A *healing environment* for *children*

Research booklet

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AR3AD110 - Designing for Care in an Inclusive Environment

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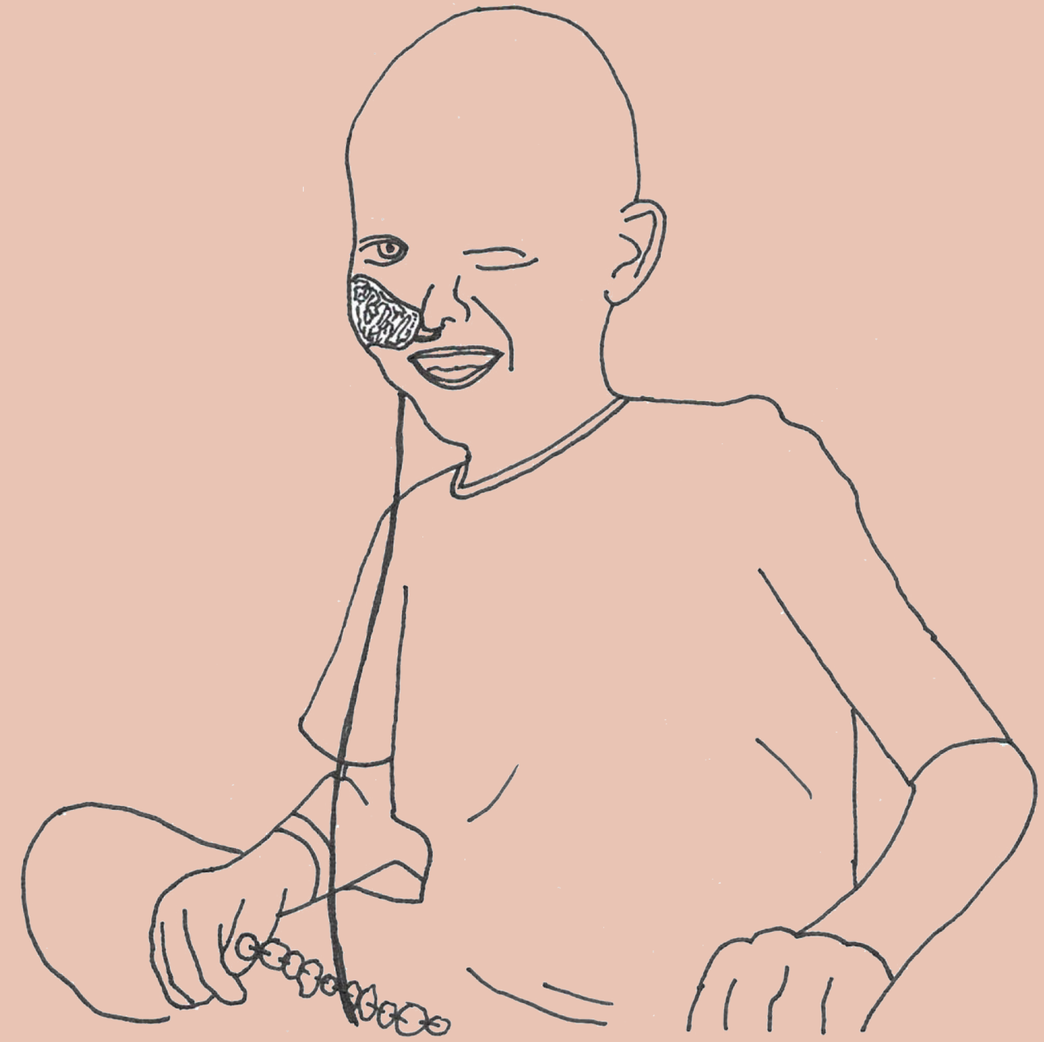

Figure 1

KEYWORDS

Children
Healing environment
Healthcare facilities
Long-term stay
Architecture

ABSTRACT

When children are admitted to the hospital because of a severe illness, as whole new chapter in life starts for the children and the parents. Several researches emphasize the stress children and parents experience during hospitalisation. However, life becomes even more distressing when the child is allowed to go home and it becomes the parents' responsibility to take care of the child. Nowadays when a child is too well to stay in the hospital, however, too sick to stay at home, the child is sent home anyway. The reason behind this is that a stay in the hospital is expensive.

Research has been conducted on how the healthcare system is shaped now and how architecture can contribute to an optimisation of healthcare facilities for children who require long-term care. By using multiple research methods like interviewing, fieldwork, documentaries, case studies and a literature study, the aim was to answer the main question.

Healing environment was introduced as a technique to be able to conduct the research. Since research on healing environment is most of the time only for adults, a new framework has been compiled especially for children.

It can be concluded that by implementing the design guidelines, that are compiled, as requirements for an healthy healthcare facility, that architecture can contribute to an optimisation of healthcare facilities.

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INTRODUCTION

Introduction to the research topic

Cancer was the most common cause of death for children aged three to eleven from 2007 to 2016. Three out of ten deceased children of this age died because of cancer. Brain tumors accounted for the highest number of deaths, with 42 per cent. Leukaemia accounted for 22 per cent of the deaths (Steeds minder kinderen sterven aan kanker, 2018).

