress of hospitals is noticed by health insurers as an important factor. Currently, health insurers address that there is often a lack of insight into what hospitals are doing and what not yet, related to circularity. A health insurer stated: "*I miss the insight into how far hospitals are in transitioning towards circularity. For example, whether they all adopt a good example. And it's okay if they don't for good reasons, like when it is not feasible or possible, but I don't know if there are also healthcare providers that are not aware of it and that would be a waste.*"

If this progress would be more transparent and known to everyone, then hospitals could learn from each other. It could raise the awareness and knowledge also at other hospitals that might be not so far with their circularity progress yet. It is expected by health insurers that as hospitals are more aware of circularity, they are also more willing to be more transparent about it and show their efforts, increasing the transparency. More transparency also leads to increased actionability of patients, as they can make more informed decisions if the patients know what a hospital does about circularity and what circular healthcare options it offers.

***Steering options for health insurers***
More transparency in the circularity progress of hospitals can also increase the steering options for health insurers, as they can provide more targeted incentives. These could be in the form of more targeted obligations or creating more targeted awareness on necessary subjects, which could be a more effective way to eventually stimulate the amount of implemented R strategies.

Additionally, it makes it possible to specifically go into conversations with the hospitals that lag behind. As health insurers stated: "*Insight into where there is room for improvement regarding circularity would help health insurers to stimulate this*" and "*With insight into what hospitals are doing and what not yet, we can go into conversations with hospitals that lag behind and maybe get them into contact with a more progressed hospital*".

***Causal relations main objectives***
Lastly, health insurers addressed some causal relations between the main objectives. Most health insurers believed that more circular healthcare and implementing R strategies does not always have to be costly and actually can be cost saving in general. This reflects in their statements: "*Implementing more circular strategies is a way to keep the healthcare affordable*" and "*I think such circularity strategies can really give an advantage in reducing the costs*". Some studies actually also found that circular strategies could have financial savings (Van Straten et al., 2021; Morris & Murray, 2024). Therefore, more implemented R strategies lead to lower healthcare costs.

In the long term, if nothing will be done the healthcare sector will become more polluting and this will negatively affect people's health, threatening the accessibility. More circularity in healthcare will thus help in keeping the healthcare accessible. Additionally, as reducing certain uses will lead to more time that can be spent to delivering healthcare, more implemented R strategies will also lead to a higher accessibility of healthcare.

Furthermore, health insurers noted that when costs of healthcare would increase, the affordability decreases and so does the accessibility of healthcare.

Lastly, it was discussed that if the accessibility of healthcare would decrease, the quality of healthcare will too. According to health insurers, while trying to still keep the accessible in some way, there is less room for delivering high quality healthcare.

Overall, it was concluded by health insurers that more circular hospitals (which implies they have implemented more R strategies) would not be threatening for also reaching the other main objectives of the costs, quality and accessibility in this situation. Actually, most health insurers believed it could be safeguarding the other objectives, especially on the long term.

## 4.4 Preliminary identification of system barriers

According to the health insurers from the interviews, there are also certain barriers present within system context of stimulating circular hospitals. A preliminary identification of system barriers from the first interview round is discussed here. In a later research phase, a more in-depth discussion of barriers will follow.
There were multiple system barriers identified by health insurers, which are perceived as difficult factors within the system context of stimulating circular hospitals.
All the identified barriers are shown within the Insurer-driven Circular Hospitals model V3 in figure 10, to visualise where these barriers are situated. Mostly, the barriers relate to one factor within the Insurer-driven Circular Hospitals model, but sometimes to multiple.

***Differing focus***
While health insurers think that circularity and sustainability is becoming a subject of growing importance, they address that there are often still more pressing priorities and responsibilities that require focus. As it was stated by a health insurer: "*For hospitals and us at the negotiation table, it is actually almost impossible to handle all these different subjects and include all the elements in the right way.*"

Related to their duty of healthcare, health insurers have to keep healthcare accessible at all times, so they cannot simply focus exclusively on circular healthcare. Furthermore, at the moment there are also challenges for healthcare sectors related to digitalisation, prevention, the greying of the society and staffing shortages etc. This makes it difficult, also at the negotiation table for procuring healthcare, to make agreements on all these different subjects. Circularity is thus often still a smaller subject with less attention. However, while all these different problems create tension, some health insurers also address the possibility that circularity could potentially go hand in hand with solving other challenges.

***Financial barriers***
One barrier that is often mentioned by health insurer has to do with costs. Hospitals keep asking the question how much extra money they will receive for implementing more circularity.

However, health insurers address that there simply is no extra money reserved for this. This makes it difficult as a lot of circular strategies and products are still costly to implement, and hospitals can or are not willing to make such investments. Although health insurers understand that not all circular strategies will gain money directly, they often believe that in the long term the most will be cost reducing. Also, implementing a package of circular strategies could enable hospitals to break-even on the financials, as a health insurer stated: "*I understand that not all initiatives will gain money, however it should be possible to implement a package of initiatives and to play break even in that way.*"

Another financial barrier has to do with health insurers financing circularity individually. When a health insurer would choose to finance hospitals on circularity, this would put them in a financially disadvantaged position towards competitors. Other health insurers would freeride at this investment as hospitals are always delivering healthcare for multiple health insurers.

***Lack of knowledge***
As health insurers themselves are not directly involved in the delivery of healthcare, they admit that they do not exactly know how a hospital functions and thus what is exactly possible for implementing circularity. For this, not only very specific knowledge on current healthcare practices is necessary, but also on circular possibilities, which is at the moment still limited. Health insurers thus say that they lack the practical knowledge on what is possible and feasible, which can hinder them in taking action in stimulating circular hospitals.

Next to this, in current conversations between hospitals and health insurers for the crucial healthcare procurement agreements, there are mostly people without knowledge on circularity talking to each other. These healthcare procurers and business controllers might sometimes be acting like a pass-through on the sustainability topic, while experts on this topic from both parties are not yet involved to, hindering incorporation of circularity into the agreements. One health insurers explains: "*The conversation is mainly about money and maybe only indirectly, like a pass-through, sometimes about sustainability. This does not work well, so it would be better if the right people with the right knowledge on circularity should come together*."

***Lack of awareness***
A health insurers stated: "*At the moment it is just accepted that a lot of waste is produced, and to change this and the system, someone has to make clear that it cannot go on like this any longer.*" This quote addresses the awareness, that is currently often still very ambiguous. Although the interest is growing in hospitals and some are really into the subject, others care much less, especially when it comes to extra costs or challenging changes. Health insurers also think that this is caused by a lack of intrinsic motivation.

A similar phenomenon of this ambiguous level of awareness is noticed by health insurers within their own organisation. This makes it hard to also really take action for a health insurer. While sustainability experts might be present, aware and willing, higher directors or healthcare procurers might also be needed to realise circularity in hospitals. This might have to do with financing projects or stimulating circularity through the healthcare procurement process. This unequal awareness and attention for circularity within the health insurer organisation themselves is thus also a noteworthy barrier for actually executing the potential means.
This lack of awareness is noticed to be even bigger at suppliers, and health insurers state that their effort are in general still very disappointing.

***Medical procedures / standards***
In the healthcare sector there are a lot of standardised practices, which can be useful at times, but can also be hindering the needed change in the transition towards more circularity. This barrier was also noted by multiple studies, stressing the need to change current practices and products in healthcare (Fletcher, 2021; Leissner & Ryan-Fogarty; Vaccari et al., 2017).

For instance, the packages of medical consumables that are supplied for medical treatments often include a lot of redundant components, which are only necessary in exceptional situations. Similarly, some medical products are provided in bulk to patients, while they often end up not needing them anymore. A health insurer stated: "*There is so much waste in the chain, which should be taken out, but logistically this could be challenging*." Also the variance in composition of medical products from different supplier makes it difficult to take products apart to lengthen their lifespan. All this causes the production of excessive waste.

Furthermore, transitioning towards more reusables requires sterilisation of these products. This implies there is a need for central sterilisation departments, maybe even transportation towards

these, or more capacity of hospital staff. This means that a lot of current practices needs to be changed, which can be challenging to realise. Also in light of keeping the healthcare affordable.

***Lack of insight progress***
Another important barrier for health insurers is their lack of insight into the circularity progress of hospitals. A health insurer stated: "*I miss insight into what certain hospitals are currently doing on circularity subject. And whether all the hospitals implemented a certain good practice, or only a few and why. Because it could be for good reasons that they don't, but if a hospital just don't knows about it, then it would be a waste*." Health insurers indicate that they don't have a clear view on what the level of knowledge is at different hospitals, while there certainly are frontrunners and others that lag behind, which might benefit from more help.

***Current government***
The current government is mentioned by health insurers as a factor which does not help the situation. As the climate and sustainability are a lower priority here, health insurers doubt whether there is an opportunity to talk about healthcare circularity in the political arena. One health insurer stated: "*It's a little "choose your battles", and I doubt whether they would even listen to us, if we bring it up to them*."

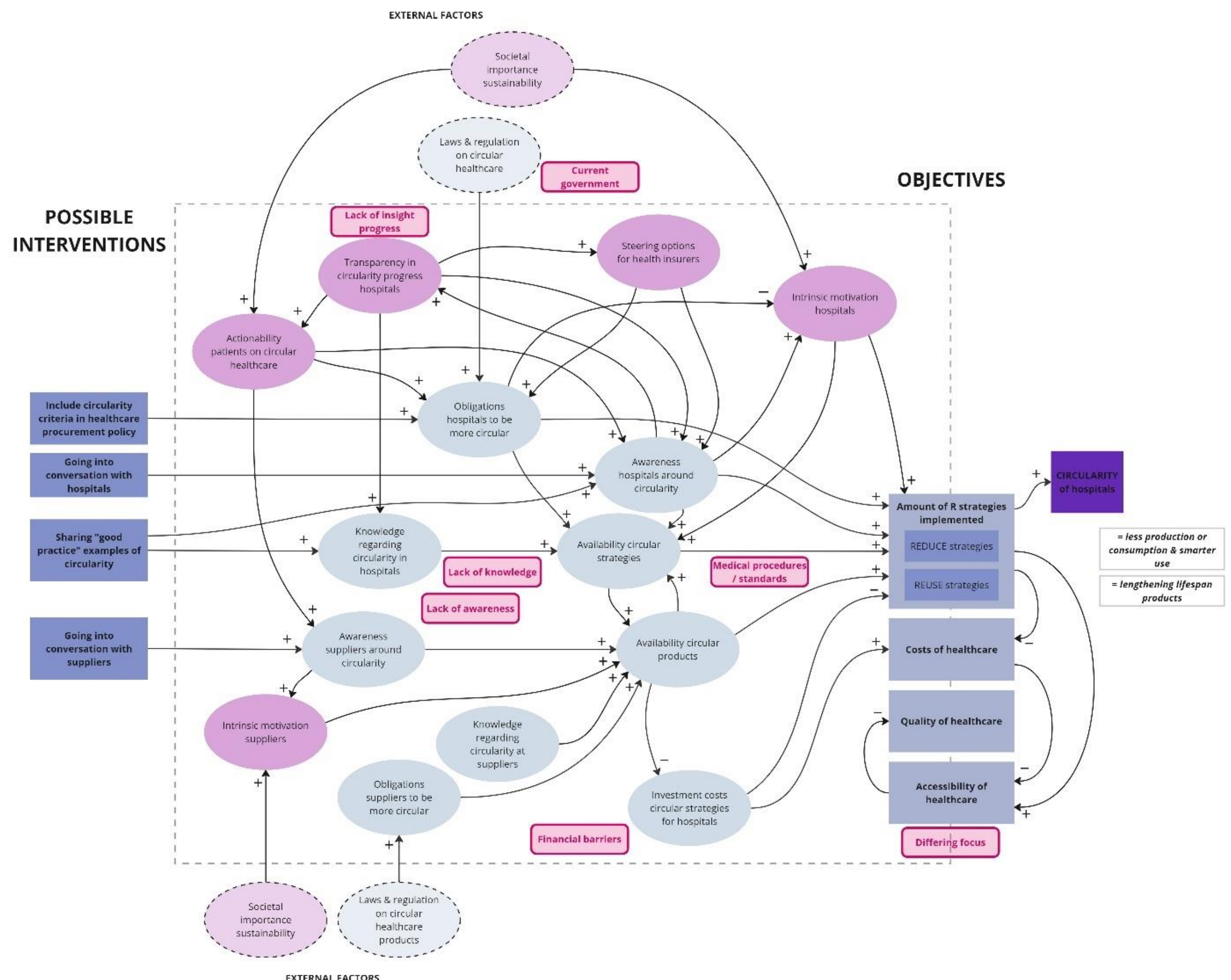


***Figure 10.*** Insurer-driven Circular Hospitals model V3
(with identified barriers in red from conducted interviews round 1)

## 4.5 Actor analysis

During the first round of interviews it was also discussed with the health insurers which other actors they notice to be relevant in this process of stimulating circular hospitals. The most important actors were identified and it was discussed how their roles are perceived.

Additionally, their own role in this situation was discussed with health insurers. Furthermore, it was asked to the interviewees how much power and interest they perceived the relevant actors to have related to this situation. This resulted in a power-interest matrix, substantiated by merging the input of six different health insurers into one diagram, both for all actors together in figure 11, and per actor in figure 12.

### 4.5.1 Relevant actors

The most relevant actors in stimulating circular hospitals from the health insurer perspective appeared to be hospitals, suppliers, the government and insured/patients. The main insights on how health insurers perceived their roles, including their own, will be discussed.

Additionally, different organisations or actor groups that fall within these main actor categories, and even sub groups within these actor groups, which are mentioned to be important as well, will also be described, based on the discussion within the interviews. Table 3 presents these findings on the roles of the relevant actors and it describes the relevant actor (sub) groups, that fall within.

***Table 3.*** Roles of relevant actors, and the related actor groups within

| ACTOR | ROLE DESCRIPTION | |
|---|---|---|
| **HEALTH INSURERS** | Health insurers notice that they are in fact capable of enforcing circularity upon hospitals within healthcare procurement contracts, while they admit that this is not realistic and undesirable. If they would decide that hospitals are not financed if they do not comply with certain circularity requirements, this would cause tension with keeping the healthcare accessible to everyone, which is their primary duty. Due to their lack of knowledge and insight into progress, they also admit it is not feasible from their role to oblige what a hospital should do, but it is better to stimulate and facilitate them in the process.<br>Health insurers also noted that they are in direct contact with multiple other relevant actors in the field, such as hospitals and suppliers. Therefore, they see a more suitable role for themselves in bringing the right parties together, to inform and to agendise. Additionally, some health insurers see a possibility in their direct connection with insured/patients to create a demand for circular healthcare. | |
| | *ACTOR GROUPS* | *SUB GROUPS* |
| | **Individual health insurers:**<br>Health insurers in the Netherlands are operating individually and are competing with each other. Therefore, it is possible that one health insurer does already more than other health insurers related to circularity. However, it is | - *Healthcare procurers*:<br>Within the health insurers the healthcare procurers are in the crucial process of procuring healthcare and making agreements about the delivered healthcare. Here they are in direct contact with hospitals and are possible to set certain criteria to the |

<table>
<tr>
<td rowspan="2"></td>
<td>important to note that as health insurers are competitive organisations, but are delivering their healthcare in the same hospitals, they cannot simply put extra money to hospital circularity, as this could create a competitive disadvantage.</td>
<td rowspan="2">hospitals on how to deliver the healthcare. However, health insurers noted that healthcare procurers are often not yet too busy with sustainability, so it could be possible to do more on this aspect.<br>- Sustainability experts:<br>At the moment, most health insurer have a sustainability expert, whose responsibility is to give advice on sustainably procuring the healthcare. This translates to advising healthcare procurers and others who are making policies on healthcare procurement, but they are not directly involved during the procurement. Furthermore, they are often actively trying to go into conversations with hospitals. However, health insurers also note that it can be difficult for them to put real actions into motion.</td>
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<td>Zorgverzekeraars Nederland (ZN), branche organisation:<br>Next to the individual health insurers, Zorgverzekeraars Nederland (ZN) is the branche organisation, where all health insurers work together. Sustainability is one of the subjects they work on together and they agreed not to compete on this subject. Health insurers note that more action might be possible on circularity through this collaboration, and this could solve the financial problem on competition.</td>
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<tr>
<td rowspan="3">HOSPITALS</td>
<td colspan="2">Health insurers recognize that hospitals are the one that are eventually able to realize the circular hospitals or not. They deliver the healthcare and are controlling how it is delivered, and which medical consumables are used. Hospitals procure their medical consumables from suppliers, so health insurers see this procurement as important influence for how circular the hospital healthcare eventually is. Health insurers notice that there is much difference between hospitals that lag behind and other frontrunner hospitals, but also those are facing issues.</td>
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<td>ACTOR GROUPS</td>
<td>SUB GROUPS</td>
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<tr>
<td>Individual hospitals:<br>There are a lot of hospitals within the Netherlands, focused on delivering healthcare within their region. Health insurers notice a distinction between bigger (academic) hospitals within cities, where more might be possible, and smaller rural hospitals, which often lack the resources to take sufficient action on circularity.</td>
<td>- Hospital board:<br>Within hospitals, the hospital board is often making the decisions on doing investments related to implementing circularity. Health insurers admit that these decisions are often dependent on how much these directors value circularity, as taking such investment risks are often done from a certain belief in the importance of sustainability. It is realised by health</td>
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| | | |
|---|---|---|
| | **Hospital branche organisations (NVZ/NFU):**<br>There are two different branche organsations where hospitals work together. The NFU is for all the seven academic hospitals in the Netherlands (NFU, 2024). The NVZ is for all the 65 general hospitals in the Netherlands and some other healthcare institutions (NVZ, 2024). Both organisations have the goal to work together on healthcare and in collaboration with other healthcare parties, and they promote the interests of their members, for instance towards the government. However, the NFU is here more focused on the research and education aspect of healthcare. | insurers that agendizing could help to push this importance.<br>- *Green teams:*<br>The green teams within hospitals are perceived by health insurers to be very active on implementing circularity in hospitals, and to really have "energy" on this subject. Some hospitals have a central green team, and others have one green team for every specialisation. Although their motivation is very high and have the freedom to figure out what works best within their focus area, health insurers also notice that the power of green teams is limited and they are often dependent on the hospital board for the (financial) realisation of circularity plans.<br>- *Doctors / operation room:*<br>The doctors are also an important actor group according to health insurers, as they are eventually working with the circular strategies and products. This means they have the knowledge what is possible and have the best insight into what possibilities lie in front of them. However, health insurers also point out that they can also be the ones that are blocking implementation of such strategies, if they do not like the circularity plans for certain reasons. Also here, the motivation and awareness seems to play a big role. |
| **SUPPLIERS** | The medical product suppliers are also pointed out in the conversations with health insurers as important actors. Within the healthcare chain, they are the ones that supply the medical products to the hospitals, which enables to deliver healthcare with these products. This implies that hospital healthcare is dependent on these products, while the use of these current products is for a great part the causing the pollution of the healthcare sector. Therefore, health insurers also note that hospitals are dependent on the availability of circular medical products in the market. The suppliers are the ones that can control this. Health insurers are in general negative about suppliers, as they notice that there is no trigger for them yet in the system to take action for becoming more circular. This causes them to perceive suppliers as a difficult actor in the context. | |
| **GOVERNMENT** | The government is identified as the actor which determines the important rules for the playing field, according to health insurers, as they create the law and regulations for the system context. The Ministry of Health, Welfare | |

| | |
|---|---|
| | and Sport is the most important as they create policy related to this subject, and this ministry is also part of the Green Deal for Sustainable Healthcare. |
| **INSURED / PATIENTS** | The last identified actor are the insured or patients, which were mentioned in all the interviews. They are very important, as eventually the healthcare system is intended to deliver healthcare to this actor group. In this system context it is perceived by health insurers that in general patients or insured are not really interested in the circularity of healthcare, because they just want to receive the right healthcare when they need it. However, some health insurers also noted that the patients or insured can play a role in creating a demand for circular healthcare from bottom-up. For this, the two separate actor groups of insured and patients is important. |
| | *ACTOR GROUPS* |
| | **Insured:**<br>The insured are actually all the citizens who have a healthcare policy and might choose to switch from health insurer every year, but they are not necessarily in need of healthcare at the moment. They are mainly interested in paying a low premium for their health insurance, according to health insurers, but they also note that there are a few who might be concerned about how sustainable their health insurance is. |
| | **Patients:**<br>The patients are the people that are in need of healthcare, so health insurers think they are primarily interested in getting good healthcare, instead of being busy about circularity issues. They are often more concerned with other things than whether there is a circular option available. |

### *4.5.2 Power Interest matrix*

Within the interviews with health insurers, it was also discussed how much power and interest they perceived the relevant actors to have within the system context. This leads to a power-interest matrix for all of the six interviewees, which are merged for all actors together within figure 11, and for every actor separately in figure 12.

Below an explanation will be given based on the interview input, which clarifies how the different actors are positioned within the power interest matrix, according to the health insurer perspective. Furthermore, the power interest matrix is used here to visualise the relative power and interest of the most important actors within the system context, divided into four quadrants of actor categories. This clarifies the role of the actors and what is useful to do with them, or maybe even influence them so that their position will change.

The power interest matrix includes the four actor categories (Bryson, 2004):

- *Key players (high power, high interest):*
  They have a lot of influence and are actively involved within the system context, so they have to be engaged and managed closely.
- *Context setters (high power, low interest):*
  They can affect influence in the system context, but they are mostly not too busy with it. This implies it is useful to meet their needs, keep them satisfied and handle them with care, so they are willing to work in collaboration instead of against the desired direction.
- *Subjects (low power, high interest):*
  They are dependent on the actions of others and it is useful to keep them informed and show them consideration.

- *Crowd (low power, low interest):*
  As they are not too busy with the situation, they just have to be monitored.

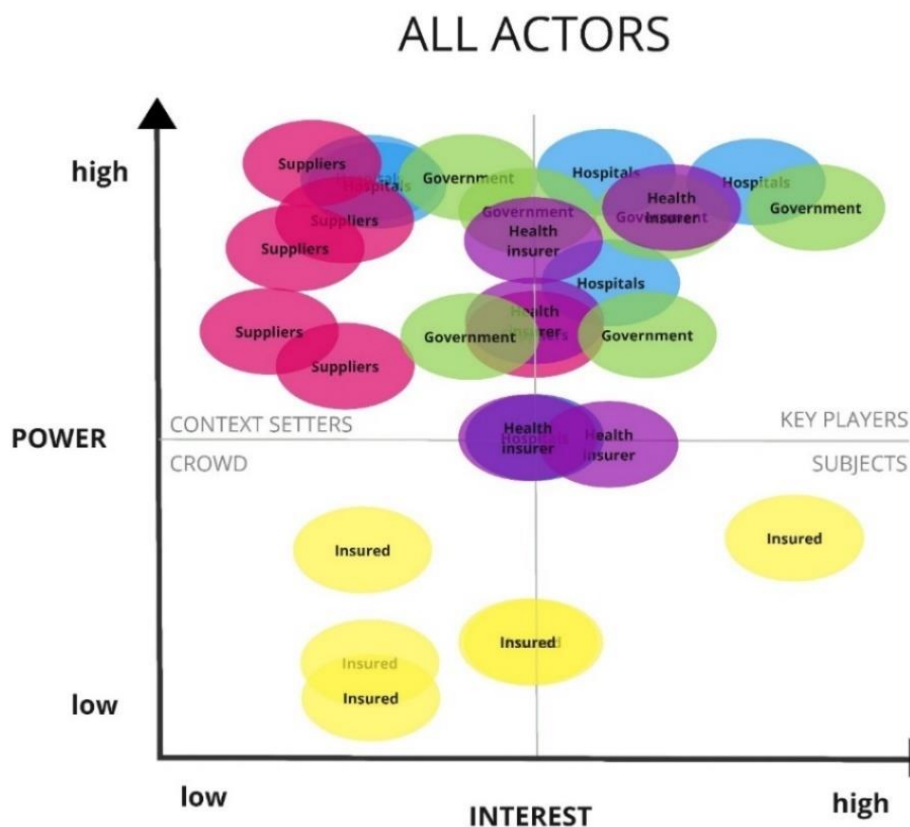


***Figure 11.*** Power-interest matrix for the five most relevant actors together

**Health insurers - KEY PLAYERS**
Health insurers perceived themselves to be key players, but close to context setters, as not everyone perceived their interest to be high, which is shown in figure 12.
It appeared that health insurers found their power to be limited. While they are the ones financing the hospitals and could set circularity criteria for that, they admit that they cannot just enforce it in this way, as this would threaten the accessibility of healthcare. However, their financial power still gives them power to some extent, this leaves their power somewhere in the middle.

The interest of health insurers appeared to be ambiguous. Some health insurers said that they think health insurers are relatively interested in hospital circularity at the moment, while others said that the interest is mostly still limited and that there is too little attention for it in general. Furthermore, most people noted a growing interest in circularity, also due to their CSRD obligation of reporting about sustainability, which forces them to be more active on the subject.

The level of interest also depends on the persons and roles within the health insurer organisation. There are some groups really busy with the subject, such as the sustainability experts, but other groups, such as healthcare procurers much less, or it can be dependent on their intrinsic motivation. This difference in interest, related to roles and personal motivation is reflected in what one health insurer stated: "*I think health insurers have an average interest, because there are much layers to it.*"

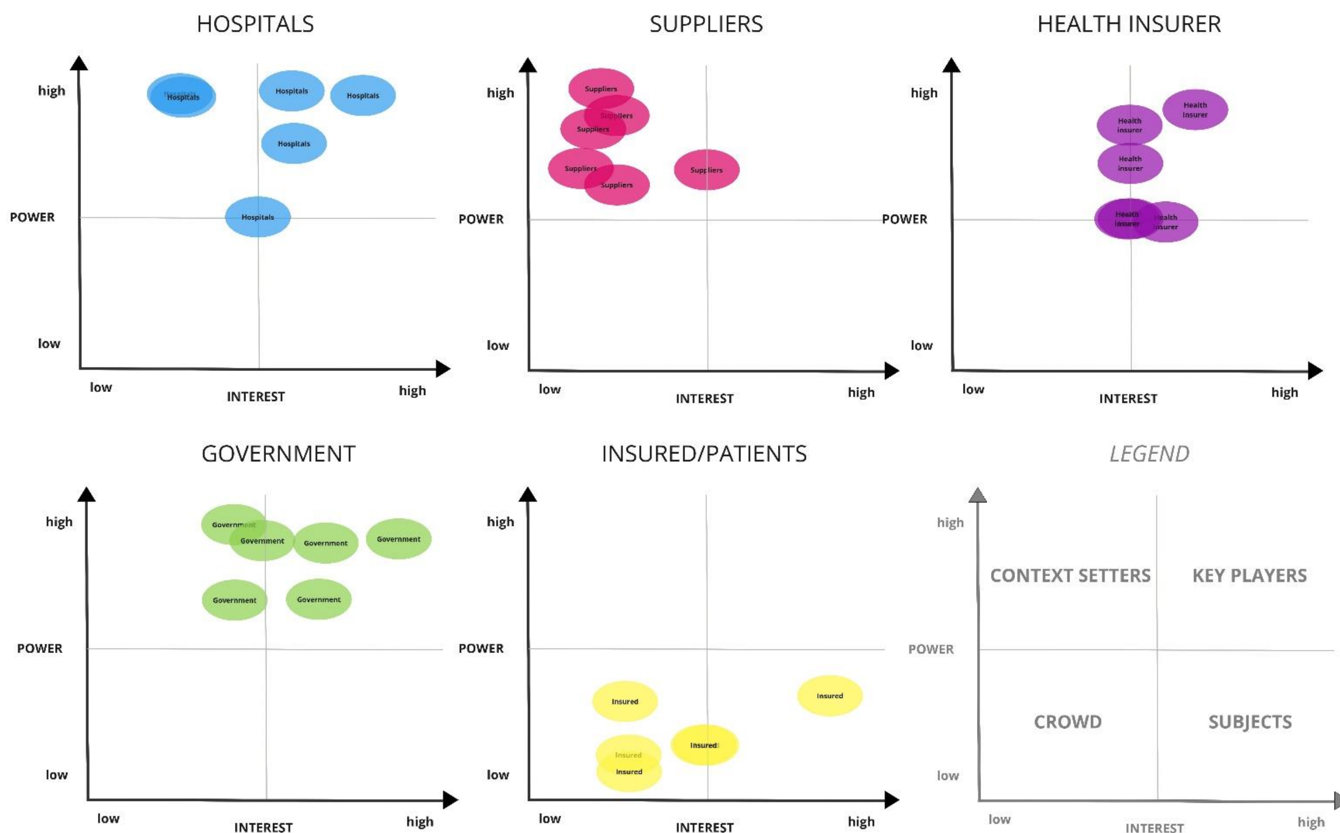


***Figure 12.*** Power-interest matrix for the five most relevant actors separately

**Hospitals – KEY PLAYERS (/ CONTEXT SETTER)**

According to health insurers, hospitals are mostly key players, but a few think they are more context setters, depending on their level of interest, which is visualised in figure 12.
As health insurers admit that the hospitals are eventually the ones that can realise the circular hospitals by implementing circular strategies or not, they emphasize that this gives the hospitals the real power in this situation. Also, they have the necessary knowledge to determine what is possible on circularity in hospitals. This implies they have a lot of power in this system context.

The interest of hospitals is perceived by health insurers to be quite differing between the hospitals, but also within the hospitals. This has to do with the intrinsic motivation of individuals and their roles, but also with the resources and knowledge of hospitals. Therefore, their interest cannot be simply captured for the whole actor group, but is rather spread out and perceived differently by the interviewed health insurers. A quote from one of the health insurers illustrates this: "*There really are frontrunners, but there are also hospitals that lag behind, and there is much difference between this.*"

**Suppliers – CONTEXT SETTERS**

Suppliers are perceived by health insurers to be context setters, as almost everyone thought their interest is very limited, but their power is high, which is shown in figure 12.
The power of suppliers is very high in the system context, according to health insurers, because they are the controlling the market supply of medical products, and thus also the circularity of these. Suppliers have certain contracts and agreements within the procurement process with hospitals, who buy products from them. One health insurer also illustrated their power with a story about a supplier who threatened a hospital with taking juridic steps, at the moment the hospital discovered the possibility of using a certain medical product more frequently.

The health insurers all noted that, next to a few exceptions, most suppliers are not interested in supplying circular healthcare products. They are mostly commercially driven, and are selling mostly cheap disposables. They do not feel the need yet to become circular, however it was also noted that this might change in the future, as there will be more regulations on circularity, making it eventually also commercially more important for suppliers.
The general low interest resonates in what one health insurer said: "*The most suppliers, that is a misery on circularity, there is no trigger in the system yet*."

**Government – KEY PLAYER / CONTEXT SETTER**
Government is seen by health insurers somewhere in between key player and context setter. Everyone perceived their power to be high, but their interest is differing, figure 12 shows this. The power of the government is high, due to the fact that they are the one determining the law and regulations, also related to circularity in healthcare. In this way, they can force different actors to act more upon circularity if they would want to. Therefore, most health insurers see the possibility for the government to forbid certain products or uses in healthcare strive against pollution and push the sector to become more circular.

Although they have quite some power health insurers don't think it is likely they will use it sufficiently, as their interest is perceived to be differing and multiple health insurers note that the current government is much less interested than the previous. The following quote by a health insurer illustrates this: "*With the current government, I think climate is a subject with lower priority. It is a little "choose your battles". So we could put a lot of energy into sustainability, but I doubt whether they would even listen to this…*"

**Insured/Patients - CROWD**
As health insurers all agree that insured or patients do not have much power, they are mostly seen as crowd, or subjects when their interest is perceived to be high, in figure 12 this is shown. The power of insured or patients is very low, as they cannot do much as individuals. However, one health insurer also noted that if they would unite together, their power might increase, but this is not something that was expected to be happening soon.

The interest of insured and patients was also in general perceived to be quite low. Especially patients are of course mainly interested in getting their healthcare issue solved, instead of being busy with circularity. However, some health insurers believed that also this actor group has a growing interest in circular healthcare, but they cannot act upon this when they do not have the choice or no insight into the actions that hospitals take on the circularity topic.
This increasing interest is also noted by a health insurer who stated: "*I can imagine that patients are starting to value sustainable healthcare more. So if they would have the chance to choose, they would go for the more sustainable choice.*"

## *4.6 Answering sub question 1*

After the findings of this chapter have been presented, an answer can be given to the first sub question: "*What is the complex system context of stimulating circular hospitals from the perspective of a health insurer?*".

Within the system context, there are four main objectives identified for health insurers:
- High amount of circularity strategies (R strategies, focusing on reduce and reuse)
- Low costs of healthcare
- High quality of healthcare
- High accessibility of healthcare

Eventually, figure 10 shows the main findings together in the Insurer-driven Circular Hospitals model V3, which is for a great part the answer to the first sub question, as it displays the complex system context of stimulating circular hospitals from the perspective of a health insurer.

The system factors that are present, according to literature, are the awareness of hospitals (and suppliers), the knowledge of hospitals (and suppliers), obligations for hospitals (and suppliers), the availability of circular strategies, the availability of circular products, the investment costs of circular strategies for hospitals and the external factor law & regulations.
During the interviews new system factors are identified, being intrinsic motivation, transparency in circularity progress of hospitals, steering options for health insurers, actionability of patients and the external factor societal importance of sustainability.

Another interesting finding is that health insurers in general pointed out additional causal relations between the main objectives, implying that implementing more circular strategies will eventually be cost reducing on the long term, so there does not have to be a tension between circularity and other health insurer objectives.
Furthermore, the identified barriers are financial barriers, lack of knowledge, lack of awareness, medical procedures / standards, differing focus, lack of insight in progress of hospitals and the current government.
Lastly, four means are also visualised in the Insurer-driven Circular Hospitals model, showing the effects of interventions that are already mentioned within literature sources. These are including circularity criteria in healthcare procurement policy, going into conversations with hospitals, sharing “good practice" examples of circularity and going into conversations with suppliers.

Subsequently, the main findings from the actor analysis are an addition to the answer provided by the Insurer-driven Circular Hospitals model, as it contextualises the actors that are involved in the system context. From the actor analysis, it became clear that the most relevant actors next to health insurers are hospitals, suppliers, government and insured/patients. With the application of the power interest matrix, it became clear how high health insurers perceived the power and interest of these different relevant actors to be. This led to the finding that in general health insurers see themselves as key players, however some indicate that their interest was not very high. Hospitals are also perceived to be key players with much power, with the notion that it depends on the hospital how high their interest is, so some are more context setters. In a similar way, the government is seen somewhere in between key players and context setters, but with the current government the interest is perceived to be lower. Suppliers were clearly context setters with much power, but low interest. Lastly, insured and patients are mostly seen as crowd with a growing interest, but not much power.

These findings imply that to get the most relevant actors along, all the health insurers, the hospitals with a lower interest and the government should become more aware. Furthermore, the suppliers should get more interested to enable circularity on the healthcare product market for other system actors, as they are perceived to be quite powerful. Another possibility is finding a way to give insured/patients more power as their interest is already growing. In this way, there can be more key players working together to reach the main objectives.

In summary, the detailed overview of the complex system within figure 10 provides a basis for analysing the effects of possible interventions and barriers within the next part of this research. Additionally, the understanding of the roles of the most relevant actors, following from the actor analysis, can be useful for this, and for studying the responsibility role of health insurer in stimulating circular hospitals.

# 5. POSSIBLE INTERVENTIONS FOR A HEALTH INSURER

As the complex system context of stimulating circular hospitals has been studied in the previous chapter, it became clear what factors are affecting each other and who are the most relevant actors involved in this situation. Subsequently, interventions can be researched that can be used to reach the objectives in this problem situation. Therefore, this chapter will aim to answer the second sub question "*What are possible interventions for a health insurer to stimulate circular hospitals?*".

First, 5.1 will discuss a preliminary identification of possible interventions, following from the interviews in round 1. This list will be used as input for the interviews in round 2, where the list will be finetuned and sharpened during with the interviewees. The full interview questions can be found in appendix D, and a summary of the results in appendix E. From a discussion of the preliminary interventions with interview participants of round 2, a definite list of possible interventions will result as answer to this sub question. This will be presented in 5.2. Lastly, in 5.3 the sub question will be answered.

## *5.1 Identification of preliminary possible interventions*

During the first round of interviews with health insurer employees, preliminary possible interventions for health insurers to reach the main objectives within the system context of stimulating circular hospitals were identified and discussed. Currently known means were discussed and how these are now perceived by health insurers, for instance how successful they experience them to be and why.

Additionally, new potential interventions are identified to stimulate circular hospitals. For now, this led to an overview of potential interventions that were identified from the perspective of health insurers, presented in table 4. These interventions are still quite general, and will be used as input for the next round of interviews. This enables to leave these potential interventions open for useful input of relevant stakeholders from the second round of interviews. In this way, the interventions will be elaborated further during the process and an open discussion on potential effects and barriers will be stimulated.

***Table 4.*** Preliminary possible interventions

| *Focused on hospitals* | |
|---|---|
| **Going into conversation with hospitals** | Not only through healthcare procurement, but involve sustainability experts from both parties, for awareness and working together on solutions, and facilitating where necessary |
| **Including circularity criteria in healthcare procurement policy** | To force hospitals to deliver circular healthcare |
| **Sharing "good practice" examples of circularity** | To accelerate the dissemination and implementation of circular strategies |
| **Developing a tool / dashboard / standard on progress** | To enable measurable circularity progress of hospitals |
| **Offering financial support** | To make realisation of more circular strategies possible |

| | |
|---|---|
| *Focused on insured/patients* | |
| **Activating insured by campaigns** | On the importance of circular healthcare, for awareness and encouragement to make circular choices (e.g. providing green checks for the choice between healthcare providers) |
| **Offering a circular healthcare insurance policy to insured** | To enable them to actively make a choice for more circularity in healthcare |
| *Focused on other parties* | |
| **Going into conversation and collaborate with suppliers** | Making the importance of circularity in healthcare and medical products clearer, and maybe creating a volume/price deal to procure circular products jointly for/with hospitals at a more affordable price |
| **Collaborating with all health insurers (ZN)** | E.g. for financing circular projects in hospitals, to counter competition on sustainability |
| **Collaborating with banks to realise financing** | When large investments are needed to realise circularity |
| **Lobbying the government** | For more law and regulation for hospitals and suppliers around circularity |

**Outside of scope interventions: prevention and suitable healthcare**
Furthermore, a note has to be made on prevention and appropriate healthcare, which was mentioned multiple times within the interviews. Prevention and appropriate healthcare are certainly interesting in the whole sustainability issue of the healthcare sector, but is out of scope here. This is because these measures are about preventing healthcare by keeping people healthier and only providing useful care that is strictly necessary. While this is interesting for general sustainability, because it makes less use of scarce resources, this is about preventing the delivery of healthcare. So this is prior in the process to the eventually delivered appropriate healthcare that is deemed necessary. This next step is what this research focuses on, which points to the issue of how this appropriate healthcare in hospitals can become more circular. The prevention and appropriate healthcare interventions are thus outside the scope, as this results in less healthcare delivered, but does not make the healthcare itself more circular, which is the focus of this study.

## 5.2 Definite list of possible interventions

Within the interviews of round 2, the interventions from table 4 were discussed which naturally came up within the conversations with the interview participants, or sometimes they were brought up if it was suitable for the situation. In this way, the preliminary list of twelve possible interventions in table 4, is brought down to the eight possible interventions. The resulting list of definite eight possible interventions, is presented in table 5. The interventions will be discussed in more detail in the following chapter, related to their effects.

## 5.3 Answering sub question 2

This chapter aimed to answer the sub question: “*What are possible interventions for a health insurer to stimulate circular hospitals?*”.

There are eight possible interventions for health insurers for stimulating circular hospitals, presented in table 5. As this sub question focuses only on what “are” possible interventions, the

8 identified interventions are only shortly presented here. A more in-depth discussion with the effects of these interventions and key considerations will be discussed in the next chapter.

***Table 5.*** Definite possible interventions

| **Focused on hospitals** | |
|---|---|
| *Going into conversation with hospitals* | To offer suitable and concrete help |
| *Sharing "good examples" of circularity* | To increase knowledge exchange and circularity, with an obligation for implementation |
| *Offering financial support* | To lower the financial threshold and make realisation of more circular strategies possible |
| *Improving measurability* | To increase insight into progress and stimulate knowledge, with a measuring tool suitable for every hospitals |
| *Including circularity criteria in healthcare procurement policy* | To directly set requirement to hospitals on circularity |
| **Focused on other parties** | |
| *Collaborating with suppliers* | To help in creating a circular healthcare product market |
| *Involving insured/patients* | To activate them and indirectly stimulate circularity, while internalisation of circular healthcare should be prioritised |
| *Collaborating with all health insurers* | To form one strong direction towards hospitals, and prevent competition on circularity between health insurers |

# 6. EFFECTS OF POSSIBLE INTERVENTIONS AND BARRIERS

In this chapter, it will be aimed to answer the third sub question: "*What are the perceived barriers and effects of the possible interventions on the complex system of circular hospitals?*". Again, this question will be answered based on the interviews of round 2, where the interviewees of health insurers and hospitals were asked about their perceived barriers, and the expected effects of possible interventions. Appendix D shows the full interview questions for this, and a summary of results can be found in appendix E.

First, in 6.1 an discussion on the perceived barriers will be presented, with perspectives from both health insurers and hospitals. Then, the effects of the possible interventions, that were presented in the previous chapter, will be discussed in 6.2. Lastly, in 6.3 the sub question will be answered and the results will be visualised within a new version of the Insurer-driven Circular Hospitals model.

## *6.1 Perceived barriers*

During the interviews it was discussed how the participants, both health insurers and hospitals, perceived the barriers present in the complex system of stimulating circular hospitals. This led to an identification of several barriers. Looking back to the preliminary identification of barriers in 6.3, the financial barriers, differing focus, lack of knowledge/awareness and medical procedures / standards are also found in the second round of interviews. The other two barriers of current government and lack of insight were not discussed, so they seem to be less persistent.

Furthermore, there were new barriers identified in this second round of interviews, being healthcare product market, multitude of scattered initiatives and collaboration health insurers different interest. All the barriers will be discussed in more detail below with the differing perspectives on them. It will also be made clear whether barriers were more experienced in the hospital or health insurer perspective, or when they were clearly present for both actors. In figure 13 the different barriers are shown, including whether they were perceived from a health insurer, hospital or a shared perspective.

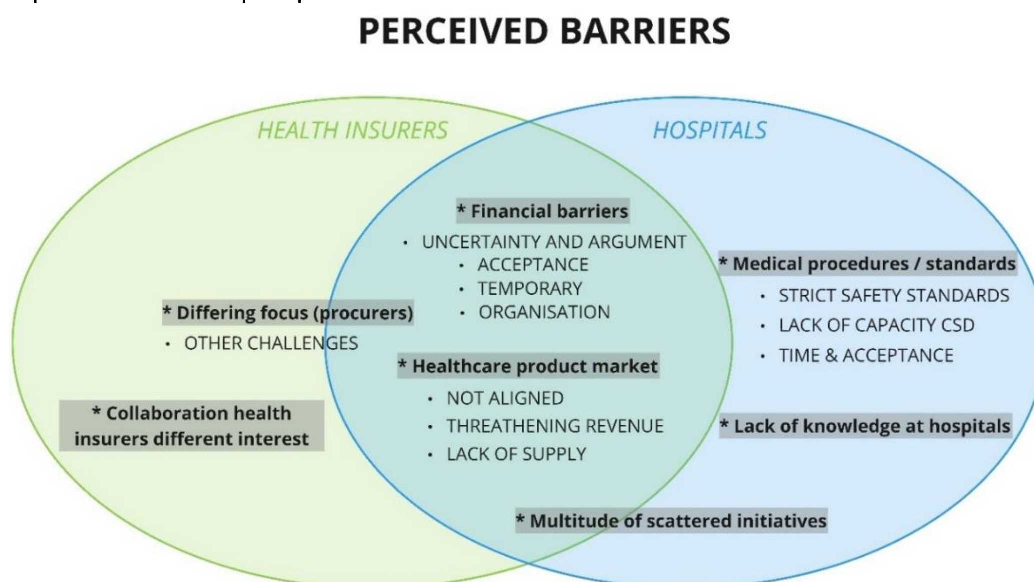


***Figure 13.*** Perceived barriers from health insurers and hospitals perspective

**Financial barriers**
Both health insurers and hospitals see financial barriers in several forms as a significant obstacle in the system context of stimulating circular hospitals. The main perspectives highlight for both parties that there is much uncertainty around costs and sometimes higher costs are perceived to be only temporary. Some health insurers state that higher costs for circularity are something that might have to be just accepted. Lastly, hospitals perceive organisational difficulties in the costs reductions and extra costs, which are made in different hospital departments or even system parties.

*Uncertainty and argument*
There is much uncertainty around extra costs or cost reductions for implementation of circular strategies, both at health insurers and hospitals. Health insurers talked about the high risk of investment for circularity, as it is often unclear whether it will turn out positive and who will benefiting from the financial benefits and who will be bearing the risk if it does not. Also, one health insurer stated: "*A lot of things in healthcare have an infinite payback period, so actually it is strange that this argument is mostly mentioned here, while for other things it is just accepted.*" Similarly, hospitals also notice this argument for cancellation of circular initiatives at the moment a business case turns out negative, while the results for the pilot were very positive. Furthermore, health insurers state that hospitals are often expecting direct financial returns from health insurers for implementing circular initiatives, while these circular initiatives can often be cost reducing. These cost reductions are also noted by some interviewed hospitals.

*Temporary*
While the financial barrier is often mentioned by health insurers and hospitals, it is also stressed by a lot of them that this barrier can be only temporarily. There are a lot of initiatives that are in need of a initial investment, and there are innovation costs and costs at the beginning due to a smaller scale. However, at the long term also these initiatives can make money and scaling up will lead to lower costs. Such temporary transition cost, also in terms of extra time for staff, are also noted by hospitals as it is stated: "*Transition costs are often part of new strategies, as in a business process when A goes to B, then for some time you make extra cost because you might have two systems next to each other, or extra investment costs or extra working time, while in the long term the reusables are cheaper*". Hospitals also admit that a longer time horizon can lead to negative business cases turning positive.

*Organisation*
Hospitals also perceive difficulties with the extra costs and cost reductions of circular strategies which can be situated in different hospital departments or even system parties. As it is often the case in hospitals that every department is responsible for their own procurement, one department could benefit from the cost reductions, while the other has to deal with the extra costs. For instance, one department might benefit from lower costs for a reusable medical product that is cheaper than many disposables, while the washing department has much higher cost due to the cleaning for this reusable product. This implies that money has to be transferred between hospital department, which can cause delays in implementation. Hospitals also stress the need for a more centrally organisation of investments on circularity, and it is stated: "*We are trying to start doing it more centrally and I am trying to get an overarching budget on circularity, to use whenever a department falls shorts, but this is hard to realise with all the cost reductions we have to make.*"

*Acceptance*
One interesting perspective of a health insurer is that accepting higher costs could be part of the transition towards a circular healthcare. This interviewee stated: "*Eventually, I think we as a society have to be willing to sometimes pay a higher price for circularity. This implies that some*

*healthcare costs will be higher, and eventually health insurers will have to pay this, and we are now having such conversations about whether we should accept this*." This implies that this acceptance of higher costs might be necessary to really make the necessary changes. Even more so this health insurer said that we actually don't have a choice, and have to pay more now to keep it liveable in the future.

**Healthcare product market**
Another significant barrier within the system context is the current healthcare product market, which is both by hospitals and health insurers seen as a difficulty. The perspectives on this barrier show that there is no alignment between this market and what is necessary for circular hospitals, that there is a lack of supply and that the transition to circularity is threatening the revenue of suppliers.

*Not aligned*
Health insurers stress that suppliers are in general large multinational companies, which are volume driven and mainly busy with making profit, captured in complex economic networks. They notice that it is hard to change this market and the suppliers, but eventually this will need to happen. The whole economic sector is needed for this as a demand has to be created at hospitals first, according to a health insurer.
Hospitals also note that the efforts of suppliers are very disappointing. One hospital participant stated: "*I notice some say yes, but still don't do it*". Additionally, hospitals see that some suppliers are greenwashing and procurers have to be alert on what is really more circular. Another example from a hospital is that they notice that suppliers are sometimes lowering the prices for disposables to prevent that the business case of a reusable turns out positive. Also one hospital participant remarked that it might be the problem that current prices for disposables are too low, instead of that the prices for reusables are too high.

*Lack of supply*
Furthermore, hospitals note that there is clearly a lack of supply of circular medical products, stating: "*There are not much medical suppliers in the field, as it is a specific branch, so sometimes there is not enough choice or supply yet*." Additionally, the disposable economy is noted to be very developed, leading to a widespread availability, while the reusable product market is much more limited and there is not much choice. A hospital also states that the possibility of developing a product yourself with supplier is very time consuming and costly.

*Threatening revenue*
Because of the focus of suppliers on disposables, suppliers lack a different revenue model that is suitable for reusable circular products, according to a hospital interviewee. It is stated that time is needed for suppliers to change their revenue model, to be able to survive in a new circular economy. A hospital explains: "*For instance, if we start using breathing hoses 24 hours instead of 8 hours, their profit decreases by one third, so that is really threatening for them. So we have to do this together and give them time to change their revenue model*."

**Medical procedures / standards**
The barrier of medical procedures and standards that are used in hospitals, are mostly perceived as barrier by hospitals and less frequently mentioned in conversations with health insurers. The perspectives on this barrier include the lack of capacity of central sterilisation departments (CSD), the extra time and acceptance that are often part of changing medical procedures for circular strategies and the current strict safety standards.

*Lack of capacity Central Sterilisation Department (CSD)*
Some hospitals state that their capacity of the CSD is not sufficient for the implementation of more circular products which require sterilisation, and that this is also a problem for other hospitals. Furthermore, it is stated: "*For different medical reusable products, the washing is often separated and they all go to other laundry facilities, which is not efficient.*"

*Time and acceptance*
Hospitals also argue that some circular strategies can be more time consuming and this can be hard for hospital employees to accept and is thus used as argument against implementation. However, hospitals also state that there are a lot of circular strategies that are saving time and in that case it is just seen as bonus. One hospital also states: "*The time factor is often used as an argument to not implement strategies, because there already staffing shortages, however we also see that some initiatives are really also saving time*." The acceptation of changing their way of working, including sometimes spending more time on a procedure, can thus be an obstacle for employees. One health insurer also sees this extra time as part of the transformation costs for circularity.

*Strict safety standards*
Circular strategies focused on switching to reusables can have a hard time to fulfil the requirements for infection prevention, as opposed to the currently used disposables for which a new clean one is used every time. One hospital participant also states: "*The current safety standards have become much more strict, so this makes it sometimes hard to go back to reusable products, which were already used years ago in hospitals.*" Additionally, it is noted that there is still a lot to gain on circularity efforts in the national guidelines for infection prevention. The difficulty of the need to adjust current medical guidelines is also noted by a health insurer.

**Differing focus (procurers)**
A differing focus, often also noticed for procurers, is perceived as a barrier in the system context of stimulating circular hospitals, mostly by health insurers, but also once mentioned by a hospital. The perspectives for this barrier show both the focus on other challenges and the focus of procurers.

*Other challenges*
Health insurers are of course also focused on other important objectives next to the circularity of hospitals, such as keeping healthcare accessible and affordable. This is reflected in a quote of a health insurer: "*We are a little with our back against the wall, as we cannot simply choose to not procure healthcare at hospitals that do not fulfil certain circularity criteria, as we have to keep healthcare accessible and are in need for their healthcare. We need them too and are dependent on their healthcare*." Furthermore, there are multiple other challenges like digitalisation and shortages and health insurers state that then circularity is not a priority, but that it could possibly go together.

*Procurers*
Health insurers see that their procurers are often mainly focused with making good price deals and obtaining low healthcare costs. One health insurer states: "*As procurers are mostly focused on obtaining low healthcare cost and efficiency, they are pressuring into the direction of disposables. I don't think they are aware of this.*" A hospital also noted that tenders are often just done on the supplier with the cheapest offer, so procurers really have to be steering more on circularity, maybe with the use of strict circular procurement criteria.
Additionally, health insurers state that procurers don't have much knowledge on circularity, which makes it even more difficult to integrate circularity into the procurement process.

For hospitals a differing focus is also noted, as Green teams and sustainability experts might be willing, but directors, procurers or other departments might see other barriers and don't want to, so this stresses the need for a similar commitment.

**Lack of knowledge/awareness at hospitals**
Another barrier that was mentioned mostly by hospitals themselves was the lack of knowledge. Although, one health insurer also mentioned that hospitals need more knowledge on how to procure circular and what are the more circular products available.
Hospitals stress the importance of data and evidence that show the impact of circular strategies, certainly for hospitals at the beginning of the transition to convince everyone. It is also stated: "*Clear data and evidence would also help in convincing the people that are more doubting on implementation of certain strategies.*" Some hospitals also notice ignorance and negative attitudes of some hospital employees towards the more enthusiastic ones, which can be very frustrating.
Furthermore, hospitals state that knowledge is sometimes only available at specific hospitals, but it should be shared and elaborated to make it applicable for every hospital.

**Multitude of scattered initiatives**
A barrier in the system context that is also perceived more by hospitals, but also by some health insurers, is the multitude of scattered initiatives. Hospitals state that there is a lot going on related to circularity in healthcare, but it is quite spread out and there is a lack of steering. It is stated: "*Hospitals are now also active with sharing on LinkedIn or other networks, but this is a whole process, and meanwhile others might be busy with the same matter*." To prevent that everyone has to reinvent the wheel themselves, it would be helpful if all the existing initiatives can be found more easily and with more structure.
Health insurers also notice a lot of initiatives going on, and stress that they want to prevent to create an administrative burden for hospitals. This implies that everything has to be tied into what is already there and into existing networks as much as possible.

**Collaboration health insurers different interest**
Health insurers perceive also a barrier in the collaboration with all health insurers via the overarching organisation ZN (Zorgverzekeraars Nederland). A health insurer states: "*Not every individual health insurer thinks the same of the importance of circularity, and when it comes to actions, some are less willing to agree to certain initiatives than others*." This can make realisation of collaborative actions for circular hospitals difficult.

## 6.2 Effects of possible interventions

Within the interviews of phase 2 there were multiple directions for interventions discussed with the participants. This resulted in the expected effects of the eight most promising interventions and related key considerations for these interventions. The interventions and their effects are shortly summarised in table 6 and will be discussed extensively below.

***Table 6.*** Effects of possible interventions

| Intervention | Effects |
|---|---|
| *Improving measurability* | Facilitating learning<br>Clear goals<br>Alignment CSRD |
| *Going into conversation with hospitals* | Suitable help and real actions<br>Connecting hospitals |
| *Including circularity criteria in procurement policy* | Important direct influence |
| *Sharing good examples* | Knowledge sharing and awareness<br>Suitable for health insurers |
| *Offering financial support* | Lower financial threshold<br>Share investment risks<br>Organising shared funding<br>Financial differentiation |
| *Involving patients/insured* | Increasing patient actionability<br>Suitable for growing patient interest |
| *Collaborating with suppliers* | Increase supply<br>Create volume and price deals |
| *Collaborating with all health insurers* | One strong direction<br>No competition and share costs |

### Including circularity criteria in procurement policy

Using their procurement policy to include circularity criteria for hospitals was also discussed an opportunity for health insurers to stimulate circular hospitals.

**EFFECTS**

*Important direct influence*

One health insurer sees the procurement policy as their most important instrument and highlights the possibility of making it a little more strict every year, to stimulate circularity.

**KEY CONSIDERATIONS**

*Step away from strict criteria*

A health insurer stated: "*Procurement policy has been our main instrument for a long time, so it is possible to use, however we are now looking to use our role differently*." Simply obliging is also not seen as a good thing, as hospitals are already taking up their role in a good way. Therefore, more facilitating the whole context would help, instead of setting strict criteria to hospitals.

*Not right method*

It is also stated that procurement policy should just be used for what it is meant, to give hospitals transparency about what is procured against what criteria. Another health insurer also stated: "*While healthcare policy can be used, my experience shows how difficult it is to seriously assert influence on this subject in this way*".

## Improving measurability

One of the interventions that was discussed is improving measurability, which implies that a new tool is created or current measuring tools are enhanced, for measuring the circularity efforts of hospitals.

**EFFECTS**

*Insight into results and progress*
Health insurers stress that measurability is very important for monitoring results and making information and progress optimal transparent and insightful. Hospitals also agree that it can show clear progress. Developing a clear standardised tool for this, which is applicable to all hospitals would therefore be helpful.

*Facilitating learning*
Eventually, improved measurability could lead to more awareness and knowledge within hospitals, as they can learn from each other's transparent information on progress. One health insurer also states: "*The main idea should be to learn from each other instead of comparing*."

*Clear goals*
A hospital stated: "*We participate in the milieu thermometer, and I like that it provides such concrete handles to become more circular*." Hospitals also address that it can help to get colleagues, which are less intrinsically motivated, along for why certain strategies have to be implemented. For instance, reaching a higher level for a circularity measuring tool is a clearer goal for them, than just circularity in general. Therefore, a hospital noted that a measuring tool can help in the securing of objectives.
A health insurer also states that clear feasible goals are needed to get people on board and such a measuring tool might help also in automatically reaching these.

*Alignment with CSRD*
Health insurers notice that eventually there will be data needed from hospitals to fulfil the CSRD regulations around reporting about sustainability. Therefore, they identified the opportunity to develop a measuring tool, which could also capture the needed information for the CSRD, as there will need to be more data available from hospitals for this. Health insurers stated: "*Certain CSRD data should be better available for us"* and *"such a measurement tool can serve this*". A hospital participant also noted the necessity for more clear reporting for CSRD.

**KEY CONSIDERATIONS**

*Prevent administrative burden*
If this intervention would be executed, health insurers stress the importance of preventing an administrative burden for hospitals, as hospitals are already required to deliver certain information and this should not be different for every health insurer. Hospitals also admit that it can cost them quite some money and time to perform internal audits. Therefore, health insurers need to think about how they can tie such a measuring tool in to data that is already there. One health insurer stated: "*It is the best to look into how such a measurement tool can fit into existing initiatives, like "milieu- thermometer and -barometer.*" The barrier of the multitude of initiatives resonates within this notion.

*Customise and voluntary*
Health insurers note that such a measuring tool is not be suitable for every hospital, based on their experience with the "milieu thermometer". One hospital that is much further might not benefit anymore, while others that lay behind may find it a barrier to participate financially. Therefore, making it an obligation is difficult and also not desirable. Hospitals also stress the importance of freedom to participate, as it is not suitable for every hospital. These insights should be taken into account if a new measuring tool would be developed, which might be more suitable for every hospital or enables a customised approach for hospitals.

## Going into conversation with hospitals

Another intervention which was discussed often is going into conversation with hospitals. This already happens and may sound as a general solution, however some interesting remarks and effects were noted, making this an interesting possible solution direction.

**EFFECTS**

*Suitable help and real actions*

One health insurer stated: "*Going into conversations is useful, as we still do a lot of assumptions of where there are obstacles, so conversation helps to get more realistic insight.*" Thus, conversations help to get more realistic insights into what is happening at hospitals. Additionally, health insurers note that looking together at hospitals at what they really need in the moment and what are the barriers present in the transition towards circularity is useful, as hospitals have more insight into this, also into what is feasible, due to their care specific knowledge. Next to this, health insurers can then act upon this as suitable for the situation, to come to real practical actions. Hospitals also say that with these conversations, health insurers can provide the extra help that might be needed to get things from the ground for circularity progress, as sometimes hospitals want to but they cannot do it alone.

*Connecting hospitals*

Furthermore, hospitals state that health insurers can be an important connecting factor, as health insurers know much more about what is happening at different hospitals, and how hospitals can learn from each other's successes. A health insurer also notes that they can make the necessary connections for helping hospitals further.

**KEY CONSIDERATIONS**

*Involve sustainability experts*

An important remark for this intervention is the necessary involvement of sustainability experts from both health insurers and hospitals. Health insurers stress: "*Conversations with sustainability experts from hospitals and insurers are important*", as these sustainability experts have the same goal and more knowledge regarding circularity. This can lead to more concrete agreements and they can try to put it at the agenda higher up at directors. Currently, through procurement conversations, not the right people are reached yet for realising more circularity in healthcare.

*More practical action*

One health insurer also stresses the importance of coming to more practical actions in these conversation, stating: "*Really making it also more practical here, because we are talking a lot and informing, boosting, motivating, stimulating etc., but I think it is now time for the next step!*".

*Trust building*

Another health insurers also points out that in the process of these conversations, they need to build trust in their relationship with hospitals. As the procurement negotiations have become harder the last years and health insurers procure very "sharp", health insurers need to show their willingness to stimulate circularity with conversations. One health insurer stated: "*We are interested in how they look against us and how we might be in the way,  so we are open for critics from hospitals.*"

## Sharing good examples

The sharing of good examples is an intervention that is already being executed to some extent by some health insurers, but multiple health insurers and hospitals discussed the further potential of this solution. The idea of it is that health insurers are actively trying to find circular initiatives in hospitals and spread these initiatives, with the necessary information, to successfully scale it up for implementation at other hospitals.

**EFFECTS**

*Knowledge sharing and awareness*

Health insurers note that the sharing of good examples is an important way to spread knowledge between hospitals and increase their awareness, within their contact with hospitals. Additionally, there is no money needed for it. One health insurer expresses this positive perception: "*Sharing good examples is a fantastic initiative. There is no money needed, and health insurers are actively trying to help with finding initiatives and spreading them*".

*Suitable for health insurers*

Hospitals points out that sharing good examples is very suitable for health insurers. A hospital stated: "*Health insurers have a network within hospitals and are also visiting them, while we are less in contact with other hospitals, so their power is larger there.*"

Health insurers also recognize this role, and one states: "*We speak to all the hospitals and get to hear interesting things happening there, that might be also relevant elsewhere, so sharing this knowledge is valuable.*"

**KEY CONSIDERATIONS**

*Not just sharing*

One health insurer stresses that, while sharing good examples can be a good idea, they have to think about how non-binding it is. It is stated: "*You can also inform too much and there is a limit to that.*"

A hospital also states that just sharing good examples can be a form of greenwashing, while actually nothing happens. This interviewee stated: "*I support knowledge exchange, but I hope it is not a form of greenwashing. However, if it would be an obligation to implement some, I stand behind it.*" Another hospital also notes that at some point health insurers will have to start obliging, otherwise hospitals will take no action and other things will get priority.

*Realistic obligation*

Some health insurers are already planning to oblige hospitals to implement a few good examples per year. However, they recognize that it should be suitable for the hospital, as there could be financial problems or other hospitals might be so far that it gets harder to implement more. Therefore, they should be free to choose which one suits them.

Hospitals in general think that an obligation to implement good examples is a good idea, but they note it might require an adjusted approach for every hospital. They state: "*Such requirements should be realistic and communicated timely, so we can properly prepare*" and "*they have to keep it realistic and feasible*". Also when hospitals would lack the resources for implementing a certain amount, they should not be punished for that.

*More centralised and transparent*

Lastly, hospitals also stress the importance of making the sharing of good examples more centralised and with more transparent information. They state: "*There are now a lot of parties that do sort of the same, but all in a different place, so it still does not quite come together.*"

Next to this, sometimes good examples can lack enough details and tips for implementation elsewhere, so this need to be more concrete and transparent. A hospital also stated: "S*ometimes I still look for more transparency, for instance about the brand of the medical circular product, as I am not able to find it myself.*"

## Offering financial support

Another intervention that focuses on hospitals is offering them financial support. There are multiple ways to do this and some perspectives on this were discussed with health insurers and hospitals.

**EFFECTS**

*Lower financial threshold*

Health insurers understand that sometimes, there is an initial investment needed to realise circular initiatives, which can be a financial threshold to implement circular strategies for hospitals. It is stated: "*We play a role when there is an initial investment needed, offer financial support maybe in collaboration with banks, to execute an initiative which would otherwise not pass the financial threshold*." By offering financial support health insurers thus see the possibility to enable hospitals to implement more circular strategies.

*Share investment risks*

Additionally, health insurers state that offering financial support can be a way to share the risks and uncertainties for investment on circularity. A health insurer stated: "*Banks can offer loans to hospitals related to sustainability, and we can be an extra guarantee actor for banks, assure that we are going to pay the healthcare. And if the business case is less successful than expected, we can help pay back the initial investment. This shares the risks and can maybe lower the interest rate on the loan, making the whole financial process easier for hospitals*."

*Organising shared funding*

A potential form of financial support that a health insurer mentions is stimulating the use of a shared funding financial model by hospitals. This implies that higher investments are realised with the cost reductions of other implemented initiatives, which can thus lower the investment costs in general. One hospital states: "*We have a shared savings model, where half of what we are saving on circularity projects, is reinvested on other circular initiatives that might also be more expensive*." Another hospital states that they are also trying to implement it. There is also a hospital which points out the possibility for health insurers to give some sort of bonus to hospitals that are using this shared savings model, to stimulate the use and eventually the implementation of circular strategies.

*Financial differentiation*

Financial differentiation can be another potential form of financial support to hospitals according to a health insurer, where hospitals get more money if certain circularity criteria are fulfilled and less if they don't, starting with a neutral budget. Another health insurer states that this already happens in the pharmaceutical sector, so there is evidence that it works.

**KEY CONSIDERATIONS**

*Banks collaboration*

The opportunity to collaborate with banks is also mentioned by health insurer as a wise option, because there are many similarities between insurance companies and banks. Also it is stated that hospitals alone cannot easily get money from banks, so health insurers could help them.

*Collaborative approach health insurers*

The notion is also made by multiple health insurers that, as they do not compete on sustainability, offering financial support might be better from through a collaborative approach of all health insurers. This enables every health insurer to pay their fair share for investments in circularity, with no competition on sustainability.

*Acceptance higher costs and plan*

A health insurer also noted: "*Eventually, if it is really necessary, we might have to accept higher costs for circularity, and not pass it on to healthcare providers or suppliers, because then it just won't happen*." A hospital also recognises that the transition might mean there is extra money needed, and states: "*This is my call to health insurers, to calculate the financial part of the transition and make a plan for this*." This implies that hospital should do serious research into the costs of a transition towards a circular healthcare system and make a plan on how to spread these costs over a longer period to make it manageable.

## Involving patients/insured

An intervention that is focused on another actor than the hospitals is the involvement of patients or insured. This can be an indirect way of stimulating circular hospitals and there are quite some differing perspectives on this, both from health insurers and hospitals.

**EFFECTS**

*Increasing patient actionability*

As health insurers are in direct contact with insured / patients, they see the possibility to involve them more by giving them a more active choice for more circular healthcare. This could be through online tools where patients can choose their preferred healthcare provider and for instance "green choices" are shown. By such information, more awareness at patients is created and eventual behavioural change, according to a health insurer. One health insurer states: "*As we activate patients, and inform them, then they can pose critical questions to hospitals, stimulating them indirectly*."

*Suitable for growing interest patients*

A health insurer states that it is important to not only involve all healthcare system parties, so also people that use the healthcare. Another health insurer notes the growing interest in their sustainability impact and expects this will only be increasing, and states: "*It is becoming a more important decision factor.*"
Also a hospital sees an increase in the awareness as they are getting more comments on sustainability from patients. Another hospital talks about research that showed that patients value the sustainability of their healthcare as very important.

**KEY CONSIDERATIONS**

*Prioritise internalisation*

While health insurers note the increasing interest of patients and think that informing is important, some of them also state that internalising sustainability in healthcare should be a priority. Especially in hospital healthcare, as patients often don't have much choice, the most circular options should just be internalised in the standard healthcare. Hospitals also agree with their responsibility to steer towards the most circular healthcare treatment and to make healthcare intrinsically more circular. While hospitals also think that some people would choose for a more circular option, they think the main incentive for patients should be to get better. It is stated: "*It is not feasible to always make this choice or and not desirable, also because it is costly and requires a lot of time from doctors*."

*Clear information and measurability need*

To involve patients and give them more information about circular healthcare, health insurers stress the need for clear measurability and information. It should be very clear to patients what options they have and it should not make them confused, but inform on the climate impact of healthcare. Also a hospital states: "C*lear measurement that is suitable for every hospital should be available to show patients how circular the different options are*."

*Circular policy not very promising*

One discussed direction for patient involvement is offering a circular healthcare policy, but in general this was not viewed very promising. Health insurers talk about the multitude of healthcare policies for people to choose from, and about the tension with keeping healthcare affordable and premiums low. However, one health insurer thinks that a circular policy might be the future, as price differences between different insurances are becoming very minimal, and the number of people choosing for sustainable options is increasing. One hospital also states: "*Circular healthcare policy is not a good option I think, as you should not use their money while they are not getting different healthcare.*"

*Relaxed informing*

Lastly, a health insurer made an interesting remark about that patients should be informed in a relaxed way, without putting a blame on them. Information should be given about why circular healthcare is necessary, given the climate impact of healthcare, and it should give them inspiration on what they can do, and that they could go into conversations with healthcare providers, without pushing them to do so.

## Collaborating with suppliers

As suppliers are recognised as important actors in the healthcare system, who are often not yet aligned on the circularity aspect, the intervention of a potential collaboration with suppliers is also discussed with health insurers and hospitals.

**EFFECTS**

*Increase supply*

As there currently is a lack of supply of circular products, a health insurer states: "*We have to approach suppliers, to make sure there will be a supply of circular products.*" A hospital also notes that if health insurers would make suppliers aware that there is a great demand from multiple hospitals, it would get more interesting for suppliers to offer more circular products on the market. A health insurer stresses that it is important to make agreements with suppliers on the long term, to get them out of focusing on short term revenues. However, it is also stated that it still has to be figured out how health insurers can exactly help in this.

*Create volume and price deals*

Hospitals also think that health insurers can help in creating volume by coordinating multiple hospitals in a collaboration with suppliers, to make circular products more affordable. In this way, the investment cost for circular products are lower for hospitals, by creating a bigger scale for the demand of hospitals together.

**KEY CONSIDERATIONS**

*Standing stronger together*

Hospitals also note that if health insurers would go to suppliers with the involvement of hospitals, it would be more pressing towards suppliers that there is a real need for circularity. Also hospitals note that they stand stronger together with health insurers, and it is stated: "*I think health insurers could form more a front with us in procurement processes, against suppliers*." They could also be more helpful towards suppliers, to enable a more circular healthcare market. Additionally, hospitals state that they often don't have specific knowledge on procurement needed for circularity, and health insurers with more procurement expertise could help them in this collaboration with suppliers.

*Through existing platform*

A few health insurers also noted the possibility to realise such a collaboration with suppliers as an extension of, or tying it in with, an existing platform. To enforce it and look into how they can offer added value to this. One health insurer states: "*Maybe we can tie in with existing initiatives, "Intrakoop" for instance, as it is a very large network and quite new, but it has sustainability as one of their goals*."

## Collaborating with all health insurers (ZN)

Lastly, an intervention that is discussed by health insurers is their joint approach of all health insurers through the organisation of Zorgverzekeraars Nederland (ZN).

**EFFECTS**

*One strong direction*

Health insurers note that together they have to set the same objectives towards hospitals, which makes it also more feasible for hospitals. A health insurer also stresses that together they should determine an agenda, which is executed by the individual health insurers. It is stated: "*Let individual health insurers take the main role for conversation in the regions where they are largest, but from the agenda that is determined within ZN.*" This prevents hospitals from having the same conversation with separate health insurers, and asks for the same effort from every health insurer.

*No competition and share costs*

Although one health insurer notes that competition can be important, on sustainability they agreed to work together as they can have more impact and all want the same. Another health insurer notices that this collaboration creates an equal playing field, but takes out a small part of the competition, so everyone should stand behind it. Furthermore, a health insurer states: "*To fairly share the transformation costs, the bill for circularity has to be shared, so that it does not affect the premium of health insurers individually and every citizen eventually also pays it fair share.*"

**KEY CONSIDERATIONS**

*Increase own knowledge*

One health insurer points out: "*Procurers from health insurers are busy with a lot of other subjects and often don't know much about circularity*." Therefore, from this collaboration of health insurers, they are planning to change this by giving all procurers more knowledge to get them also aligned in this collaboration on circularity.

*Adjust regulations*

An idea that was noted by one health insurer is to set a step together with all health insurers towards adjusting regulations that currently block circularity in healthcare.

## *6.3 Answering sub question 3*

Within this chapter is was aimed to answer the third sub question: "*What are the perceived barriers and effects of the possible interventions on the complex system of circular hospitals?*".

The effects of these eight possible interventions and their key considerations in the complex system of stimulating circular hospitals are summarised and presented in table 7. The main barriers perceived by health insurers and hospitals were financial barriers, healthcare product market, differing focus (of procurers), collaboration health insurers different interest, medical procedures/standards, lack of knowledge at hospitals and a multitude of scattered initiatives.

Subsequently, the discussed effects of the possible interventions are visualised within a new, fourth, version of the Insurer-driven Circular Hospitals model in figure 14, to show how the interventions exactly affect the system context of stimulating circular hospitals. Additionally, also the perceived barriers are shown in this version, to make clear where they are situated in the system context. Furthermore, it is visualised how certain interventions are related to barriers, or can also reduce and maybe even take away some of these barriers. In this way, figure 14 acts as the visualisation of the answer to this sub question.

***Table 7.*** Effects and Key considerations of possible interventions

| Intervention | Effects | Key considerations |
|---|---|---|
| *Improving measurability* | - Facilitating learning<br>- Clear goals<br>- Alignment CSRD | - Prevent administrative burden<br>- Customise and voluntary |
| *Going into conversation with hospitals* | - Suitable help and real actions<br>- Connecting hospitals | - Involve sustainability experts<br>- More practical action<br>- Trust building |
| *Including circularity criteria in procurement policy* | - Important direct influence | - Step away from strict criteria<br>- Not right method |
| *Sharing good examples* | - Knowledge sharing and awareness<br>- Suitable for health insurers | - Not just sharing<br>- Realistic obligation<br>- More centralised and transparent |
| *Offering financial support* | - Lower financial threshold<br>- Share investment risks<br>- Organising shared funding<br>- Financial differentiation | - Banks collaboration<br>- Collaborative approach insurers<br>- Acceptance higher costs and plan |
| *Involving patients/insured* | - Increasing patient actionability.<br>- Suitable for growing patient interest. | - Prioritise internalisation<br>- Clear information and measurability need<br>- Circular policy not very promising<br>- Relaxed informing |
| *Collaborating with suppliers* | - Increase supply<br>- Create volume and price deals | - Standing stronger together<br>- Through existing platform |
| *Collaborating with all health insurers* | - One strong direction<br>- No competition and share costs | - Increase own knowledge<br>- Adjust regulations |

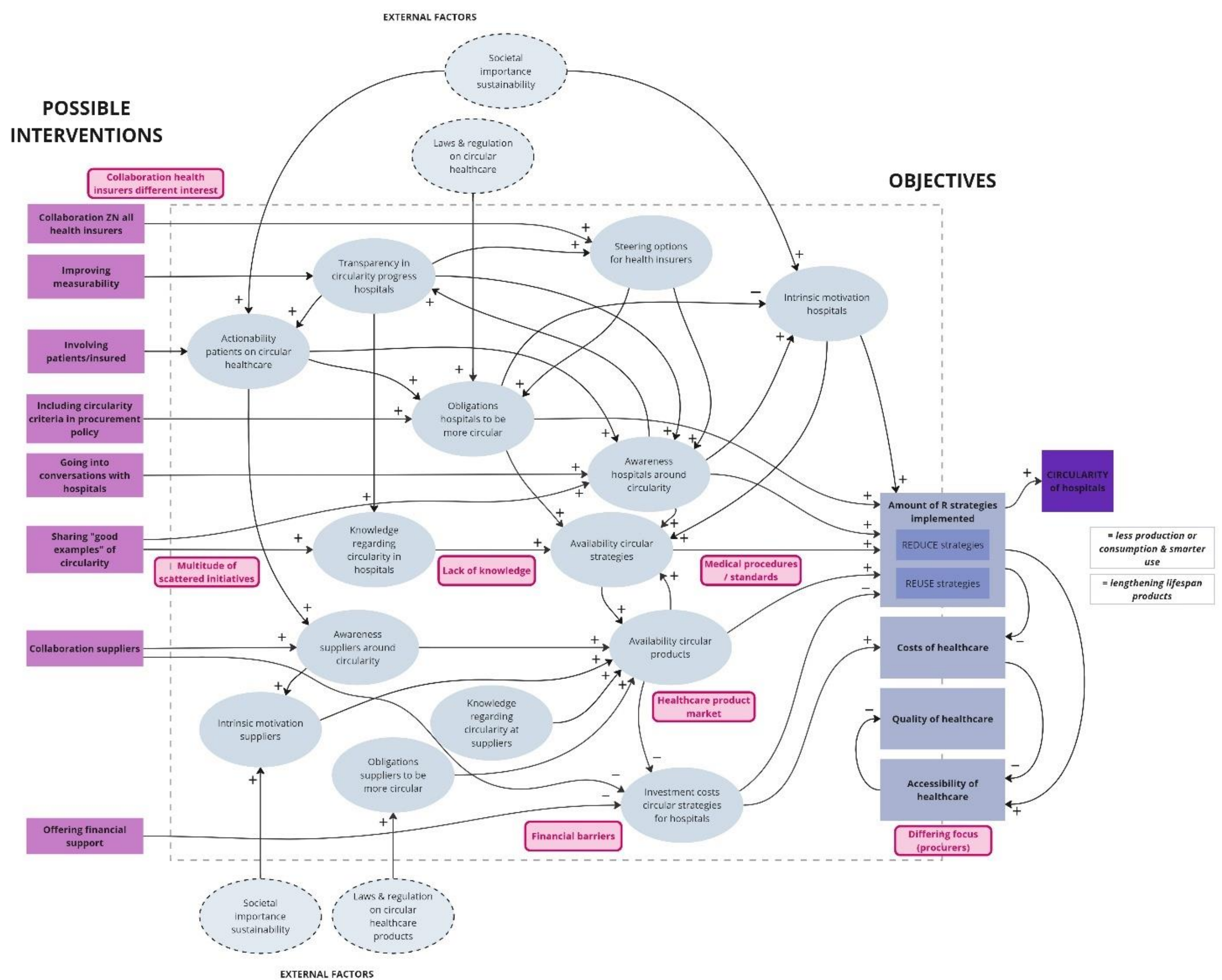


***Figure 14.*** Insurer-driven Circular Hospitals model V4

# 7. RESPONSIBILITY ROLE OF HEALTH INSURER IN THE SYSTEM CONTEXT

In this last part of the research, the responsibility role of the health insurer in stimulating circular hospitals will be studied further. The aim is to answer the last sub question "*What is the responsibility role of a health insurer in stimulating circular hospitals?*".

Within the interviews of phase 2, the participants from health insurers and hospitals are asked about the role of health insurers and how they perceive their responsibilities within this problem situation. The full interview results of this can be found in appendix E.

It should be pointed out that the focus of stimulating circular hospitals here also refers solely to the reduce and reuse categories. The discussed responsibility roles will thus be related to these R categories. The eventual findings that follow from this are discussed below and point out that when talking about responsibility roles, hospitals are also mentioned often and eventually a shared responsibility role of multiple actors. Therefore, these additional views on responsibility roles will also be discussed below.

The perspectives on the responsibility roles and their implications are visualised in figure 15. Respectively, 7.1 discusses the responsibility roles of health insurers, 7.2 the responsibility role of hospitals and 7.3 discusses the shared responsibility role. Lastly, 7.4 summarises the findings and answers the sub question.

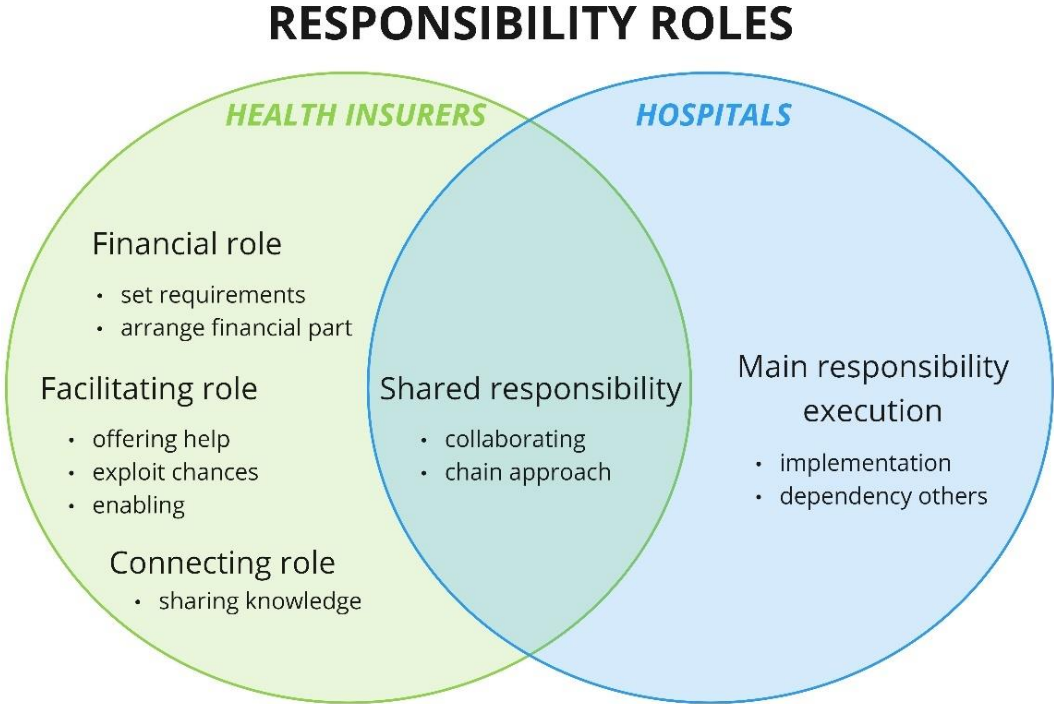


***Figure 15.*** Responsibility roles and implications

## 7.1 Health insurer responsibility roles

There were multiple perspectives on the exact role of health insurers and how they are linked to a certain responsibility role in the system context of stimulating circular hospitals.

***Financial role***

Multiple health insurers stress the direct role they fulfil in financing the healthcare that is delivered in hospitals. From this financial role, health insurers state that they have an influential position and that by paying they determine, so they play a role in thinking about the circularity of healthcare. Another health insurer states that it makes them co-responsible for the circularity of healthcare. Furthermore, it is recognised by health insurers that from this financial role, they are able to set some criteria and ask for obligations to hospitals, while they are also responsible to take action and put it on the agenda.

However, it is also mentioned by health insurers that their explicit task is to keep healthcare affordable and accessible, and that very strictly they only have the task to pay for the healthcare for their insured and to have the right contacts for delivering healthcare.

Hospitals also note the financial role of health insurers and one hospital states that it enables them to set certain requirements to hospitals on circularity. However, a hospital also states that they cannot demand something that is not feasible and shift the responsibility fully towards hospitals. Additionally, a hospital notices that health insurers as financial organisations should take care of arranging the financial part of the circularity transition well, as they have expertise on how money flows through the whole system. Therefore, it is also stated by hospitals that they could stimulate this with financial instruments, and for instance help in making money available for investments on circularity.

***Facilitating role***

Health insurers also mentioned their facilitating role a lot, which resonates in one health insurer stating that they might not be directly responsible for circularity in hospitals, but they are part of the solution. Another health insurer states that they have some sort of moral responsibility, as they are linked to the circularity of hospitals, but it is not their direct responsibility. From this indirect role as being part of the sector, health insurers note that they should help hospitals in filling in the prerequisites, taking away barriers and exploiting chances in the transition towards circularity.

Hospitals also note that, next to the financial part, it is a lateral responsibility for health insurers, where they should think about how they can mean something to hospitals. One hospital also agrees that health insurers can mostly facilitate this transition.

***Connecting role***

Another interesting role of health insurers is related to their network, as they note they are talking to all the hospitals. Therefore, health insurers state that sharing knowledge is suitable for them, as they get to hear interesting things happening at hospitals and can spread this information as it might be relevant elsewhere.

Hospitals also recognise the importance of the network of health insurers within hospitals, which makes their power larger there compared to an individual hospital, and makes knowledge sharing very suitable.

## 7.2 Hospital responsibility role

As hospitals are a directly involved actor in stimulating circular hospitals, their responsibility role was also mentioned multiple times in the conversations with health insurers and hospitals. These perspective will also be discussed here, as it can clarify their role compared to the role of health insurers.

***Main responsibility execution***

Multiple health insurers stress that the main responsibility is for hospitals, as they are the executing actor and are responsible for their own business operations, where the implementation of circular strategies and thus the circular hospitals are realised. However, in combination with noting this main responsibility of hospitals, health insurers often mentioned their own facilitating role, where they should enable hospitals and make sure they do not stand in the way of what they from desire hospitals.

One hospital literally mentions their primary responsibility, with the notion that they cannot do it alone and it is eventually a system responsibility, which shows the dependency of hospitals. Other hospitals also mention that they are the ones to make sure it works internally, and to create a strong demand for circularity in healthcare, but others have to think along.

## 7.3 Shared Responsibility Role

Eventually, both health insurers and hospitals stress the shared responsibility that exists in the system context of stimulating circular hospitals. Therefore, this perspective highlights how multiple actors are involved in the system context and are all part of stimulating circular hospitals and are sharing the responsibility in some way.

***Health insurer perspective***

Health insurers recognise that they have a shared responsibility and can do their necessary part in the transition towards circularity, as they are a important director party in the healthcare sector. Another health insurer also notes that this role in the sector implies they should really do it together. Also from their societal role and link to healthcare, health insurers state they have to minimise the health impacts of climate for the insured, together with hospitals and the ministry.

***Hospital perspective***

Hospitals often mentioned the shared responsibility in the healthcare system to realise circular hospitals and the need to really do it together as the only way, as hospitals cannot do it alone. Although they admit that internally they are responsible, they point out that the responsibility is not for one party and other parties like the government, suppliers and health insurers really all have to take up their own part. One hospital also stresses their dependency on the whole supply chain of healthcare, and states that therefore a chain approach and chain collaboration is needed for this transition towards circularity.

## 7.4 Answering sub question 4

The aim of this chapter was to answer the sub question: *What is the responsibility role of a health insurer in stimulating circular hospitals?*".

However, it appeared that there is not one clear answer that can describe "the" responsibility role of health insurers. Next to the identification of multiple perspectives on responsibility roles of health insurers, also other responsibility roles were found, which cannot be seen totally separately. Therefore, the answer to this sub question will discuss the found perspectives and implications on the responsibility roles of health insurers, on the responsibility role of hospitals

and on the shared responsibility role in stimulating circular hospitals. Figure 15 visualises these main findings.

In stimulating circular hospitals, health insurers are perceived to have a *financial role*, from which they should set requirements to hospitals, and arrange the financial part of the transition, as they are procuring the healthcare and have the money in hands for this. Additionally, due to their indirect moral responsibility and link to healthcare, they are perceived to have a *facilitating role*, from which they are expected to offer help to hospitals, support them in exploiting chances and enabling them, to make the transition towards circularity. Lastly, they are perceived to have a *connecting role*, as they have a network within hospitals, which makes them very suitable for knowledge sharing regarding circularity in hospitals.

Hospitals are perceived to have a *main responsibility for the execution* of circularity in hospitals, as they are responsible for their own business operations, which directly enables them to implement circularity strategies. Although, this is with the notion that in this internal execution, they are dependent on other actors to really make it work.

This leads to the last identified *shared responsibility role*, which actually stresses the importance of collaboration between health insurers and hospitals, but also all other relevant actors in the system. This implies, as they are all part of the healthcare chain, it requires a chain approach and everyone has to take up their own part in stimulating circular hospitals.

# 8. DISCUSSION

This discussion chapter reflects on the findings of this master thesis research on stimulating circular hospitals from a health insurer perspective. First, the findings of all research phases of this master thesis will be interpreted together within 8.1. Then, in 8.2 it is discussed how the findings of this master thesis research relate to the wider literature on this topic, as discussed in 2.2. Furthermore, it is acknowledged that limitations are inherent to this research. Therefore, the most apparent limitations will be discussed in 8.3, together with their implications on the findings of this research. Subsequently, in 8.4 recommendations will be given for future research, to address these limitations and deepen insights.

## *8.1 Interpretation of all research findings*

The main research question that was addressed in this master thesis research is: "*How can a health insurer stimulate circular hospitals?"*. This main question will be answered extensively, with an integration of the subsequent findings of the four sub questions which are answered throughout this research. The next conclusion chapter will eventually follow this up with a concluding answer to the main question.

To formulate a coherent answer to the main research question, the possible interventions will be discussed including their effects on the system context, key considerations, addressed barriers and related responsibility roles. In this way, the possible interventions with effects indicate how a health insurer can stimulate circular hospitals. The key considerations will point out how these interventions can be executed successfully. Additionally, the related responsibility roles clarify how the interventions are suitable from these perceived roles.

Figure 16 visualises the possible interventions and how they are suitable from the three separate or overlapping identified responsibility roles of health insurers. With this presentation of results, the findings on the possible interventions are integrated into the perceived responsibility roles of health insurers.

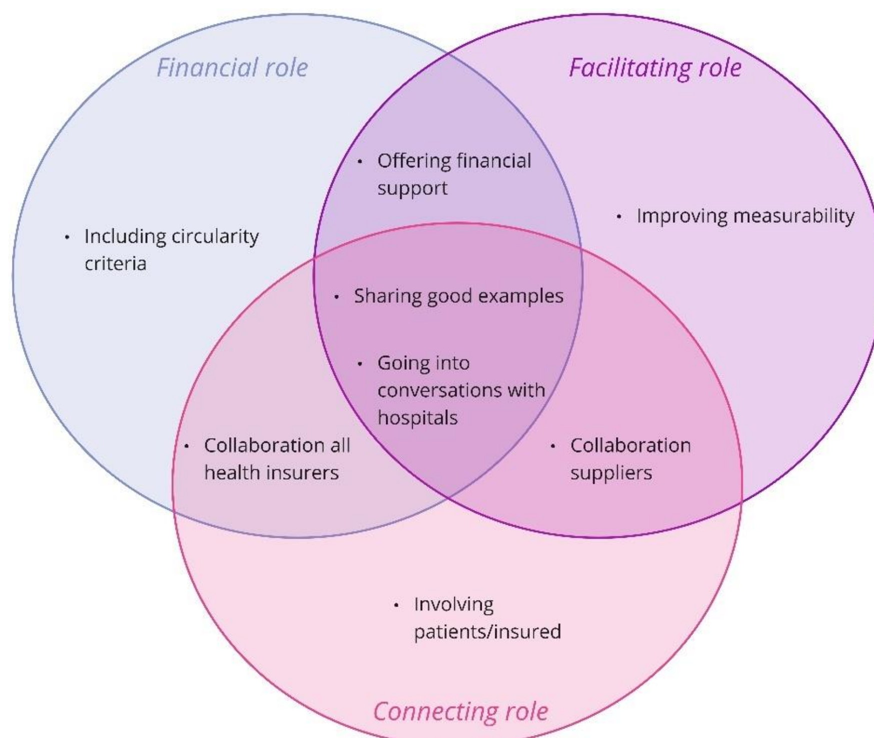


***Figure 16.*** Possible interventions within related responsibility roles of health insurers

***Going into conversations with hospitals***
Health insurers can go into conversations with hospitals to offer the most suitable help needed at the moment and to come to real actions together with hospitals. Additionally, it can be a way to connect hospitals where it might be relevant to learn from each other.
**Key considerations** are that sustainability experts from both parties should be involved to reach concrete agreements, there should be really steered towards practical actions in these conversations and mutual trust should be built to show the willingness to stimulate circularity.
**Barriers** that can be addressed are *financial barriers*, *medical procedures / standards*, *lack of knowledge at hospitals*, *multitude of scattered initiatives* and *healthcare product market*, as this intervention offers the help that is suitable for hospitals at that moment. This implies the exact practical action that follows up from the conversation is depending on what a hospital indicates necessary, but it can possibly reduce these barriers that are perceived by hospitals.
The **responsibility roles** of health insurers relating to this intervention are all of the three *financial*, *facilitating* and *connecting* roles, as it thus depends on what comes out of the conversation which role suits mostly for the help that the hospitals need.

***Sharing good examples***
Health insurers can share good examples of successful circularity initiatives within hospitals, to increase the awareness and knowledge sharing between hospitals, and it is suitable for their powerful role as health insurer within a large network of within hospitals.
**Key considerations** are that it should not be just sharing good examples without actions, but a realistic obligation to also implement a few of these good examples and that the sharing of good examples should happen more centralised and transparent to ease implementation.
**Barriers** that can be addressed are the *lack of knowledge at hospitals* and the *medical procedures / standards* by increasing the knowledge sharing between hospitals of these successful circular strategies, and the *multitude of scattered initiatives*, if the key consideration of centralisation and transparency is taken into account.
The **responsibility roles** of health insurers that relates to this intervention are all the three *financial*, *facilitating* and *connecting* roles, as it set requirements by a realistic obligation for implementing good examples, helps them in exploiting chances, and uses their network within hospitals.

***Offering financial support***
Health insurers can offer financial support to lower the financial threshold and share risk for hospitals investments on circular strategies. Specific potential forms of financial support are organising that shared funding is used by hospital, where cost reductions of circular initiatives are reinvested in more expensive circular initiatives, or applying financial differentiation, where hospitals get a certain amount of money based on fulfilled circularity criteria, starting with a neutral budget.
**Key considerations** for the financial support are that health insurers should look into how they can collaborate in this with banks and how a collaborative approach with all health insurers can make every health insurer pay their fair share. Additionally, they should consider that it might be necessary to accept the higher costs of circular healthcare, and do research into the financial implications of a transition towards circular hospitals and make a plan for it.
**Barriers** that can be addressed are mostly *financial barriers*, as the potential forms of offering financial support can reduce the perceived financial barriers discussed, such as the shared funding which addresses the organisational barrier. Also it can increase the low power they are perceived to currently have in the context, which became clear in the power-interest matrix.
The **responsibility roles** of health insurers that relates to this intervention is the *financial* role, due to the use of financial instruments and arranging the financial part of the transition, but also the *facilitating* role, as it offers help and enables hospitals to implement circular strategies.

***Collaboration all health insurers***
Health insurers can collaborate with each other to form one strong direction with similar objectives towards hospitals to make it feasible for them, and to fairly share the costs and prevent competition in this transition towards circular healthcare.
**Key considerations** are that from this collaboration they should increase their own knowledge to be aligned in this collaboration and they should consider setting a step towards adjusting regulations that are currently block circularity in healthcare.
**Barriers** that can be addressed are the *differing focus (of procurers)* and the *different interest in this collaboration* by increasing their own knowledge and making sure they are aligned in this collaboration, and *financial barriers* by sharing the costs of the transition fairly, and the *multitude of scattered initiatives* as together they can organise centralised initiatives.
The **responsibility roles** of health insurers that relate to this intervention are the *financial* role, as it is a way to fairly share costs between them, and the *connecting* role, as they are using their network within hospitals.

***Collaboration suppliers***
Health insurers can collaborate with suppliers as a way to increase their supply of medical products by raising their awareness, and to create volume and price deals by coordinating with multiple hospitals.
**Key considerations** here are that health insurers could stand stronger together with hospitals against suppliers, to form a front in indicate the necessity of circularity and support hospitals with knowledge on circular procurement. Additionally, they should consider using an existing platform for realising a collaboration with suppliers and offer an added value to this.
**Barriers** that can be addressed are mostly the *healthcare product market* by creating more supply and making them more aligned with circularity, and the *lack of knowledge at hospitals* by offering them support on circular procurement.
The **responsibility roles** of health insurers that relate to this intervention are both the *connecting* role, as they can use their network of hospitals, and the *facilitating* role, as it can help hospitals in increasing the supply and affordability of circular products.

***Involving patients / insured***
Health insurers can involve patients / insured to increase their actionability, enabling them to make active choices and pose critical questions on the circularity of healthcare, by informing them, for instance about "green choices" of healthcare providers.
**Key considerations** here are that it should still be prioritised to internalise circularity in standard healthcare as involving patients is indirect and less desirable, and that offering a circular healthcare policy is not a promising way of involving insured. Furthermore, clear information and measurability is needed for informing patients, and it should be done in a relaxed manner without putting a blame on them.
**Barriers** that can be addressed is the *lack of knowledge at hospitals*, as it can cause patients to be more active in posing questions to hospitals, making them more aware and transparent, which can eventually increase their knowledge.
The **responsibility role** of health insurers that relates to this intervention is the *connecting* role, as they can use their network with direct patient/insured contact. Furthermore, it relates to the perceived low power of patients / insured within the actor analysis in 4.5.

***Improving measurability***
Health insurers can improve the measurability of circularity efforts of hospitals, to enhance the insight into hospitals results and progress, to facilitate learning between hospitals, to create clear goals for hospitals to work towards and to create alignment with the needed CSRD data.
**Key considerations** are that an administrative burden has to be prevented by tying a potential improved measurability tool in with existing measuring tools and that participation should be

possible to customise to hospitals and be voluntary as the tool might not be suitable for every hospital.
**Barriers** that can be addressed are the *lack of knowledge at hospitals* by facilitating learning, and the *multitude of scattered initiatives* by tying in with existing tools.
The **responsibility role** of health insurers that relates to this intervention is their *facilitating* role, as they it can be seen as creating the prerequisites and help to exploit chances.

***Including circularity criteria***
Health insurers can include circularity in procurement policy to directly influence the circularity of hospitals, by creating a little more strict obligations every year with this important instrument.
**Key considerations** are that most health insurers and think they should actually step away from just setting strict criteria, as hospitals are already taking up their role in a good way and facilitating them would be better suitable at this moment, so this intervention is in general viewed as not being the right method to use for stimulating circular hospitals.
**Barriers** that can be addressed is the *differing focus (of procurers)*, as strict criteria will just have to be fulfilled and not leave room for giving priority to other challenges.
The **responsibility role** of health insurers that relates to this intervention is their *financial* role from which they are able to set requirements to hospitals.

In summary, figure 17 below shows all these interventions positioned within the related responsibility roles of health insurers, including their effects, key considerations and addressed barriers. This visualisation provides an extensive overview of the findings on the possible interventions.

## 8.2 Findings in relation to existing literature

In light of wider literature on this topic, this research presented several additions. With the use of a system diagram to represent the complex system, for the creation of the Insurer-driven Circular Hospitals model, this research adds an holistic, system thinking approach, which was deemed necessary by Hoveling et al. (2024), MacNeill et al. (2020) and Vaccari et al. (2017). Thus, the systems approach of this research indeed proved useful, as it showed how different important system factors are affecting each other and the objectives in stimulating circular hospitals, and in what way this can be influenced by health insurers through multiple interventions. Also, it pointed out the perceived responsibility roles of actors and the collaborative responsibility within the healthcare chain. However, the power-interest matrix in this research showed that not all relevant actors with power are interested enough, implying that all hospitals, health insurers and suppliers need to get more interested, to use their power for realising the transition towards circular healthcare within this collaborative approach.

Furthermore, by focusing specifically on circular hospitals, this research contributes to the limited research on healthcare circularity specifically in hospitals (Soares et al., 2023). Additionally, by providing insight into the perceived responsibility roles of health insurers in stimulating circular hospitals, this research delivers a contribution to the limited availability of academic research on their role in the transition towards healthcare circularity (Van Boerdonk et al., 2020). Besides, it highlights the shared responsibility role where all relevant actors have to take up their own necessary part for realising the transition towards circular hospitals.

Next to doing certain additions, this master thesis also verifies multiple findings within the existing knowledge base.
The importance of collaborative approaches and inclusion of stakeholder in the transition towards circular healthcare (Fletcher et al., 2021; Leissner & Ryan-Fogarty, 2019; MacNeill et al., 2020) became clear once again, with the substantiated possible interventions and shared

responsibility role. Also, the inclusion of the societal importance of sustainability as external factor in the Insurer-driven Circular Hospitals model corresponds to the statement of Soyler et al. that change will only happen if circular principles are universally adopted and ingrained in societal norms (2024). Similarly, the noteworthy system factors of awareness and knowledge positively affecting circular hospitals resonates with findings of Gaberščik et al., (2020), Hoveling et al. (2024) and Ville et al. (2023).

The cost-saving potential of circular healthcare noted by Van Straten et al. (2021) and Morris & Murray (2024) also corresponds the relations between objectives addressed by health insurers, implying that more circular strategies eventually lead to lower healthcare costs. However, the tension with the perceived financial barriers that was found, also existed within the literature (Fletcher et al., 2021; Hoveling et al., 2024).

Other perceived barriers in this research include the healthcare product market and medical procedures/standards, which reflect the need to change current healthcare products and practices (Fletcher, 2021; Leissner & Ryan-Fogarty; Vaccari et al., 2017), and challenging decision making regarding increased safety risks (Ville et al. 2023), found in existing literature. Lastly, the study of Vanholder et al. (2022), stressing the responsibility of health insurers to enforce the move towards more circular healthcare, resonates to the perceived financial role, from which they should set requirements to hospitals, substantiated as one of the responsibility roles of health insurers within this research.

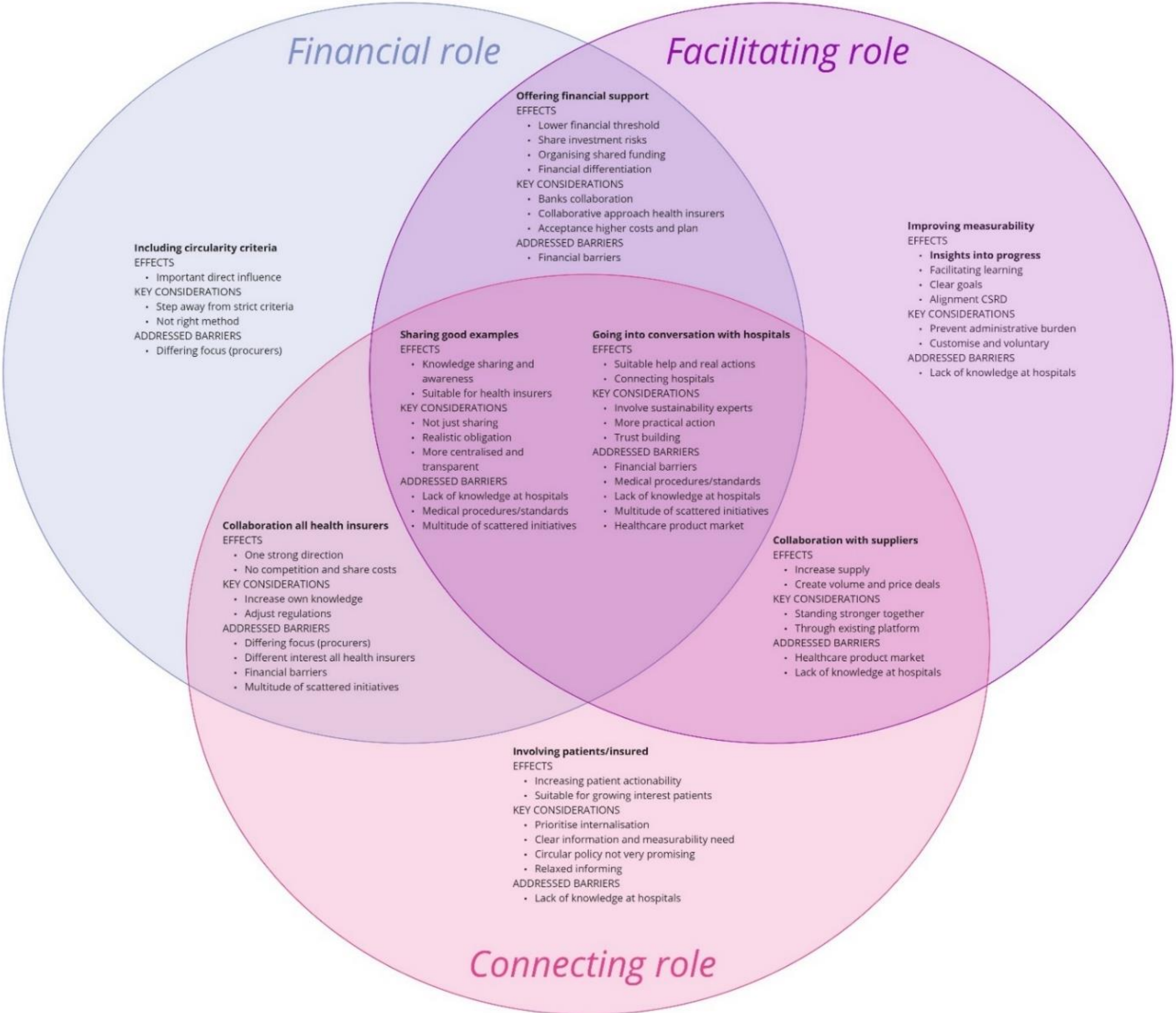


***Figure 17.*** Extensive findings on possible interventions, within responsibility roles of health insurers

## 8.3 Limitations

There are multiple limitations that are part of this research and these have certain implications for the results of this thesis. These limitations will be discussed to reflect on this and to acknowledge the consequences for interpretation of the findings within this master thesis.

### 8.3.1 Limited time period master thesis

One limitation that is inherent in a master thesis and inextricably linked to some other limitations, is the fact that there is only a limited time period for doing master thesis research. This hinders the depth of the research, and the extensiveness in using differing methods and analysing the results. In this specific case, it implied amongst others that a limited amount of interviews was executed.

### 8.3.2 Interview method

***Semi-structured interview***

The main research method in this research was the use of semi-structured interviews. As there were a lot of subjects to discuss with the participants within a certain timeframe, this meant that sometimes the depth of the interviews was limited or that not every subject could be discussed. This implies that a more explorative instead of an in depth approach was taken, and that it does not necessarily say anything how often something was mentioned within the different interviews, as not every intervention for example could be discussed in every interview.

***Interview participants***

As this research mainly focused on the perspective of health insurers, it was a logical choice to execute the interviews for a great part with health insurers. Additionally, some hospitals were interviewed. However, it would have been useful to execute more interviews with other relevant actors like suppliers and governmental parties. This could broaden the understanding of the effects of even more possible interventions and of the responsibility roles of health insurers.

Furthermore, it has to be acknowledged that the role that the interview participants fulfilled within their organisation (health insurer or hospital) was for all participants in round 2 a sustainability advisor / expert role. This implies that they are probably much more involved in this healthcare circularity situation, compared to their colleagues. This may have resulted in other perspectives than would be found for directors, procurers or other employees. Therefore, it can be questioned whether the interview results of these participants are representative for their whole organisation.

***Qualitative findings***

This research only includes qualitative results, collected through semi-structured interviews and literature sources. Although this can be interesting, sometimes quantitative results can say more about for instance the effects of interventions. In this research the effects of interventions are descriptive, but it does not indicate how big the impact of these interventions might be.

### 8.3.3 Systems approach

***Fixed system perspective***

With the use of a system diagram, a fixed system perspective is taken, as this diagram is only able to visualize a current system context with fixed barriers, as it is perceived at the moment. This enables to study the effects of interventions on the current system well, however it also neglects the fact that this system might be changing, which also affects the influence of interventions. Within this research it also implied that the finding that multiple health insurers

stressed that there is a need to change the current system was not further included in the Insurer-driven Circular Hospitals model.

***System actors as institutions***
As this thesis focuses on institutions such as hospitals, it does not make a distinction between directors and as actor groups within. This results in difficulties for capturing for instance the difference in intrinsic motivation for these actor groups well, which is an important factor.

### 8.3.4 Definition Circular hospitals

***Small scope***
To delineate this research, the scope for circular hospitals was substantiated with a definition related to R strategies, focusing on reduce and reuse. This made the research area smaller and better manageable. However, this also may have led to the exclusion of studying other interventions that also might be promising for stimulating circular hospitals in a broader sense.

***Exclusion Recycle category***
As the definition of circular hospitals within this thesis focused on Reduce and Reuse categories, it left the Recycle category out of scope. However, it should be noted that eventually to really be circular, recycling will probably always be necessary to fully close the circular loop. Therefore, for interpreting the findings of this research, it is important to emphasise again that the findings are related to the reduce and reuse categories of circularity in hospitals. This implies that the responsibility roles that are discussed might differ at the inclusion of the recycle category, but also the substantiated Insurer-driven Circular Hospitals model, including interventions and barriers. Related to the responsibility of health insurers, it was also expected that their responsibility is less present at the Recycle category, where it is expected that suppliers have a bigger role. Suppliers are supplying the medical product and thus will also be more responsible for them at the end of their lifecycle.

The implications of this limitation are visualised within figure 18. Here it is shown how the resulting interventions, within their corresponding responsibility roles, are related to the different R categories of reduce and reuse. However, it can be noted that the perceived shared responsibility role that was mentioned by health insurers and hospitals is positioned to be related to all R categories. This is an assumption that this shared responsibility that was perceived within the healthcare chain, will also transcend to the Recycle category. Additionally, the grey circles with question marks show how the left out Recycle category creates the possibility for further research on interventions and responsibilities related to the inclusion of the Recycle category for stimulating circular hospitals.

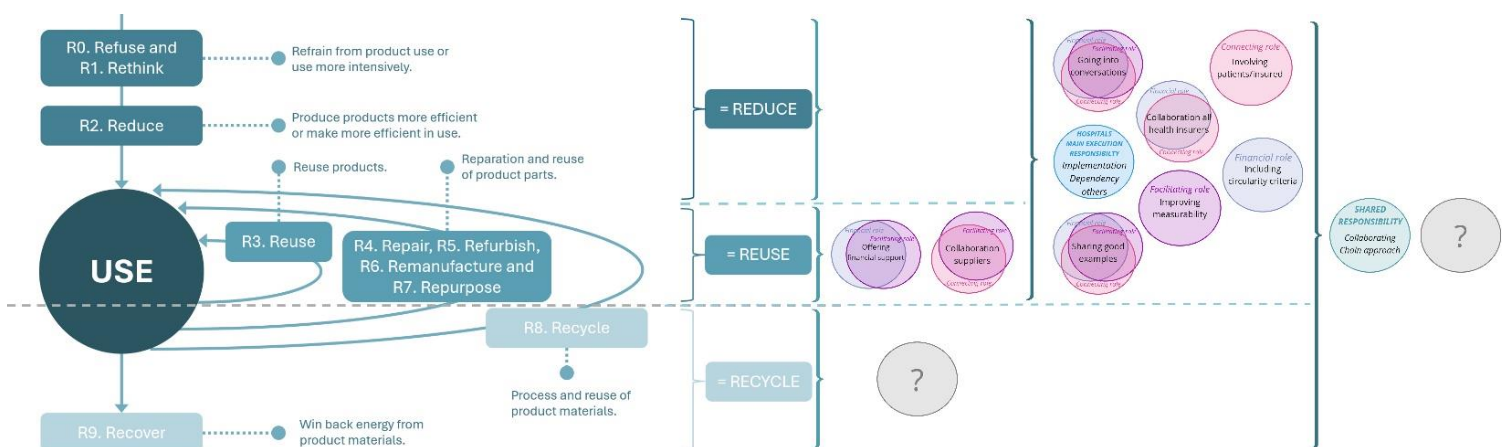


***Figure 18.*** Implications of exclusion Recycle category

## 8.4 Recommendations for future research

Following from the discussion of identified limitations of this research, several recommendations for future research can be made.

***Involving more differing participants in interviews***

To better substantiate the current findings on perspectives in this research and further broaden the possible interventions, other actors, such as suppliers and governmental parties should be involved in interviews in future research. Also participants from health insurers and hospitals that fulfil roles that are not related to sustainability should be involved to enable a perspective that is more representative for their total organisation.

***Distinction of actors within institutions***

Future studies could also focus more on the separate actor groups within institutions, such as directors, procurers, sustainability experts and other employees within hospitals or health insurers. This can give better insight into their roles and how they are affecting the system context of stimulating circular hospitals from within their institutions.

***Quantifying system diagram to estimate impact***

To enable comparing the possible interventions more on their impact, future research should quantify the system diagram to show the effects not only in a qualitative manner. This can lead to more findings about how big the impact different interventions is in reaching the main objectives in the system context.

***Follow-up survey for interventions***

Future research could focus on a follow-up survey on the results of this research, to further study how successful the possible interventions are perceived by different actors and make it quantifiable. This could also be done for the identified barriers, to study which barriers are perceived to be the most pressing by the survey participants.

***Elaborating on changing current healthcare system***

Future research can elaborate on the briefly discussed notion of some health insurers that there is a need to change the current healthcare system to enable to realise circular hospitals. This implies stepping away from the use of a system diagram in future research, but maybe designing a new system with the use of different methods, related to system transformations.

***Extension of definition "Circular hospitals"***

To broaden the insights in stimulating circular hospitals, it is recommended to extend the definition of circular hospitals by including the Recycle category. This can clarify the perceived responsibility roles of multiple actors related to this category. For instance, the responsibility of suppliers might be more interesting here; as they are supplying the medical product, they might also be more directly linked to the products at the end of their lifecycle to close the loop. Furthermore, more possible interventions and other barriers could be identified when the recycle category is also included.

In this way, a next step can be made in filling the identified research gaps, visualised within figure 19. Here it is shown that the current research of this thesis focused mostly on the reduce and reuse categories, which resulted in findings on interventions and corresponding perceived responsibility roles, related to these R categories. However, it is not sure how the Recycle category relates to certain interventions and responsibility roles of actors. Therefore, figure 19 shows where this research finishes and sets the scene for future work. The grey circles with

question marks point out where future research can follow up and study what possible interventions and responsibility roles of actors relate to a potential inclusion of this category.

These recommendations aim to address the discussed limitations and provide ways to further improve research efforts regarding stimulating circular hospitals from a health insurer role, to build on this master thesis research.

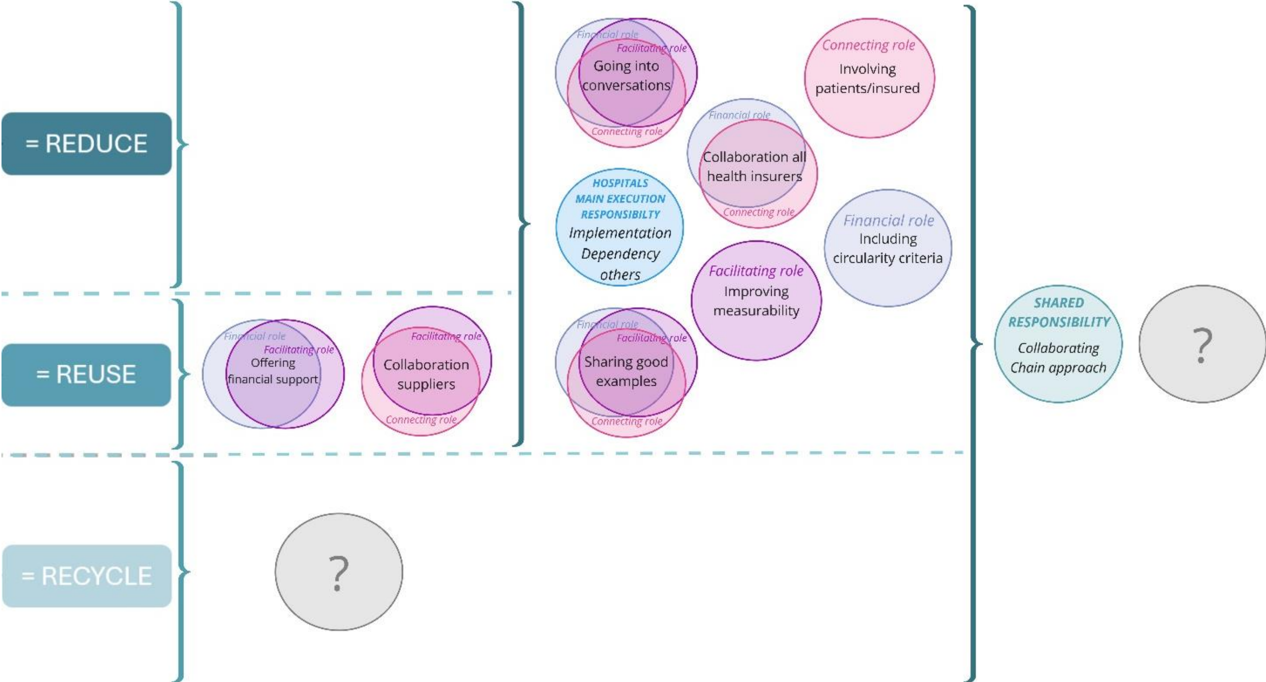


***Figure 19.*** Identified research gaps related to exclusion Recycle category

# 9. CONCLUSION

In this last conclusion chapter, an answer will be formulated to the main research question of this master thesis, based on the subsequent findings of the four sub questions which are answered throughout this research thesis. The main research question that was addressed in this master thesis research is: "*How can a health insurer stimulate circular hospitals?*".

The use of a systems approach made it possible to identify important system factors that are affecting each other, the objectives in stimulating circular hospitals, how health insurers can influence this with multiple interventions and what barriers are perceived. Additionally, advances to existing literature were made by creating the insurer driven circular hospital model, capturing the most important system factors and their causal relations and barriers, and the identification of multiple responsibility roles of health insurers. The finding of amongst others, financial barriers and the importance of collaborative approaches, were verifications of current literature.

Eventually, it can be stated that circularity in hospitals was perceived to be mostly a shared responsibility of hospitals, health insurers and all the other relevant healthcare sector actors (such as suppliers and the government), who should all work together to realise circular hospitals. Health insurers are an important actor and are expected to do their necessary part, which was the focus of this research.

Altogether, this research highlighted eight different interventions for health insurers to stimulate circular hospitals, focusing on the reduce and reuse categories of circularity within hospitals. This research showed how the interventions affect the system context and address several perceived barriers.
Furthermore, the financial, facilitating and connecting responsibility roles of health insurers became clear and how these are related to the interventions. In this way, it was indicated how health insurers can use these roles to execute several interventions, with key considerations that point out what has to be taken into account during this process.

In the end, the chances of success of the identified interventions, are firstly related to the number of responsibility roles the health insurer is fulfilling per intervention, and secondly, to whether the interventions are directly focused on hospitals.
The more responsibility roles the health insurer fulfils within executing an intervention, the more supported they are from within the different responsibility perspectives.
Interventions with a direct focus on hospitals are regarded to be more effective than indirect interventions.

Based on the above, the two interventions that are expected to be the most promising are *going into conversations with hospitals* and *sharing good examples*. Both interventions are directly focused on hospitals and in both interventions health insurers fulfil all three of the identified financial, facilitating and connecting responsibility roles.
Hospitals have the main execution responsibility, as they are directly able to implement the circular strategies. Health insurers can *go into conversations with hospitals*, together with sustainability experts, asking them for their present needs and really act upon this by offering practical suitable help This can also be a way to support them in reducing several perceived barriers.
Additionally, *sharing good examples* and realistically obliging the implementation of circular initiatives within hospitals, encourages knowledge exchange between hospitals and can stimulate the implementation of even more circular strategies.

Furthermore, another potentially successful intervention, which is also directly focused on hospitals and in which the health insurer fulfils both the financial and the facilitating responsibility role, is *offering financial support*.
Health insurers can *offer hospitals financial support* in multiple forms, to reduce financial constraints and smoothen the financial part of the transition by arranging a financial plan.

Then, two other possible interventions directly focused on hospitals, in which the health insurer uses only one responsibility role, are *improving measurability* and *including circularity criteria*.
*Improving the measurability* is a way to increase insight into circularity progress of hospitals and stimulate their knowledge. Such a measuring tool should be suitable for different hospitals and participation should be voluntary.
*Including circularity criteria* in procurement policy is also a direct way to set strict requirements to hospitals. However, it may not be the right method as it was found to be time to step away from simply obliging.

Focusing on other actors, the most promising interventions are those in which the health insurer uses two different responsibility roles.
*A collaboration with suppliers* can affect the healthcare product market, to address the need and increase the supply for circular products.
*A collaboration between all health insurers*, which can be seen as a separate intervention, but can also relate to all of the above interventions, can create a stronger impact from health insurers in stimulating circular hospitals, and fairly share the costs of the transition to counter competition on the sustainability subject, according to their mutual agreement.

Lastly, there is another possible intervention not (directly) focused on hospitals, in which the health insurer only uses one responsibility role. *Involving patients/insured* by activating them through a relaxed way of informing, can be an indirect way to stimulate circular hospitals. However, internalising circularity in healthcare should be prioritised.

Nevertheless, to enforce the effects of the separate interventions and create synergy, health insurers can even execute combinations of the possible interventions. For instance, *going into conversations with hospitals* can go together with *sharing good examples* and also *offering financial support* for implementation of these examples, agreed upon in these conversations.
Another example is a *collaboration between all health insurers*, where they can *develop a measuring tool* together, that will be useful and applicable for all hospitals.
These two potential combinations of interventions are not exhaustive, so there might be more interesting combinations of interventions possible to execute for health insurers.

All in all, these are ways in which health insurers can stimulate circular hospitals and eventually contribute to the transition towards circularity in healthcare. Through the use of their financial, facilitating and connecting roles, health insurers can execute several interventions and potential combinations of interventions. In this way, they can serve different hospitals with their specific needs and recognise the need for collaborative approaches.

This master thesis finishes at presenting findings on what health insurers can do related to the reduce and reuse categories for stimulating circular hospitals. This is a result of the scope of this research with the definition of circular hospitals leaving out the recycle category of circularity. In this way, the scene is set for future research. In future work, the inclusion of this recycle category of circularity within hospitals can be used to study how findings might change, related to for instance the possible interventions and the perceived responsibility roles of actors.

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# APPENDIX A: SEARCH STRINGS LITERATURE REVIEW

The literature study at the beginning of this research, for which the results can be found in the literature synthesis in 2.2, made use of certain search strings. The full search strategy is written out in section 2.1, but the used search strings this section refers to are to be found here below. As the first search strings did not result in enough relevant articles after performing the evaluation of their usefulness (explained within 2.1), more different and eventually also much broader search terms where used. Eventually, the following search strings resulted in a sufficient number of relevant articles to enable the literature synthesis in 2.2 to be written.

Used search strings:

- (circular*) AND (hospital* OR health* OR clinic* OR medic*) AND (insur* OR payer OR payor)
- circular* AND sustainab* AND health* AND hospital*
- “circular healthcare”
- circularity AND hospital

# APPENDIX B: INTERVIEW ROUND 1 QUESTIONS

The questions that were used for the first round of interviews with six employees of the health insurer Zilveren Kruis can be found below. As the interview is semi-structured the questions leave enough room for steering the direction during the interview to other interesting subjects as they came along, or adjusting the order as it was suitable for the conversation.

OPENING

- Can you tell me more about who you are and what is your role within Zilveren Kruis?
- How long have you been working here?

CIRCULARITY

- What do you think circularity is?
- What do you want to do with this as a health insurer?
- What are circular hospitals?

OBJECTIVES

*Giving info on used circular hospitals definition: 'maximising implementation highest possible R strategies, aiming to reduce use where possible and reuse otherwise'*

- What do you think about this challenge, stimulating these circular hospitals?
- What are your goals in achieving circular hospitals?
- What are other important objectives for health insurers in this situation?
- Where do you see tension between circular objectives and other objectives?

SYSTEM FACTORS

- What affects the main objectives?

*Show version 1 system diagram to let them verify and make additions*

- Are there certain factors or relations missing within this diagram?
- Where do you have no influence over? (external factors)

BARRIERS

- Are there specific barriers within the current healthcare system that hinder circular initiatives?

POSSIBLE INTERVENTIONS

- What can you as health insurers do to stimulate circular hospitals?\
- What interventions are needed?
- What resources does health insurer have?
- What power in the field does health insurer have?
- Can you name some interventions that seem ambitious or even radical, yet could be feasible in the longer term?
- What interventions or incentives could motivate hospitals to embrace circular measures faster?

ACTORS

- What other parties are relevant in stimulating circular hospitals?
- With whom would a possible collaboration be interesting? How would that look like?
- PI matrix: which actors are most relevant is this system context?
    - How much power do they have?
    - How much interest do they have?

# APPENDIX C: INTERVIEW ROUND 1 RESULTS SUMMARY

The summary of interview findings from round 1 with six Zilveren Kruis employees are listed below. These objective results exist of quotes that are categorized into the main subjects of system factors in C.1, means for a health insurer in C.2, system barriers in C.3, role of health insurers in C.3, role of hospitals in C.4, role of suppliers in C.5, role of patients in C.6 and role of government in C.7. Within these broader categories, the quotes are again categorized into smaller suitable subcategories.

## *C.1 SYSTEM FACTORS*

*SYSTEM CHANGE*

The healthcare system needs to change and we need to start thinking differently about this sort complex problems, and act like we really see this as a problem and act upon it.
Currently there are not enough incentives in the system to really enforce change, so without system change, this will not work.

*JUSTIFICATION*

Nice to see this system which is actually just like the situation I just outlined. All the elements are quite much included.
The system you display is indeed like how we currently talk about it.

*AWARENESS*

Only when you feel and experience how much waste is produced and products are used in healthcare, you start to get a feeling about what it really means. Awareness is thus quite important.
First of all, only the awareness of a hospital is very important if they even want to undergo any change at all.
I wonder how well known certain circular strategies are to hospitals.
Green teams in hospitals are more active in proposing their own sustainable improvements, which is maybe also something from the younger generation.
Creating awareness is already done by going into conversation, however that is non-binding.
The awareness is indeed captured in the system and you see it growing when it is shared more.

*OBLIGATIONS*

At some subjects you just have to start enforcing, by forbidding certain things, like using certain products or materials. This may sounds easy, but you have to arrange quite some things for this.
As green teams are less directly commissioned and mandatory, there is more energy and they have the freedom to figure it out themselves.
The more we put pressure on them, the more they are asking us what we are going to pay them for it.
On one hand we don’t want hospitals to lose their ‘energy’ on this subject with putting them under big pressure. On the other hand, when we do we know we are going to get questions about how we are going to finance it, if we think it’s so important.
Less variation in products of different healthcare suppliers would help to reduce the used materials, as you can use the same packaging for everything.
The CSRD for health insurers makes it important for us to be able to report about the sustainability in our healthcare chain. For that reason, hospitals should be able to report about it. Transparency and good measurability thus would help us in that.

You can make certain agreements with hospitals and that could be obligations in the form of contracts.

*KNOWLEDGE*
I believe in sharing best practices and in this way activating hospitals, by increasing their awareness and knowledge regarding the subject.
You don't know if the knowledge level regarding this subject is similar in all hospitals, but probably not.

*INVESTMENT COSTS*
If you start speaking about things like they have to improve their circularity, they are very quickly in asking questions about how much we are going to pay them for that. However, I understand that not all initiatives will make money, but some do and others even more. Therefore, as a package of implemented strategies it could be break-even.

*ACCESSIBILITY OF HEALTHCARE*
If you don't improve the sustainability of the healthcare system, then the sector will become even more polluting, and eventually, this will be a threat to the healthcare system's accessibility. As a consequence, the healthcare quality will also diminish to still keep the healthcare accessible in some way.
The duty of healthcare for health insurers is a legal obligation to keep the healthcare accessible to everyone, and therefore it will always outweigh other factors.
On the long term, more sustainable healthcare will also lead to more accessible healthcare.

*COSTS OF HEALTHCARE*
Affordability of healthcare is also very important but I believe that sustainability does not always have to be more expensive. However, a lot of people do believe that it is, which makes it a dilemma. Therefore, hospitals often ask for extra money when making agreements about circularity.
I think financially it is crazy actually, that there are in the current practices so much materials at people's home that are not used anymore, while healthcare costs are currently only increasing. Therefore, if there is so much waste in the chain, I think it is crazy that we did not tackle this subject already and did more about eliminating this waste.
So even apart from sustainability, I think implementing such circularity strategies can really give an advantage in reducing the costs.
Implementing more circular strategies is a way to keep the healthcare affordable.

*INTRINSIC MOTIVATION*
Maybe it is also something from the younger generation. It appeals more to some people.
Some things are such big investments and then you really have to believe in it and dare to make the choice, so therefore you got to have a certain vision and background from a director.
I think if this is a theme a hospital director finds interesting, from whatever background, they are more willing to invest in this.
I saw on a conference that there is really a new generation with a lot energy on this subject of sustainability.

*TRANSPARENCY HOSPITAL PROGRESS*
I miss the insight into how far hospitals are in transitioning towards circularity. For example, whether they all adopt a good example. And it's okay if they don't for good reasons, like when it is not feasible or possible, but I don't know if there are also healthcare providers that are not aware of it and that would be a waste. Therefore, a sort dashboard would be helpful to get insight into

what hospitals are doing and what not yet. Then we can go into conversations with hospitals that lag behind and maybe get them into contact with a more progressed hospital.
Insight into where there is room for improvement regarding circularity would help health insurers to stimulate this.

*PATIENT ACTIONABILITY*
I think the patients also pays a role in this and can imagine that patients also value sustainability increasingly more. Therefore, it is important that the patient knows what a hospital does about it, and that they can see that one hospital does more than the other, so that they can make this decision.
And I can imagine, especially in big cities where there are multiple hospitals, that a patient chooses for a more circular hospital. Then the other hospitals may start to act upon this and also improve their circularity practices. However, this will probably not work outside cities, as you are not going to travel half an hour further, because that is also not sustainable.
There can also be a demand created, in the way that patients also want to have sustainable healthcare.

## C.2 MEANS HEALTH INSURER

*CONVERSATION & THINKING TOGETHER WITH HOSPITALS*
We could simply oblige hospitals to fulfil the criteria of the Green Deal, however that does not say it is that easily fixed. I think we as health insurer can help in thinking about strategies and working out policies related to the Green Deal, to actually put them in action.
Sometimes a supplier sells a package of products of which a hospital only uses a few. In such cases, it should be possible to change the package to reduce unnecessary material use. However, we don't have knowledge on what is necessary for a hospital, so we shouldn't interfere too much.
In conversations with hospitals it is interesting to look at who of the health insurer has to be in contact with who of a hospital, should it be procurers or someone internal that is specialised in sustainability?
During the procurement process I notice that there are actually no Green Team or sustainability persons at the table, so maybe we have to start organising this differently, to start involving the people with the right knowledge for the transition towards circularity. At the moment we are actually as procurers more a pass-through of these sustainability experts, but they should be involved more directly.
You also have to think about whether it is realistic to go into conversation with all our 76 hospitals, or if you make a choice in this to go to big or important hospitals.
We could have a role in sharing good practices and are trying to, but we could do more and take it up in our policy and inform us as procurers more about it. We hear also from healthcare providers that other health insurers are finding it more important and talking more about it in procurement conversations. So procurers should be steered more on this subject, and not only say they have to do something with circularity, but work it out more specifically, and know more about what we expect from them and how we can make agreements about it, and what is the win-win.
Conversations about awareness are also still quite non-binding. So we could take it up in our policy, which we also already do, but for the elaboration it has to be implementable, because otherwise it's just well okay we talked about it and that's it.
I can't take over the role of doctors and tell them what to do, they are much more smart in that way, so I think more about how we can facilitate and stimulate it that it makes it easier for them. Then I got back from the doctors, they said it helped them when we put the topic on the agenda, and asked if we could please do that in conversations with hospital directors and procurers.

Internally, they have a lot of ideas and initiatives, but have to fight to get financial help from higher up to realise such projects, so we can help in making them aware of the importance.

*SHARING "GOOD PRACTICES"*
I believe in making best practices, and we can play a role in that. For example, when one hospital realises a good example, we could take it up as a requirement in our contract with other hospitals and show them this successful case.
There are initiatives and platforms that are sharing such good practices between hospitals, and we say they can take a look at it and should take action, but we do not yet put much pressure on it. However, it is an option to give this a more obligatory character, but I don't know if that would really help. I think we should embrace that there is a lot of energy and it would be a waste to lose this by putting it into too much strict regulations.
I think we should not say how they must do it exactly, but let them do it and find it out themselves and facilitate them in this, also at sharing this knowledge. We as health insurer do not have the innovative ideas and do not know what is exactly possible. Therefore, it is super nice if hospitals would figure this out themselves and just do it.
While I really believe in sharing best practices, I doubt whether it is suitable from our role, because everything happens in the field and there it is really active with green teams etc., with people having much influence and making impact, with great visibility. Then I think we as health insurer lag behind really quickly if we first have to collect them from the field where they are already super actively busy with it. So I think it can help, but I doubt the impact we can make with it, and whether it would be more suitable to facilitate this from a supporting role, instead of collecting and sharing these good practices ourselves.
Sharing good practice happens already, and we could do it more, however it is very non-binding, like "have a look at it and see what you do with it, if you have questions let me know".
I think the groups and initiatives in the field find each other anyhow and develops itself, and then actively sharing examples by us is less important I think, that's quite passé.

*PROCUREMENT CRITERIA*
I see possibilities in the procurement process of a hospital, because there it is determined which materials are used and which not. However, this has again to do with costs, as more circular materials are often more expensive. So therefore, if you could increase the volume…
You could directly take up only circular healthcare deliverers in your procurement criteria, or exclude the ones that are not circular.
You could do two things with contracting:
- or you could implement a more general obligation, saying we only procure care at hospitals that fulfil X.
- or you could make a bilateral agreement, saying we want to make substantive agreements, amongst others about sustainability.

The reason I make this difference is that we also have to fulfil our duty of healthcare, so if we implement the general agreement, that could only be realistic if enough hospitals would offer this sustainable healthcare, to keep sufficient healthcare available for everyone.
I believe some form of obligation is always useful to a certain degree, provided that it is executable. This is very important and therefore, we should always be able to give a good explanation about the why for a certain obligation, and go into conversation about it.
I don't think it is feasible to make for instance agreements about a reduction of their waste production. While I think it would be realistic to realize, however I don't think we are able to put that into a requirement.
From some good practice I think they are perfectly suitable for certain healthcare paths, however I doubt whether we as health insurer can oblige a hospital to implement it, as then we would maybe take over the role of doctors too much, and it is simply not feasible.
Something like a preferred supplier could be possible to take up into criteria.

In the form of a strategic partnership for multiple years with hospitals, we could require X, Y or Z on sustainability aspects, that would be the most viable.
I think obliging the implementation of a certain amount of good practices is less helpful, but something like certification (milieuthermometer) would be a better option.

*COLLABORATION WITH SUPPLIERS*
Maybe it would be possible to go into a conversation with suppliers and draw up a contract for multiple years for medical products for hospitals.
I think conversations with suppliers would be interesting, as two parties with relatively much power together. The difficulty is however that for some medical products we would procure ourselves, you can assert much influence. However I'm not sure about how to do this indirectly with all the products that are procured by hospitals themselves, whose healthcare we procure. This might be weird to do that for them, for their procured goods.
I think it is really relevant to go into conversation with suppliers, as we have great power, because we also do the procurement of some medical goods, this is not only hospitals. So I think we could use this more and this is an interesting opportunity.

*VOLUME PRICE DEAL TOGETHER WITH SUPPLIERS & HOSPITALS*
We can maybe fulfil a valuable role for suppliers in relation to enlarging the volume of circular medical products which could lower the price, if we would could organise a deal with a great number of hospitals. This could also make it interesting for them to start doing things differently, or push the sustainable variant of products.
Imagine if you could do the procurement of the around 100 hospitals together, then you could really generate volume for a supplier.
We could also make a coalition at the moment a supplier won't listen to a hospital, and that we in our role would then bring hospitals together to go against these suppliers.
I think this is something you might have to discuss with ACM, because it sounds like creating a consortium of hospitals, who would do the procurement together. This is not unique and happens more often, also for certain medicine, however I'm not sure what the health insurer is in this process. And how big this consortium is allowed to be, is also something for the ACM.

*ACTIVATE AND INVOLVE PATIENTS*
If you would increase the awareness of patients, while it is the question how much they can influence it, then they might stop accepting certain things from hospitals. And then you go to another hospital with a more sustainable option as a patient.
We could do campaigns about sustainability, promoting that we care about it. And that your doctor discusses with you what is sustainable medication.
Or you could implement a green label in the search machine website for healthcare deliverers such as hospitals, to inform the clients/patients.
I have a hope, while it is idle hope, that if insured would speak up more and form a power block, but I just don't see that happening.
I think patients could assert more influence, but it is difficult because they are often alone, so if you would want something with this, you should act together, and then I think their power could increase.
The health insurer and patient could enable the patient to deploy its power as consumer.
As health insurer we think that is very complicated and therefore I don't think we would do it, but it is interesting to develop a green healthcare policy, with circular healthcare.

*DEVELOP DASHBOARD / MEASURABILITY HOSPITAL PROGRESS*
I think it would help to have a sort dashboard which can show the progress what a hospital does and does not yet on circularity. This could give us insight into which hospitals lag more behind and maybe get them into contact with hospitals that are further. So sharing good practices is

fine, given that you have some insight into what is already happening and what not and maybe why.
From procurement perspective and given the current administrative burden and staff shortage, working towards a certain standard would really be helpful.
The “milieuthermometer” as standard or certification could be promising, because then you can see that whether they are bronze, silver or gold and you know that they are on the good way. You can also require them to have a certain certification by 2027, for instance.

*COLLABORATION “GROENE ZORG ALLIANTIE”*
I know there once would be a collaboration between groene zorg alliantie and the health insurer, but I don’t know if that is still something. However, I think that we cannot do much ourselves in this, but we can be a great facilitator.
Groene zorg alliantie could play an important role in unambiguous reporting. For instance, developing clear measuring tools or whatever, so that its clear what has to be delivered. And they also have a clear vision about what can be practical changes to implement in healthcare. So they are the ones that should visit hospitals make general implementation plans available for sharing, so that you can accelerate the implementation process in a similar way at several organisations, instead of that the same discussion happens everywhere. I think they can play a role in this, also for delivering the evidence for what is a good decision in replacing disposables by reusables.

*FACILITATING GREEN TEAMS*
I really think it has to come from the Green teams, so we have to facilitate them. The hospital directory has to facilitate the Green teams with enough tools to gather sufficient information or bring them in contact with other hospitals or send them to conferences about this subject.

*TOGETHER WITH ALL HEALTH INSURERS*
All health insurers signed the Green Deal 3.0 and together we made a “sectoraal uitvoeringsplan”, where we make agreements about stimulating knowledge exchange and sharing good practices, to make clear where it is possible to become more sustainable.

*FINANCING BY ALL HEALTH INSURERS*
I think actually if we really think it is that important, than it is actually only realistic if all health insurers, so whole ZN, finance this transition together. Because it would be very risky if we as Zilveren Kruis would pay, and another health insurer does not and eventually, a certain hospital whose circular treatments are financed by us, also delivers healthcare for different health insurers, so then other health insurers would freeride at this. Then we would pay the financial burden and competitively be worse off than other health insurers.
We could help in financing the first projects to learn more and we could help making a new or negative business case in the beginning viable with this.

*FINANCING WITH BANKS*
You can also have a conversation with banks, with who we are regularly talking about investment issues, so there you could create a alignment. If both banks and insurers would care about circularity equally when there is an investment issue, it would be helpful. So I can imagine that if we care about it that much, we can make it part of the conversation. At the moment, banks just want the finances to be in order. Sustainability is not a topic in that yet. Maybe between banks and hospitals something is also possible.

*GOVERNMENT LOBBY*

I think we can address it if we can demonstrate it, when we say we have a certain volume and price deal with a circular healthcare product, then they should be able to forbid the polluting variant of the product.
A lobby would be possible at this subject, however I think we have about 3 or 4 other important things that are more a priority for lobbying at this point than sustainability. Also right now it is a little "choose your battles" with the current government. As the climate is less a priority for them, we can strive really hard for it, but would that make sense?

## C.3 BARRIERS

*OTHER RESPONSIBILITIES/PRIORITIES*

The accessibility of care (and affordability), related to our duty of healthcare is of course always more a priority, which could create tensions between the transition towards more circularity. However, I believe circular healthcare does not have to be more expensive, but I think this belief does not hold for everyone.
Of course we make specific agreements about certain topics, and from transformation perspective we also include subjects like circularity, however that are the smaller numbers, and for the large bulk we don't make agreements. So yes, there is much tension of implementing strategies and the impact on costs.
You also have to keep it achievable and feasible for hospitals to implement different strategies, because circularity is one, but you also have digitalisation, prevention, etc. There are multiple topics that are important to work on for a hospital, so they can't do everything at once, and meanwhile they are struggling with staffing shortages, so there is a lot of tension. Especially if you don't want the healthcare quality and accessibility to decrease.
For hospitals and us at the negotiation table, it is actually almost impossible to handle all these different subject and include all the elements in the right way.

*FINANCIAL BARRIERS*

Compared with disposables, a circular variant of this product, often a reusable, is much more expensive.
The risk is when you start making agreements with hospitals, and the more we put pressure on them, we start getting the question what we are going to pay them for it.
I understand that not all initiatives will gain money, however it should be possible to implement a package of initiatives and to play break even in that way.
However, we simply don't have extra money reserved for such projects.
If we would choose to finance hospitals on circularity, this is a risk, as we would put ourselves in a worse competitive position, as our healthcare would eventually become more costly, while other health insurers can benefit from the circular healthcare in hospitals, financed by us.
This circularity should just be part of the normal business operations, and not be something that has to be financed separately.

*LACK OF KNOWLEDGE*

I don't know exactly how a hospital functions, so what exactly is possible on circularity practices.
In current conversations, there are mostly people without knowledge on circularity talking with each other. For instance, healthcare procurers and sometimes business controllers are talking, but no Green team members or sustainability experts are involved. Therefore, the conversation is mainly about money and only indirectly, like a pass-through, maybe sometimes about sustainability. This does not work well, so it would be better if the right people with the right knowledge should come together.
Also at hospitals I doubt how well known different initiatives on circularity are.
We as health insurers don't have much knowledge, and knowledge is here very specific.

I think maybe it would be helpful to stimulate the creation of evidence on what is a good decision, for instance on the transition from disposable to reusable.
Some doctors who have a lot of power have the idea that a disposable is always better, but if we would have evidence, we could convince them otherwise.

*LACK OF AWARENESS/INTEREST*
At the moment it is just accepted that a lot of waste is produced, and to change this and the system, someone has to make clear that it cannot go on like this any longer.
It is also the question how to go into conversations with hospitals, and ask ourselves whether it is realistic to go into conversation with all of them (76) or only big or important ones.
The interest is currently still growing, also for ourselves as health insurers, because now we have to, related to new regulations. However, I think real intrinsic motivation is often lacking.
Also there could be a lack of interest from hospital directors, as they notice it requires much change and investments, and meanwhile they switch positions in a few years, so their horizon is often very short, which will not make the investment fruitful for them.

*LACK OF INSIGHT PROGRESS*
I miss insight into what certain hospitals are currently doing on circularity subject. And whether all the hospitals implemented a certain good practice, or only a few and why. Because it could be for good reasons that they don't, but if a hospital just don't knows about it, then it would be a waste. You just don't know what the level of knowledge on circularity is at different hospitals.
Not only knowledge is needed on how it should be done, but also insight into where it should be done. So which hospitals are for instance the most polluting.
It is like a big chaos in the field, because there is so much happening and there are a lot of initiatives on the subject. So it would be helpful to work towards some sort of standard to keep a clearer overview.
There are frontrunners, but there are also hospitals that lag behind, and there is much difference between this, but we don't have a clear view on this.

*STANDARDISED PRACTICES*
Some products that are supplied, are within a package from which half is thrown away, because not everything in it is needed.
Furthermore, if you want to increase the reusables, you have to start sterilising all these products. This not only asks more capacity also from hospital staff, but also requires central sterilisation departments, or maybe even transportation to this, if it is not available at the hospitals. So therefore, I can imagine there are a lot of issues when changing current practices.
It would be helpful if there would be an alignment between suppliers for a certain product, on the package, material and composition. This prevents a lot of waste generation by the variance in packages etc., materials and that a product can be taken apart at the end of its lifespan.
Financially it is also crazy, that for instance some medical products, like incontinence material, is just stored at people's houses while it is not used anymore. There is so much waste in the chain, which should be taken out, by stopping such unnecessary provision of medical goods, but keeping it dosed. However, logistically this could be challenging.

*CURRENT GOVERNMENT*
The current government has climate as a lower priority, so it's a little “choose your battles”. I doubt whether they would even listen to us, if we bring it up to them.
We don't have really the opportunity to speak openly about sustainability in the political arena, or in the society.

## *C.4 ROLE HEALTH INSURERS*

*RESPONSIBILITY*

Primarily we are not responsible for the circularity in hospitals, but on the other hand, for everything we procure in our healthcare chain (just like in every sector) you have the duty to check whether the organisation you buy it from (so the hospital, and eventually medical goods supplier) fulfils certain sustainably requirements.
Our main role as health insurer is to procure healthcare and not interfere with their operations, and how sustainable that should be. So officially it is not our role to act on this topic, but of course it is our role to have an opinion about this. We did sign the Green deal as ZN.
If we still want to step out on our official role, this is only possible if we collaborate as ZN to finance it, otherwise it would be risky for us to be the only one that pays for circularity in certain hospitals, while other health insurers also offer healthcare there. This would negatively influence our competitive position.

*ROLES WITHIN*

Who should go into a conversation with who from hospitals, someone with knowledge on sustainability, or a procurer? Sometimes they are just business controllers, but not someone from a Green team, but actually you should organise this in another way, bringing the right people with the right knowledge together.
Now it are often just procurers, talking mainly about money, and if it is more content related, we have to switch internally and act as pass-through on sustainability communication.
We could choose to inform ourselves as healthcare procurers more about this subject, and make it a more important point within our strategy.

*POWER*

If we wanted to, we could do it, for instance enforce everything in contracts, but it is not realistic and undesirable.
As health insurer you just got the power to say, if you don't do this, you will not be financed by us, or we pay you less. So we could obligate them to certain things in contracts. However, this is difficult with hospitals, because we have to keep healthcare available to everyone meanwhile.
We also have the role to say to hospitals, you just have to act according to the Green Deal, otherwise it won't work. However, we can help them thinking about strategies on how to do this.
We should fulfil a more facilitating role, because on our own we can not achieve much.
We have the capability to increase the volume for suppliers, making it interesting for them to start doing things differently. For example, we could make a deal that the price of a circular product is halved if we increase the volume for them.
Eventually, the hospitals procure the most medical goods, so its not a relation where we directly take part in. So it might be weird, to maybe take a big role in this, as sometimes customisation is needed, and we don't have insight into what a hospital exactly needs to procure. So we also should not want to interfere too much with this.
We have the role to bring people together, such as hospitals and suppliers, inform them and put things on the agenda.
You could also see a health insurer as a supply and demand platform, and we could create more supply in stimulating circularity at hospitals directly, or indirectly by creating more demand from patients, asking for more circular healthcare.
I think actually our power is limited, a little in the middle.
We can facilitate and stimulate hospitals, as we heard from doctors it helps them if we put it on the agenda higher up, in our conversations with hospital directors. Because if they also hear it from us, we can make them more aware of the importance of such ideas and initiatives that are happening in the field, so that they are more willing to finance it.

I think from our role it is better to for instance push them to fulfil certain certifications (milieuthermometer) and see how far they are and know that they are on the right way.

*INTEREST SUSTAINABILITY*
I think health insurers are relatively interested at the moment. However, it is in the order that the government have obliged us, and now we are looking at how to make it happen, which makes our interest grow.
It has been a whole process to make our intrinsic motivation grow on this subject.
I don't know whether it is really intrinsic motivation here for health insurers, or more driven by law and regulations.
I think our interest is still limited, there are groups within the health insurer that are very busy with it, but in general I think we have too little attention for this subject.
Maybe we value sustainability less than other health insurers at the moment, or that is something we hear back from healthcare providers.
We have to fulfil the CSRD regulations, so we should be able to report about sustainability. Therefore, it is important for hospitals to have measurable standards, and in that sense we have an interest in this.
The thing is that the healthcare sector is very polluting, which affects people's health, which is of course crazy. Therefore, we benefit if there is less climate change, causing less health problems, and eventually also less health costs.
Higher up I notice one is more enthusiastic than the other, and the one is enthusiastic until it costs money.
I think health insurers have an average interest, because there are much layers to it.

*STEERING AT PROCUREMENT*
We do not (yet) take up clear requirements on circularity in our contracts, and I don't think we should oblige it too much, as that could take out the energy on this subject at hospitals.
I think we might be able to include the circularity focus more into the procurement process, and make it more specific what we expect from healthcare providers, instead of just saying they have to look at it.

*MISSING KNOWLEDGE*
From our role, we don't have the innovative ideas and don't know what is possible exactly, so therefore it would be nice if hospitals come with ideas themselves and just do it.
There is much more happening in the field, and from our role we lag behind really fast. For instance when sharing good practices if we first have to collect them, while they are actually already very actively busy with it. So I think it's better if we facilitate the field, and take a supporting role in this process.
We shouldn't take over too much the role of doctors, which is not feasible, as they know better what is possible to implement and not.
Who am I to say to the hospitals, you should do it like that, because they know much more about the processes and everything.

*MISSING INSIGHT PROGRESS*
Also I miss insight into what hospitals are doing exactly about circularity at the moment, for instance how many hospitals implemented a certain good practice. And if they don't for good reasons, that's fine, but maybe some also just don't know about it and that would be a waste. Because you don't know whether the knowledge level is similar on this subject at hospitals.

*TOWARDS GOVERNMENT*
We could go to the government and tell them that a certain circular medical product a good alternative to a disposable, and then they should simply forbid the disposable.

We don't have much options to openly speak about sustainability in the political arena or the society.

## C.5 ROLE HOSPITALS

*INTEREST*

There are frontrunners, but there are also hospitals that lag behind, and there is much difference between this. And the frontrunners they want to do something, but they also have the issue of how they can do it then.

On the circularity aspect, hospitals have the real power, as they can realise it or not. However, I think their interest is just very low.

*GREEN TEAMS*

This is for the first time that there are really teams from within the hospital that come with this and say I want to do something with sustainability. I also think this is maybe something more from a younger generation, that it really appeals to people.

Some hospitals have one team working centrally, and others really have one team per specialism that has interest and works on it. So there is a lot of energy on this sort subjects in hospitals, because it is not obligatory, but they are free to figure it out themselves.

Green teams are interesting as they are part of the hospital.

Mostly the initiatives come from the green teams I think.

I think Green teams are very motivated and interested, but their power is more limited.

I know there is a strong lobby at the Green teams to increase reusables and decrease disposables.

*DIRECTORS*

It is important how much sustainability is valued by directors. For instance, sometimes change on this subject takes quite some risks and a big investment, and then you really have to believe in it and dare to make such a choice. So therefore, you need a certain vision and background from a hospital director I think.

Hospital directors are often less interested than the Green teams, while they have more power.

Some directors might see that it might pay off, however other might be more worried about the investment and issues it can bring. Also it is now often a trend that directors are switching positions after a few years, and that reduces the chance to win back the investment within their time.

Directors might be more willing to take action if they also hear from health insurers that circularity is an important topic, which let them see that they might have to take action.

*DOCTORS AND OPERATION ROOM*

For refuse and rethink there are quite some opportunities I think, mainly for the operation rooms.

We shouldn't take over too much the role of doctors, which is not feasible, as they know better what is possible to implement and not.

Who am I to say to the hospitals, you should do it like that or you should use that material, because they know much more about the processes and everything.

I can't take over the role of doctors and tell them what to do, they are much more smart in that way, so I think more about how we can facilitate and stimulate it that it makes it easier for them.

Then I got back from the doctors, they said it helped them when we put the topic on the agenda, and asked if we could please do that in conversations with hospital directors and procurers.

Internally, they have a lot of ideas and initiatives, but have to fight to get financial help from higher up to realise such projects, so we can help in making them aware of the importance.

Some doctors who have a lot of power have the idea that a disposable is always better, but if we would have evidence, we could convince them otherwise.

*CONTACT SUPPLIERS*
I know some hospitals are already in conversations with suppliers, but this are mostly hospitals as they procure the most medical goods, so actually it is often not a relation in which we directly participate. If a director thinks a certain theme is important, from whatever background, then they are more likely to invest in this.

*DIFFERENCE CITY/RURAL HOSPITAL*
I can imagine if there are multiple hospitals in a city and one is more sustainable, some patients might choose to go there. However, this only holds true for cities with multiple hospitals, as in other cases people are less likely to travel much further for a sustainable options, because that is also not sustainable.

## C.6 ROLE SUPPLIERS

*INTEREST*
The most suppliers, that is a misery on circularity, there is no trigger in the system yet.
If suppliers put plastic gloves on the market, they have the interest in increasing the use of these as much as possible.
Of course there are also some suppliers who produce sustainable products, so those are more interested in this circularity situation.
I think suppliers have a low interest in general, but a lot of power.
I think the interest of suppliers is growing, as there is are now more regulations, so it becomes more important for them commercially.

*BLOCKING POWER*
Their interest could be much better. I know there were certain breathing hoses, for which hospitals discovered they could be used more frequently and made a plan conform all quality and safety requirements of other hospitals, to use it more intensively, instead of using them only once. However, the supplier then called them, threatening they would take juridic steps if they would not stop this initiative from spreading. This certainly illustrates their power, and small interest into circularity.
If a supplier does not want to listen, it might be possible to form a coalition with connecting all hospitals to act up against them, where we as health insurers can bring the right people together.
Suppliers have the power over how a product looks and how it is priced etc.

*PRODUCT DEVELOPMENT*
It would be helpful if there would be an alignment between suppliers for a medical products, on the package, material and composition. This prevents a lot of waste generation by the variance in packages etc., materials and that a product can be taken apart at the end of its lifespan.

*VOLUME PRICE DEAL*
Maybe we could make a deal with suppliers, if we can increase the volume of a certain circular product by collaborating with hospitals, they might be able to halve the price.

*DIRECT PROCUREMENT RELATION*
Suppliers are in a more direct relation with hospitals, as they procure their medical goods, and we stand outside of this. So they are more able to assert influence in these procurement processes than we.

However, for some medical products we as health insurers do the procurement process ourselves. In these cases I think we have a great perseverance, and could have conversations about it with suppliers.

*GOVERNMENT LAW AND REGULATIONS*
I think the governments can set strict frameworks for suppliers on how they can act regarding circularity. So there is also an opportunity, to form a collaboration with the government (and maybe even banks as suppliers are often reliant on investments/loans) to force suppliers.

## C.7 ROLE PATIENTS

*INTEREST*
I think if the awareness of patients would be increased, than they might stop accepting certain things of hospitals. And they might choose to go to another hospital, which more circular. However, it is the question how much influence they can have.
Probably they are not very interested yet.
I can imagine that patients are starting to value sustainable healthcare more. So if they would have the chance to choose, they would go for the more sustainable choice. This might drive less circular hospitals to also increase their circularity efforts. However, this might not hold true outside cities, where there is not much choice between hospitals, as extra travel time is also not sustainable.
I think patients are thinking increasingly more of this, but for this it is important for them to have insight into which hospital does what on circularity. Transparency on this, enables them to value the actions more that hospitals take on the circularity topic.
I also think that patients are mostly interested in getting their healthcare issue solved anyhow, instead of being busy about circularity issues. They are happy when they get help, even if there is no sustainable option available.
There is also a difference between insured and patients, as insured primarily want a low premium, and patients good healthcare. Insured might be more interested in circular healthcare, while patients are more concerned about just getting healthcare.

*POWER / CREATING DEMAND*
The patients play a role in creating healthcare demand, in that way that they might also create demand for circular healthcare.
Patients might get more power if they would unite together in a representative organisation, because individually they don't have much power unfortunately.
Or maybe in a collaboration with health insurers and patients, that we could help the patient to use its power as consumer. For instance, offering a sustainable variant of a healthcare policy.
I think we could help the patients more in this position to assert influence, however I think if the moment is there, they just want healthcare and don't mind about the circularity. Most people that consume a lot of healthcare are more concerned with other things than healthcare circularity.

## C.8 ROLE GOVERNMENT

*POWER*
The government makes the law and regulations and in this way they have a lot of power.
They force us health insurers to fulfil certain regulations (CSRD), which forces us to act more on circularity, and eventually to realise this we also try to influence others, like hospitals.
The government is able to just forbid certain products or uses, and we could make them aware and lobby for this, however we have also some other points with more priority for this.
Also against suppliers, the government can make strict frameworks with regulations.

*INTEREST*
With the current government, I think climate is a subject with lower priority. It is a little “choose your battles”. So we could put a lot of energy into sustainability, but I doubt if they would even listen to this.
How interested the government is, depends which party you mean, but I think the current government’s interest is much lower.

# APPENDIX D: INTERVIEWS ROUND 2 QUESTIONS

The questions that were used for the second round of interviews with six employees of different health insurer organisations and four hospitals can be found below. As the interview is semi-structured the questions leave enough room for steering the direction during the interview to other interesting subjects as they came along, or adjusting the order as it was suitable for the conversation. Additionally, it is important to note that not all interventions were discussed with all interviewees. The list of interventions was used as reference to discuss interventions with interviewees as they naturally came up in the conversation, or they were brought up whenever it was suitable for that conversation.

*OBJECTIVES*

- How important is circularity for you? And related to your work position?

→ circular hospitals: defined as hospitals implementing as many R strategies as possible (visual), focusing on reduce, reducing use (e.g. no more sponges after hand washing), and on reuse, replacing medical products with reusable variants

- Why do you think it is or is not important that more R strategies are implemented in hospitals? (= *strategies targeting at reducing use of medical products where possible, or replacing them by reusable variants*)
- What objectives does your organisation have regarding circularity?

*ROLE RESPONSIBILITY OF HEALTH INSURERS*

- To what extent do you think health insurers are responsible for stimulating circular hospitals? Why?
- What is their role?

*EVALUATION OF POSSIBLE INTERVENTIONS*

These questions will be asked, based on the list of interventions on the next page. The interventions which naturally come up in the conversation will be discussed. Furthermore, interventions that relate to what the interviewee speaks about may be brought up in the conversation by the interviewer, to also discuss other interventions.

- What do you see as potential promising interventions for health insurer?

Questions for every intervention on the list:

- Do you already have experience with X? What is your experience with X?
- What do you think of X and why?
- What are the potential effects of X?
- What are the potential barriers for X?
- What do you think of the ease of realising / implementing X?

*If interviewee is a hospital:*

- Are there possibilities for you to do something in collaboration with health insurer to stimulate implementation of R strategies? And what?

*SYSTEM CONTEXT AND BARRIERS*

- Are there any frustrations for you or your organisation in this process towards circularity? Can you give me an example?

*ROLE RESPONSIBILITY ACTORS*

- Whose responsibility is it to increase the circularity of hospitals? And why?

- What do you think is your responsibility, as an organisation?

## LIST OF POSSIBLE INTERVENTIONS USED AS INTERVIEW PHASE 2 INPUT

*Focused on hospitals:*

- **Going into conversation with hospitals and facilitating**

Not only through healthcare procurement, but involve sustainability experts from both parties, for awareness and working together on solutions, and facilitating where necessary

- **Including circularity criteria in healthcare procurement policy**

To force hospitals to deliver circular healthcare

- **Sharing "good practice" examples of circularity**

To accelerate the dissemination and implementation of circular strategies

- **Developing a tool / dashboard / standard on progress**

To enable measurable circularity progress of hospitals

- **Offering financial support**

To make realisation of more circular strategies possible

*Focused on insured/patients:*

- **Activating insured by campaigns**

On the importance of circular healthcare, for awareness and encouragement to make circular choices (e.g. providing green checks for the choice between healthcare providers)

- **Offering a circular healthcare insurance policy to insured**

To enable them to actively make a choice for more circularity in healthcare

*Focused on other parties:*

- **Going into conversation and collaborate with suppliers**

Making the importance of circularity in healthcare and medical products clearer, and maybe creating a volume/price deal to procure circular products jointly for/with hospitals at a more affordable price

- **Collaborating with all health insurers (ZN)**

E.g. for financing circular projects in hospitals, to counter competition on sustainability

- **Collaborating with banks to realise financing**

When large investments are needed to realise circularity

- **Lobbying at the government**

For more law and regulation for hospitals and suppliers around circularity

# APPENDIX E: INTERVIEWS ROUND 2 RESULTS SUMMARY

The summary of interview findings from round 2 with a total of 10 interviews are listed below. The participants of the interviews consisted of 6 employees from health insurers and 4 employees at hospitals. All the interviewees fulfilled the role of a sustainability advisor or expert within their organisation. The objective results exist of quotes that are categorized into the main subjects of interventions in E.1, barriers in E.2 and responsibility roles perceived by health insurers in E.3 and perceived by hospitals in E.4. Within these broader categories, the quotes are again categorized into smaller suitable subcategories. Furthermore, it is important to note that the quotes of health insurers are highlighted in green and are identified by number 1 to 6, and the quotes of hospitals are highlighted in blue and are identified by number 7 to 10.

## E.1 INTERVENTIONS

- **Improve measurability**

INSIGHT RESULTS/PROGRESS

- 1. Measurability is important for **monitoring results**.
- 2. Improve measurability would be wise, to make information and progress **optimal transparent and insightful**.
- 3. One measuring tool would be helpful to show hospitals **how far they are** compared to others, but a **clear instrument is needed** for this, with ZN we are looking at this.
- 1. And the main idea should be to **learn from each other instead of comparing**, because academic hospitals have often more resources to make progress.
- 2. **Clear feasible goals are needed** to get people on board and this might help.
- 1. Also when this would be the case, then they might already **fulfil certain circularity criteria** for the Green Deal and then we don't need to go into conversation with them about this anymore, making it also easier for ourselves and more effective.

CLEAR GOALS

- 7. We participate in the milieuthermometer, and I like that it provides such **concrete handles** to become more sustainable. It can also get your colleagues which are less intrinsically motivated along easier for why certain new strategies have to be implemented, as it is a **clearer goal** to reach a certain level of this milieuthermometer, instead of just circularity in general.
- 7. However, the **securing of objectives** is also important, which is done with such a tool.

NOT FOR EVERYONE

- 1. Improve measurability, but how can we make the most hospitals participate, **without making it an obligation**.
- 1. Obligation is difficult, as a lot of hospitals are doing it on their own, or (academic) **hospitals that are much further do not benefit** from such a milieuthermometer anymore, and for **others** it might be an **administrative burden** and a **financial barrier**, however we could offer here financial support to show how important we find this.
- 2. You **can't compare** an academic hospital with a regional one.

NOT FOR EVERYONE

- 7. We don't use the milieuthermometer, because we want more **freedom to choose**, and I also notice that some organisation have to do an internal audit every year and this costs **money and time**, which we want to use for new initiatives instead.
- 8. Making a milieuthermometer obligatory is not a good idea, as it costs a lot of **money and time** and is **not suitable** for every hospital, but more **clear reporting on CSRD** could be asked, as this will be needed eventually.
- 7. Also the current measurement criteria are sometimes on a level of detail that is **not always suitable**, for instance a lot of green is not feasible for a hospital in city area.
- 10. I don't know how helpful it would be if I look at how often hospitals are participating, but if you would do it, then you should **tie it in** instead of inventing another new one.
- 7. I would think this is a better idea from the perspective of **showing how far you are in progress** and showing **why it might not yet succeed**, instead of stating that a hospital is or is not "green".

CSRD INFORMATION NEED

- 2. This is also **needed** eventually in some way **for the CSRD** regulations.
- 3. Also then we might get the **needed CSRD information** from this.
- 1. Certain **CSRD data should be better available** for us, so we maybe have to create new data collection procedures, but we try to prevent it **by tying in**.
- 8. I would not create separate measurements, as **CSRD data will be needed** and this can serve as one.

PREVENT ADMINISTRATIVE BURDEN BY TYING IN

- 2. But the main challenge is to not make this an **administrative burden** for hospitals and that every health insurer asks for slightly different information.
  Therefore we need to think about how we can **tie this in to what they already have** and how this can be brought together in the best and easy way to make this information transparent.
- 1. It is the best to look into how such a measurement tool can **fit into existing initiatives**, like "milieu thermometer and barometer".
- 1. Certain CSRD data should be better available for us, so we maybe have to create **new data collection** procedures, but we try to **prevent it**.

- **Going into conversations**

LISTEN TO NEEDS / INSIDE KNOWLEDGE AND ACT UPON THIS

- 2. Going into conversations is useful, as we **still do a lot of assumptions** of where there are obstacles, so conversation helps to get **more realistic insight**.
- 2. Every health insurer could take a role in their region where they are largest, and ask what they really **need to make further progress?** We can make **necessary connections** between actors and maybe include suppliers.
- 2. Together looking at the barriers / (points of pain) present at the moment, and be a **conversation partner** and ask them **what they need** and **how we can help** and organise this, because they have **more insight and know this better**.
- 2. For instance, hospitals that have difficulties with supplier agreements, or are in need of financial **support**, or governmental lobby which can also be more successful coming from more parties.
- 2. To really make impact, you need to have **care specific knowledge** on where are the hotspots in resource use and waste production, therefore conversations with hospitals stay important.
- 2. And really making it also **more practical** here, because we are talking a lot and informing, boosting, motivating, stimulating, but I think it is now **time for the next step**!

- 2. Together we **can come to actions**, which could be inspiring other healthcare sectors.
- 4. Together in conversations with hospitals we should **determine the healthcare policy**, and I think the coming years this is the right direction from health insurers together.
- 3. Keep into conversations with hospitals helps to **remain streamlined** with other initiatives that are happening **within hospitals**.

EXTRA HELP

- 7. Health insurers can be a **connecting factor**, certainly for the smaller hospitals that might need **extra help** getting things from the ground. Because sometimes people want to take action, but they cannot do it alone, so the health insurer can help here.

CONNECT THE HOSPITALS

- 8. I think **health insurers know much more about what is happening** and ideas and successes that are happening and **what hospitals can learn from each other**, and therefore, next to sharing good examples, they might also start a newsletter or something on these trends regarding sustainability/circularity, to **spread what is happening** with tips what others can do and how health insurers are facilitating this.

BRING EXPERTS TOGETHER

- 1. Conversations with **sustainability experts** from hospitals and insurers is important, as they **both have the same goal** and can try to **put it on the agenda** higher up at directors. So this collaboration is important, and with green teams, while through procurement, you do not always reach the people really working within the hospitals.
- 1. Going into conversations, in a useful way **not only through procurers**, but with circularity experts from both parties to make **concrete agreements**.

TRUST

- 2. In this process of going into conversation we need to **build trust**, because we as health insurers I must admit procure very “sharp”, so the **negotiations have become harder** the last years, so these conversations are also needed for building this trust relationship.
- 2. And we are interested in **how they look against us** and how **we might be in the way with our procurement process**, so we are **open for critics** from hospital, this also shows **our willingness** to hospitals to stimulate circularity.

Two ways to do this

- 1. **Individual health insurers** making agreements about circularity with hospitals, and look together at **what is feasible** and **what we can do** to take away barriers
- 1. **Together nationally**, put together sustainability experts from hospitals with health insurers and make agreements, to make **changes on a higher system level**

- **Procurement policy circularity criteria**

POSITIVE

- 5. Procurement policy is our **most important instrument** and every year we make it a little more strict.

STEP AWAY FROM STRICT CRITERIA

- 2. Procurement policy has been our **main instrument for a long tim**e, so it is possible to use, however we are **now looking to use our role differently** to get movement in the market.

- 6. Maybe we should do it **less via strict criteria** and do it **more in facilitating** the context of the whole ecosystem around and within hospitals, that enable more circular healthcare.
- 2. We should **not oblige too much**, as hospitals are taking their role already in a good way.

NOT RIGHT METHOD

- 2. Procurement policy should be **used for what it is meant**, to give healthcare providers **transparency**, about what we procure against what criteria, so I think including criteria where we **do or cannot enforce**, is **not so credible**.
- 1. While healthcare policy can be used, my experience shows how **difficult it is to seriously assert influence** on this subject in this way.

- **Sharing good examples**

KNOWLEDGE SHARING

- 4. We **speak to all the hospitals** and get to **hear interesting things** happening there, that might be also **relevant elsewhere**, so sharing this knowledge is **valuable**.
- 5. This knowledge sharing is important to do for us as we **visit a lot of hospitals** and can **spread knowledge** there.
- 2. Sharing good examples is a fantastic initiative. There is no money needed, and health insurers are **actively trying to help** with **finding** initiatives and **spreading** them, along with the needed information, to successfully **scale it up** for implementation at other hospitals that do not apply this yet and are less far in their progress.

NOT JUST SHARING

- 9. Just sharing good examples is an option, however this does not serve circularity, but it just increasing awareness. And it helps for the **awareness and knowledge exchange**, however it does not directly impact circularity. You can affect the knowledge, but what happens after is a black box, and you can hope it stimulates the transition, but often it also stimulates small pilots, while we have to scale up now and accelerate. And I support knowledge exchange, but I hope it is not a form of **greenwashing**, while actually nothing really happens. However, if it would be an **obligation** to implement some, I stand behind it.
- 7. At some point you will just have to take this step, and if health insurers **won't oblige** this, hospitals will also take **no action**. However, smaller organisations with less capacity might require an **adjusted approach**. Because if it is too non-binding, you will see that other things get priority.

NOT JUST SHARING

- 2. Sharing good examples is a good idea, however we should think about how non-binding it is, and you can also **inform too much, there is a limit** to that.

SUITABLE FOR HEALTH INSURER

- 10. Sharing good examples is a really **good thing to do for health insurers**.
- 7. Sharing good examples is very **suitable for health insurers**, as they have a network within hospitals and are also visiting them, while we are less in contact with other hospitals, so their power is larger there.

OBLIGATION WITH CUSTOMISATION

- 2. Obliging could be an idea but **some hospitals are already very far** and would not be helped by this, and others might have **financial problems**, so this is difficult and **requires customisation**.
- 2. Sharing good examples is a good idea, however we should think about how non-binding it is, and you can also **inform too much, there is a limit** to that.
- 4. We want to **start obliging** to implement a **few initiatives** next year.
- 5. Sharing good examples is a good action, and we can go a step further and oblige them to implement a **certain amount**, and **leave the choice to them** which are **suitable** for them, while it is important to think about what to do with hospitals that already have a lot, and then it gets harder to implement even more, so **differentiation** is important here, but a minimum should be possible.
- 3. Obliging some examples is possible, but it should be **suitable for that hospital**, so we should **show respect** and let them **free to choose** which one suits them.

REALISTIC OBLIGATION

- 7. I think it is good that health insurers set some criteria and **oblige** to implement a few good examples per year.
- 7. At some point you will just have to take this step, and if health insurers **won't oblige** this, hospitals will also take **no action**. However, smaller organisations with less capacity might require an **adjusted approach**. Because if it is too non-binding, you will see that other things get priority.
- 8. Really setting some criteria and **obligations** for implementing some good examples are very important, as these are useful for **getting everyone aboard**, as I mentioned earlier that not everyone is intrinsically motivated.
- 8. However, such requirements should be **realistic** and communicated timely, so we can properly prepare.
- 10. At some point, we have to **step away from the non-binding**, while on the other side health insurers should also realise that some things just cost more money and are not feasible for a hospital at that moment. So they have to keep it **realistic and feasible**, and in facilitating and expecting it from us, they also have to give something in return. So they should not be punished if they don't have the resources to do it.

MORE CENTRALISED & TRANSPARENT

- 10. I think it is suitable, however there are now a lot of parties that do sort of the same, but all in a **different place**, so it still does not quite come together, so this should be **more centralised**, and also it need to be very concrete on how every hospital can apply it, so **enough details and tips** are given for implementation elsewhere.
- 8. The good examples are very helpful, and we really use them and look at which we can implement ourselves, but sometimes I still look for **more transparency** for instance about the brand of the medical circular product, as I am not able to find it myself.

- 9. Use the **shortlist of top 20 of most used disposables**, to make the most impact with interventions.

- **Involving patients**

AWARENESS BY GIVING CHOICE

- 2. Giving patients insight into a circular choice for healthcare providers, given that they have a certain certification could be interesting to make them **more aware** and give an **active choice**, however clear *objective measurable criteria* are needed for this.
- 1. "Zorgzoeker", to let patients find a suitable healthcare provider, which might or might not fulfil certain circularity criteria would be a better idea, however *clear measurability is*

*needed* to realise this and that is missing at the moment or milieuthermometer could be used, but it would make patients **more aware** which is important.

- 4. We already **use green choices** for healthcare providers, which patients can use when making a choice, this is **no obligation**, but **just information**, creating **more awareness** and eventually **behavioural change**.

INTERNALIZE AND NOT INVOLVE PATIENT

- 5. While some might be interested in circular healthcare policy, the latest developments are more that consumers just expect from companies that they **internalise sustainability**, so it is more important to make it more circular ourselves, instead of leaving the choice to them.
- 3. **Informing** patients is important, however I **don't know if it is the most suitable** for the **hospital segment**, while for medicine waste for instance it is much more prominent. I think in hospital healthcare it mostly should be **more internalized** in processes.
- 5. For involvement of patients, you should offer very **clear information** about what are the choices they have, so it can be easier to **just do it via our procurement** process.

INTERNALIZE BUT AWARENESS NOTICED

- 7. Now we first take **actions internally**, but we sometimes start to hear comments of patients on sustainability and then I like that the patients notices it and comments on it, so they are becoming **more aware**.
- 9. The **primary incentive of patients is to get better**, and of course some people **value sustainability**, but it is not feasible to always make this choice or and not desirable to put in the consulting room every time, also because it is costly and requires a lot of time from doctors. So actually the healthcare just has to be **made more sustainable and circular intrinsically**, and it is also more efficient.
- 10. Patients are mostly busy with **getting the right healthcare**, and if there are options, then the **hospitals should decide to steer** on the most circular healthcare treatment.
- 9. It would be maybe an option to offer a circular healthcare policy as one of the sub-brands within a health insurer, with the notion that the insured money will be invested on circular healthcare projects and I think **some people would choose this**. However, this **cannot be the primary thing to do** as health insurer as we should not burden the patient with this.

INCREASING IMPORTANCE

- 6. Also now when people are switching from health insurer, sustainability is becoming a **more important decision factor**.
- 6. More and **more patients are interested** in the sustainability impact of what they consume, so also for healthcare, and I think this will be increasing.

CIRCULAR HEALTHCARE POLICY

- 2. There are more and more people **willing to pay for a circular healthcare policy**. However, this is sort of in **tension** of **keeping healthcare affordable**, and then this subject loses.
- 1. **Not very promising**, as health insurers often get blamed on having **too much insurance policies**, causing consumers to be **confused** by all these options, so they are pressured to limit the number of different policies, so I **don't see the potential** of a circularity policy.
- 4. I think a circular policy **could be the future**, as now the **price difference** is already so **minimal**, but this will stop in a few years I think, as the **number of people** choosing for sustainable options is **increasing**.

CAMPAIGNS & INFORMING

- 1. Or a campaign in collaboration with hospitals, and hospitals that promote the **importance of circularity** towards patients and we towards insured, I think it is important within the whole situation that not only the healthcare system organisations, but also the **people that use healthcare are involved**.
- 5. As we **activate patients**, and **inform** them, then they can **pose critical questions** to hospitals, stimulating them indirectly.
- 6. We should **inform in a relaxed way**, **without pushing** consumers, that healthcare has an climate impact, and sustainable healthcare is therefore **necessary for keeping it liveable**, **without putting a blame** on consumers. And give inspiration on what they can do for circular healthcare, and that you can **go into conversation** with healthcare providers.

SOME INVOLVEMENT POSSIBLE

- 8. Everyone thinks patients are only busy with getting better as soon as possible, but **research** (by Wouter Hehenkamp - article is saved) shows that the **sustainability of their healthcare is valued as very important**.
- 7. However, then **clear measurement** that is suitable for every hospital should be available to show patients how circular the different options are.
- 8. A circular healthcare policy is **not a good option** I think, as you should not use their money while they are not getting different healthcare. A better option would then be to give **the option to compensate the healthcare** they received afterwards.

- **Financial support**

ENABLE INVESTMENTS CIRCULARITY

- 1. We play a role when there is an **initial investment** needed, offer financial support **maybe in collaboration with banks**, to **execute an initiative** which would otherwise **not pass the financial threshold**, as hospitals cannot easily get money from banks, so we could stimulate this.
- 6. Doing this from **a collaborative approach** with ZN is better, as it can enable every individual insurer to **pay their fair share** for investments on circularity, which are necessary to also **realise some investments** that **don't have a positive business case** within a reasonable timeline.
- 5. It might be possible to enable more. However, the question is **whether hospitals want to** start a **loan** for everything.

SHARE RISKS

- 1. Banks can offer loans related to sustainability, and we can be an **extra guarantee** actor for banks, that we are going to pay the healthcare, and can help hospitals **share the risks** if the business case is less successful than expected and can help pay back the initial investment, this shares the risk and maybe can **lower the interest rate** on the loan, making the whole financial process easier for hospitals.
- 1. This collaboration is wise, as we share a lot of **similarities with banks as insurers.**

SHARED FUNDING

- 5. As health insurer it is important to **take a clear stand financially**, and an idea is to stimulate higher investments by realising it with the cost reductions of other initiatives.

SHARED FUNDING

- 7. Our hospital has a **shared savings model**, so **half of what we are saving** on sustainability projects, goes back to the sustainability savings for **new investments** on other cases that might also be **more expensive**.
- 8. We are trying to implement **shared funding**, which implies that when you implement a cost saving initiative, **half of the savings** can be **invested in a initiative with a negative business case**. I think this is a really good concept.
- 9. Health insurers could also give some sort of **bonus to hospitals** that are using a **shared savings system**, where realised cost savings are **reinvested in other initiatives**, to realise also some negative business cases.

TARIFF DIFFERENTIATION
- 1. Another financial option is to differentiate and **offer more money if you fulfil circularity criteria** and offer less if they don't, **starting with a neutral budget**, however implementing this has **difficulties**, as it is the question whether this should be via ZN or individual and how exactly.
- 4. Financial differentiation is a good option, to **set the first steps** and **even very minimally**, but **making a distinction** between more circular efforts and **stimulate** it, and this already happens in the pharmaceutical segment, and is positively received by other insurers, so there is **evidence that this can work**, making next steps easier.
- 3. **Financial rewards** could be an option, however you should realise that eventually this money is **intended for healthcare**, and you should be **able to explain** it well to prevent that it is framed that you don't spend your money on healthcare.

ACCEPT HIGHER COSTS
- 6. Eventually, if it is really necessary, we might have to **accept higher costs for circularity**, and not pass it on to providers or suppliers, because then it just won't happen.

FINANCIAL PLAN
- 9. I think health insurers together should do **serious research** into how much a **transition towards a new system is going to cost** and give it a number. If we know this, a plan can be made in how the costs can be **spread out over a longer period** to make it manageable.
- 9. So this is my call to health insurers, to **calculate the financial part** of the transition and **make a plan** for this. And this could mean that there is extra money needed for healthcare, or that you have to prioritize differently and cut down on money elsewhere. Otherwise, we keep postponing and all these costs will eventually have to be made in a much shorter time period.

- **Collaboration suppliers**

PARTNERING UP TO INCREASE SUPPLY
- This is important to make sure that suppliers are going to **offer more circular products**, and also the government should be aware of this.
- We have to approach suppliers, to make sure there will be a **supply of circular products**.
- I think it is a good option to make **agreements** with suppliers on the **long term**, instead of focusing on their **short term revenues**, and there are possibilities with motivated hospitals and frontrunners in the industry, and health insurers can be an **interesting partner** in this, but **how exactly still has to be found out**.

CREATING VOLUME, BE STRONG & PROCUREMENT EXPERTISE

- Together with other hospitals we are trying to create a **bigger scale for demand**, for make washing more **affordable**. As they see there is more demand, it is more interesting to create more circular products.
- Some hospitals sometimes don't have the money for a certain investment, and then maybe a health insurer can help or **create volume** for a supplier, to **lower the investment costs**.
- It would be helpful if health insurers with **more procurement expertise** could join forces and coordinate with hospitals to **create volume** for suppliers, to make it interesting for them and to **be stronger**. Also for products that are not yet available, it would be **more pressing** towards the supplier that there is a real need on the demand side. The health insurer could have an active role in this, as smaller hospitals often lack the resources to do realise this themselves.
- As we **stand strong together**, we can also be more helpful towards the supplier, to enable a more sustainable business and **we can finance it**.
- I think health insurers could **form more a front** with us in procurement processes, against suppliers. Hospitals often don't have the time and **specific knowledge on procurement** that is needed and their sustainability expert also does not have this.

THROUGH EXISTING PLATFORM
- Collaborate with hospitals and suppliers, maybe through "Intrakoop", to support circularity **through a system level**, maybe **extend an existing platform** to enforce it.
- Maybe we can **tie in with existing initiatives** on "Intrakoop" for instance, as it is a very **large network** and quite new, but have **sustainability as one of their goals**, so how can we as health insurer offer added value to this.

- **Collaboration ZN all health insurers**

ONE DIRECTION FROM HEALTH INSURER
- Work together with ZN, and let **individual health insurers** take the **main role** for conversation in **their own regions**, but from the **agenda that is determined within ZN**.
- This makes it also more feasible for hospitals, as they do **not have** to have a **similar conversation** with all health insurers.
- Together we have to set the **same objectives towards hospitals** around circularity.
- We should **develop healthcare procurement policy together** and take up this same circularity paragraph as individual health insurers.
- Sharing good examples should be done more from a collaboration, and also an obligation, so that the **same is asked from all health insurers**.

NO COMPETITION
- Competition is important, but not on sustainability, we can make **more impact** if we work together as health insurers, and **prevent administrative burden** at hospitals.
- As we all want the same, this collaboration can create an **equal playing field**, but is an interesting development, as we also take out this small part of competition and market forces, so **everyone should stand behind it**, as it also **determines how you profile yourself** as insurer.
- Knowledge should be **transparently available** and **not monopolised**.
- To **fairly share the transformation costs**, the bill for sustainability has to be shared, so that it does **not affect the premium** of health insurers individually and every citizen eventually also pays it fair share.

OTHER IDEAS
- Maybe we can also **set a step against adjusting regulations** that block circularity.

- Procurers from **health insurer are busy with a lot of other subjects** and often don't know much about circularity, so **giving them more knowledge is also an option** (which we are **planning to do from ZN**).

## *E.2 PERCEIVED BARRIERS*

- **Financial barriers**

UNCERTAINTY AND ARGUMENT

- The **risk of the investment** is a barrier for hospitals, is it profitable? and **who is benefiting** if there are financial benefits, and who is bearing the risks if it doesn't?
- Hospitals are quickly **expecting money in return** for circularity initiatives, while it **can often be cost reducing.**
- Implementing some initiatives **can directly return money, making other more expensive initiatives possible**.
- **A lot of things** in healthcare have an **infinite payback period**, so actually it is strange that **this argument is mostly mentioned here**, while for other things it is just accepted.

UNCERTAINTY AND ARGUMENT

- We often see that eventually reusable instruments are cheaper so **financially it turns out positive**. People also think reusable instruments are more sturdy and solid and it does not feel good to throw away disposables for steel. So there is a lot of support there.
- The **affordability of washing** of products, such as heat blankets, is more often a problem which hinders implementation of such strategies, and to **make this cheaper, more volume maybe** still has to be created.
- Although there was evidence that a circular product had much less impact and the result of a pilot were very positive, also for doctors related to the comfort of use etc., eventually the **business case was negative** and it didn't come through.
- At the moment, it is often **stated** that the transition is going to **cost a lot of money**, but **actually we don't know** how much and there is no plan on how to spread these costs over a longer period.

TEMPORARY HIGHER COSTS

- Often times, **money does not have to be a barrier**, but **sometimes it is**, it could be the case that it is **only making money on the long term**, after some years, then there is a **financial barrier/threshold at the beginning** that can hinder implementation.
- **Financial barrier can also be temporary**, as innovation costs, and the start on a small scale can lead to higher prices at first, but when it is eventually scaled up, then it doesn't necessarily have to be much more expensive, we have to see that, **we don't know**.

TEMPORARY HIGHER COSTS

- **Transition costs** are often part of new strategies, as in a business process A goes to B, then for some time you make extra cost because you might have two systems next to each other, or extra investment costs or extra working time, while at the **long term the reusables are cheaper**.
- Most initiatives have a **negative** business case on the **short term**, **some become positive in a few years**, but not all and I think there are other reasons to still do it.

ACCEPTANCE OF HIGHER COSTS

- Sometimes an initiative **can be more expensive**. For instance, washable surgical coats are now available and can safely be used, and also very comfortably. However, they are more expensive and washing them also costs money. Eventually, I think we as a **society**

**have to be willing to sometimes pay a higher price for circularity**. This implies that some healthcare costs will be higher, and eventually **health insurers will have to pay this**, and we are now having such **conversations about whether we should accept this**. However, directors, procurers and financial administrators all have their own perspective, and procurers are mostly busy with a low price, so it maybe have to come from higher up, like ZN.

- But if we do nothing, in 100 years we are all screwed, so **now we have to pay to keep it liveable**. The **consequence is that life is getting more expensive** and a little less prosperous, but we **don't have a choice**, it's not a matter of want or preference.

ORGANISATION

- Studies that quantify this also show that **for the whole system it is cheaper**, but this **doesn't mean it is cheaper for every party** in the system. For instance, also within the hospital, the department pays much less for a certain reusable product, but the **washing department has much higher costs**, so this implies that every year we have to **transfer money between departments**, which **causes delays**.
- However implementation really **depends on the departments**, as they are responsible for their **own procurement**, and one manager thinks circularity is more important than the other. We are trying to start doing it **more centrally** and I am trying to get an **overarching budget** on sustainability, to use whenever a department falls shorts, but this is **hard to realise** with all the cost reductions we have to make.

- **Healthcare product market**

NOT ALIGNED

- The supplier market is **mainly busy with making profit** and is **volume driven**, so this can work against circularity.
- The suppliers are **hard to change**, and somewhere it is understandable as you **hurt their business model**, so it is difficult to do that in a good way.
- **If the demand would be growing**, and the supply also, **eventually the price will become lower**, which can lead to lower investments.
- Actually the **switch to mostly single use** plastics has **only happened the last 20/30 years**, because it was **cheap, easy and hygienic**, however the **consequences** are now really large **on resource use and waste creation**.

- Medical industry and suppliers are **in general large multinational companies**, with enormous production lines, which **cannot easily be changed** and **have big financial interest**. It will **cost a lot to change** this, and eventually they maybe want to, but these **complex economic networks** make it difficult.
- There is a **supply needed of circular products**, necessary for making healthcare circular, and suppliers and producers and the whole economic sector is needed for this. This is a **matter of creating a demand** at hospitals first.

NOT ALIGNED

- Efforts of suppliers are very **disappointing**, I notice some **say yes**, but still **don't do it**.
- Some suppliers are really **green washing** and as procurer you have to be alert on this, and really look into what is really more circular.
- We sometimes also see that suppliers are **lowering the prices of disposables,** to put pressure on the business case of a reusable to **prevent that it turns out positive**.
- The problem might also be that the **current prices for disposables are too low**, instead of prices for the new reusables are too high.

LACK OF SUPPLY

- There are **not much medical suppliers** in the field, as it is a specific branch, so sometimes there is **not enough choice or supply** yet.
- The disposable economy is very developed and products are widely available, while the reusable product market is **much more limited** and you **don't have much choice**, or you have to start developing something yourself with a supplier, which is time consuming and costly.
- A lot still has to be done on the market to **take a step to more reusables**, and the **whole chain has to respond** to this.

THREATHENING REVENUE

- However they also need to be able to **survive in a new circular economy**. Now it is mostly targeted at disposables, and suppliers **lack a different revenue model**.
- For instance, if we start using breathing hoses 24 hours instead of 8, their **profit decreases** by 1/3, so that is **really threatening** for them. So we have to do this together and give them time to **change their revenue model**.

- **Medical procedures / standards**

- New circular routines or circular products **require to adjust the current medical guidelines** etc. This means there are quite some **transformation costs, also in time**.

LACK OF CAPACITY CURRENT CSD

- The **capacity of our central sterilisation departments** is not sufficient, which is the same at other hospitals, so we should look together at how we can solve this.
- Also now for different medical reusable products, the **washing is often separated** and they all go to other laundry facilities, which is **not efficient**.
- Also for instance the **capacity of central sterilisation departments** (CSD) sometimes is not sufficient.

TIME & ACCEPTANCE

- Sometimes the argument is used that using reusable products is more **time consuming**, but other new strategies **save time**, and then it is seen as bonus, while more time is sooner **directly used as a reason** to not implement something.
- The **time factor** is often used as an argument to not implement strategies, because there already staffing shortages, however we also see that some initiatives are really also **saving time**.
- You see that reduce is often easier to implement and this goes well within Green teams, but switching to reusable alternatives is harder to implement, as it is **time consuming** and has to fulfil the current requirements.
- Employees have to **accept change**, as they probably have to change their way of working with new circular strategies and products, sometimes it is even more **time consuming,** and for some people this acceptation can be a barrier.
- As we often go back to old times with reusables, people can be **more resistant** as there was a reason why we went away and disposables were better, which is less the case for new innovations.

STRICT SAFETY STANDARDS

- You see that reduce is often easier to implement and this goes well within Green teams, but switching to reusable alternatives is harder to implement, as it is **time consuming** and has to fulfil the **current requirements**.

- The **current safety standards** have also become **much more strict**, so this makes it sometimes hard to go back to reusable products, which were already used years ago in hospitals.
- On the subject of infection prevention it is very differing within hospitals how circular they are working and are willing to change, and in the **national guidelines there is also still a lot to gain** on circularity efforts.
- Disposables are easy for **infection prevention** as a new one can be used, and for the switch to reusables it can be **hard to realise the related requirements** for this.

- **Differing focus (procurers)**

OTHER CHALLENGES
- We are a little with our back against the wall, as we **cannot simply choose to not procure** healthcare at hospitals that do not fulfil certain circularity criteria, as we **have to keep healthcare accessible** and are **in need for their healthcare**. We need them too and are **dependent on their healthcare**.
- **All the subjects** like **digitalisation or accessibility** are a challenge and then **sustainability/circularity is not a priority**, however they **can go together.**
- Healthcare procurers are focused on **multiple other challenges** and often not busy with circularity. Also they **don't have much knowledge** about this, but cannot reasonably make a conversation about this with hospital sustainability experts in the procurement process.
- **Priority of other challenges** is difficult and then **circularity** does **not get enough attention**.
- While there are some enthusiasts on circularity, there are in hospitals also **still a lot of business as usual people**, who have **other priorities**.

PROCURERS
- **Procurers** are often thinking differently about it, and they are **mainly busy with making good price deals** for healthcare procurement, and **difficult to apply circularity** here.
- As procurers are **mostly focused** on **obtaining low healthcare cost** and efficiency, they are **pressuring into the direction of disposables**. I don't think they are aware of this.
- Procurers from health insurer are **busy with a lot of other subjects** and often **don't know much about circularity**, so giving them more knowledge is also an option (which we are planning to do from ZN).
- Sometimes the sustainability experts or Green teams in hospitals are willing, but **directors or other departments see barriers and don't want to**, so within a hospital the same commitment is needed.

- The **procurers** have to be along to **make sure they are really steering on circularity in the procurement**, because tenders are often just done on the supplier with the **cheapest offer**, unless there might be strict procurement criteria on circularity.

- **Lack of knowledge at hospitals**

- Hospitals **need knowledge on how to procure circularly** and what are the more circular products available.

- Hospitals sometimes **miss the knowledge** on what is exactly more circular and what is the impact. It would be helpful if there would be **more evidence** clearly available (as this now is not always the case), certainly if a hospitals is at the beginning of this transition.

- Clear **data and evidence** would also help in **convincing the people** that are more doubting on implementation of certain strategies.
- There is a lot of **knowledge at specific hospitals** and it would be useful to **share** it and elaborate it in such a way that it is **applicable for every hospital**.
- I notice **ignorance**, a lot of colleagues think waste just ends up in one pile, and they don't want to make an effort to separate waste, so therefore we still are **busy with awareness and knowledge**. These employees are often also **negative** towards the more enthusiastic ones, which is very frustrating.

- **Multitude of scattered initiatives**

- For hospitals it would be helpful if all the existing initiatives can **easily be found back**, so that not everyone has to reinvent the wheel themselves. So there **lacks some steering**. Because hospitals are now also active with sharing on LinkedIn or other networks, but this is a whole process, and meanwhile others might be busy with the same matter.
- **More structure** would be nice for knowledge on initiatives. Now we are for instance connected to groene zorg alliantie, but if you have a question you should know which hospital to send it to and where to find that.

- 2. But the main challenge is to not make this an **administrative burden** for hospitals and that **every hospitals asks for slightly different information**.
  Therefore we need to think about how we can **tie this in to what they already have** and how this can be brought together in the best and easy way to make this information transparent.

- **Collaboration health insurers different interest**
- Another barrier is within ZN collaboration that **not every individual health insurer thinks the same** of the importance of circularity, and when it comes to actions, some are **less willing to agree to certain initiatives** than others, and also when it comes to **procurement policies** you are **in tension with competition** as every individual insurer wants to be able to offer a low premium.

## *E.3 RESPONSIBILITY ROLES PERCEIVED BY HEALTH INSURERS*

**PAYER HEALTHCARE**

- 2. Primarily payor, so **by paying we determine**, explicitly our task to keep care affordable and accessible, however from this perspective we play a **role in thinking about circularity**.
- 3. By procuring healthcare and making healthcare procurement policy, we have a role here.
- 5. We have a **role in making agreements with hospitals** in procurements, not only quality but circularity should be one the list here.
- 1. We are healthcare procurers, and therefore are **co-responsible**, but the main responsible is the hospitals or the healthcare product supplier.
- 1. We cannot procure healthcare and say that we don't have a responsibility at all about the circularity, because we have the money in hands, **giving us the position to influence this**.
- 4. We are the ones **having the conversation** with hospitals about new contracts, and there also lies the challenge to become more circular, also **putting it on the agenda**.
- 6. The link is quite strong, as we procure healthcare and provide turnover to a hospital, and **who pays decides**. And of course, you can't just determine what happens, but

eventually you are the one transferring money, so you can **set some criteria and point a need to change**, and that is our responsibility more. Therefore, we also signed the Green Deal.
- 3. We are in a financing relationship with hospitals, this gives us the **responsibility and position to take action**. From this relationship, we have the **position to ask for an obligation back**.
- 1. Very strictly, we **only have the task to pay for the healthcare** that our insured need, and have the **right contacts for delivering** this healthcare.

**NO COMPETITION ON SUSTAINABILITY**
- 4. We as health insurers don't compete on circularity, this is a mutual agreement with ZN.
- 6. To fairly share the transformation costs, the bill for sustainability has to be shared.

**STIMULATING ROLE**
- 5. We have the role to **boost and stimulate** it.
- 6. Therefore, we also signed the Green Deal and accept our responsibility to maybe **set criteria to hospitals** and **indicate the need to change**, as we can't shut our eyes and maybe we are not directly responsible, but **we are part of the solution**, so have to do something.

**FACILITATING ROLE**
- 6. You have to enable someone to do what you desire them to do, so we desire from hospitals that they become circular, but we have to **enable them by facilitating in knowledge sharing and push the supply of medical products** maybe.
- 3. Health insurers can **help in filling the prerequisites**, but eventually the end responsibility is to the hospitals.
- 3. Our role is indirect, but our role is to **take care of taking away barriers** in the transition towards circularity, where they can decide themselves on what is most suitable.
- 6. We are not in the procurement of medical products, between hospitals and suppliers, but we can **pressure from the bottom by requiring more circularity of hospitals**, or we could **pressure from above by adjusting regulations with the government** for suppliers.
- 1. From our position we can **help hospitals to exploit chances** that lie there in the transition, with sharing good examples.
- 4. We are part of the sector, so in some way **we really should do it together and help**, but intrinsic motivation starts at the hospital.
- 5. Of course we **can help hospitals**, but they stay responsible for their own business operations.

**KNOWLEDGE SHARING**
- 4. **Sharing knowledge is suitable for our role**, as **we speak to all the hospitals** and get to hear interesting things happening there, that might be also relevant elsewhere.
- 5. **Knowledge sharing** is important as we in **our role visit a lot of hospitals**, where information can be spread.

**SHARED RESPONSIBILITY**
- 3. I think we have a **shared responsibility**, together with the ministry VWS we are an important director party in the healthcare sector.
- 1. The hospitals have the most important responsibility, however the government can set certain boundaries, and other parties can stimulate it, but health insurers cannot do as

much as the government I think, but **we can do our necessary part**, but ultimately the hospitals and their directory is responsible.

- 3. We also have the **societal role to keep healthcare accessible** and eventually want to **minimize the health impacts of climate for insured**, but it is a **shared responsibility** with hospitals and the ministry.
- 6. Circularity of hospitals is not your direct responsibility as it is not your primary task, or in your circle of influence. However, you have some sort of **moral responsibility, as you are linked** to it.

**HOSPITAL RESPONSIBILITY ROLE**

- 2. The **responsibility of execution is for hospitals**, but we have to make it possible and make it tie in. At least we have to make sure we do not stand in the way, but actually we should facilitate and booster it. So there I see the **biggest role for the hospital in collaboration with health insurer**, there I think is the main responsibility.
- 1. The **responsibility lies really at the healthcare provider**.
- 4. The **main responsibility is really at hospitals**, and there the intrinsic motivation has to start.
- 5. **Hospitals are responsible**, as everyone is **responsible for the sustainability of their own business operations**.
- 6. I think it is really the **responsibility of hospitals**, and if they don't they should suffer from it in some way, however then there should be an availability of circular products and knowledge, because you have to enable someone to do what you desire them to do.
- 6. The **behaviour of healthcare providers has to change**, and also the branche organisations are needed in this. In this way, demand has to be created for circular healthcare products.

**COMPETITION HOSPITALS**

- 6. It is also a good idea if there would be some competition on circularity/sustainability, because **competition is also a source of creativity and innovation**. However, meanwhile knowledge should be transparent and it should not become a revenue model, so it is difficult how to realise this.

**GOVERNMENT RESPONSIBILITY ROLE**

- 2. The ministry has also a role, while at the moment there is **not much interest**, but it also does not stand in the way now.
- 1. The hospitals have the most important responsibility, however the **government can set certain boundaries**, and other parties can stimulate it, but health insurers cannot do as much as the government I think, but we can do our necessary part, but ultimately the hospitals and their directory is responsible.

**PATIENTS / INSURED ROLE**

- 2. The role of patients is **not so active** here, mostly they are referred to a hospital.

**SUPPLIER ROLE**

- 6. The suppliers are needed to **create the supply of circular medical products**, and **change the economic sector**.

## *E.4 RESPONSIBILITY ROLES PERCEIVED BY HOSPITALS*

**PAYER HEALTHCARE**

- Because they have the money, they can **set certain requirements** to hospitals, and luckily they are already doing that.
- Health insurers pay, so I think their **expertise is on how cash flows through the whole system** and how they can stimulate this with **financial instruments**.
- Health insurers **cannot demand something that is not feasible**, so they cannot oblige them to be fully circular, this would shift the responsibility fully towards us, including all the enormous costs. As they are **financial organisations**, they have to take care of **arranging the financial part of the transition well**. All the other is more their **lateral responsibility**.

- The transition **asks for investments**, and on the **long term** these can be paid back, but **now investment money has to be made available**, so health insurers could **facilitate** and think about how they can mean something in this.
- I think health insurers in general are **not aware** that we are facing an enormous and actually the **largest transition in the existence of the Dutch healthcare system** in the coming years. And I think they have not made the necessary people and resources available yet, which they will need to make available eventually if we want to reach the targets.
- I know there is a working group on circularity from ZN, but I haven't heard much from them, so this is a little **disappointing**, but I know they are **still busy** so it might come, and I think if they come with more **concrete action**, we can go further.

**HEALTH INSURER RESPONSIBILITY**

- I think health insurers can mostly **facilitate** and **stimulate** in this transition.
- They have to take **not a punitive** but a **rewarding** role.
- Health insurers are very important in the **healthcare chain** and this transition needs a **chain approach**, a **chain collaboration**.
- Sharing good examples is very suitable for health insurers, as they have a **network within hospitals** and are also **visiting them**, while we are less in contact with other hospitals, so their **power is larger** there.

**HOSPITAL SHARED RESPONSIBILITY**

- You **can never do it alone**, you really have a **shared responsibility** and hospitals can **create a strong demand side** for circularity, but we need suppliers to think along.
- Eventually, this is a **system responsibility**, and the primary responsibility is at hospitals and their directors, but they **can't do it alone** and they can only implement where there is budget for and what is accepted by employees and what is available. So they are dependent on the whole supply chain with suppliers, health insurers and the government.
- I think it is a **shared responsibility**, and hospitals have to **make sure it works internally**, but the **government and health insurer also have a role**, maybe in realising more capacity for CSD's to look for **transcending collaborations** and stimulating it on the front. Also in creating more cleaning capacity maybe, and forming a front against suppliers. So I don't think the responsibility is for one party, **everyone has to take up his own part**.
- I think we really **have to do it together**, that is the only way to reach the targets.