On an annual basis, about 600 children get cancer in the Netherlands (de Ruwe et al., 2023). All these children need treatment and are therefore admitted to the hospital. Hospitalisation is one of the most distressing events in the lives of children and their parents. However, life becomes even more distressing when the child is allowed to go home and it becomes the parents' responsibility to take care of the child. Nowadays children who are too well to stay in the hospital, however, too ill to stay at home, are sent home anyway. It can be questioned whether the stress parents experience, is a positive factor for the healing of the children. It would be beneficial for the parents and the children if the stress the parents experience somehow would be reduced.

Personal motivation

My motivation to write about this master's graduation research topic originates from personal reasons. My brother was diagnosed with leukaemia at a very young age and this had a huge impact on our family. And we were not the only family who had to deal with childhood cancer.

"Around 600 children in the Netherlands get cancer every year, and one in four children who are diagnosed with cancer dies from this illness."
(Prinses Máxima Centrum, 2023)

This long-term illness is one of the most present illnesses known to people. However, let's not forget all the other long-term illnesses that require a hospital admission. Such as heart diseases, autoimmune disorders or sickle cell anaemia.

Because I know a little bit about what it is like for a child to be hospitalised, I want to design for those children and their parents.

Problem statement

When children are admitted to the hospital because of a severe illness, a whole new chapter in life starts for children and parents.

"Having a child hospitalized is a stressfull event for parents who often experience anxiety and depression during the period of hospitalization."
(Commodari, 2010, p.1)

However, life becomes even more distressing when the child is allowed to go home and it becomes the parents' responsibility to take care of the child. Nowadays children who are too well to stay in the hospital, however too ill to stay at home, are sent home anyway (Paediatric oncological physician, 2023). The reason behind this is that a stay at the hospital is expensive. A stay at the hospital in the Netherlands can cost up to 900 euros per day (Kuijper, 2021). For this reason, each day that a child does not have to lie in the hospital, is one that is a bonus.

Everyone can imagine that the level of stress of a parent increases when they have to take their child home. Most of the parents have no medical expertise and all of a sudden have to administer medicines. Or have to deal with their child being in pain, without really knowing what to do about it or where it originates from.

After visiting three paediatric hospitals and talking to the staff, it became clear that there is not a specific solution yet for parents who are not able to take care of their sick child at home. The most optimal situation, of course, is when the child has both parents who can care for the child. However, this is not always the case. 23 per cent of all the families in the Netherlands are single-parent families (Ince, 2022). Also, children who become ill sometimes have siblings. Because of this, the parent either cannot focus completely on the sick child or the other children are left on their own.

Relevancy

Medical care in the Netherlands, for children whose parents are not able to take care of their sick child at home, is not available at the moment. Also, children who are sent home while they are not well enough to stay at home, are sent home anyway for the time being.

One solution that is currently in progress is the use of children's home care (Paediatric oncological physician, 2023). The children then stay at home and the children's home care comes to their house. Medical procedures like administering special medicines or inserting a feeding by stomach tube are then taken care of by them.

However, the shortage of medical staff nowadays (Ministerie van Volksgezondheid, Welzijn en Sport, 2023), causes the children to have less one-to-one time and they will therefore receive less medical care.

Concentrating the medical care for children whose parents are not able to take care of them at home or for the children who are sent home anyway while they are too sick, would be a solution. By concentrating all the children who are in need of special care, the quantity of the medical staff can be reduced.

However, research about this topic has never been conducted so far. Therefore it is important that this research will be conducted so that the topic will be addressed.

Goal and aim

The goal of the research is to formulate design guidelines which will help (future) architects to design child- and parent-centered healthcare environments. These healthcare environments are especially for children whose parents are not able to take care of them at home or for children who are sent home anyway while they are too sick.

The aim is to design an in-between building, which would be much more convenient for parents. In this building, the specialised medical care for children who require long-term care, that cannot be given at home, will be taken care of. This all with the aim that the responsibility for, for example, administering medicines is not only the responsibility of the parents, but becomes the responsibility of specialised people.

Research question

Main research question

Referring to my problem statement and thus the fact that children are not always able to stay at home, my main research question will be:

- How can architecture contribute to an optimisation of healthcare facilities for children who require long term care?

Sub-questions

1. How do the children and their parents experience the healthcare facilities?
2. How does the staff of a hospital think that children experience the environment?
3. How are healthcare facilities already creating an optimised environment for children?

Range

This research will only focus on the parents and the children who require long-term care, and possible siblings. Thus, concerning the exclusion of topics, it can be stated that hospitalisation for several days without a severe illness, will not be included in the study. Also, the research will only focus on the situation in the Netherlands. The interviews, observations and fieldwork will all be conducted in the Netherlands. Additionally, the research will include all sorts of childhood cancers which require a long-term stay at the hospital. Also, other illnesses which require a long-term stay will be included in the study.

Concerning the inclusion of topics, one important topic that is of significance is healing environment. The whole study will be based on the factors of healing environment for children, that are explained in the theoretical framework.

Declaration

For the protection of all participants, names have been kept untraceable and anonymous to be able to guarantee their privacy.

Target group

The target group that will be focused on is parents of children who require long-term medical care, and the children themselves, including possible siblings. Then, when considering long-term medical care, it is important that the child requires medical care for at least several months. This could include diseases such as cancer, but also autoimmune diseases and heart diseases.

Definitions

Stress

Several researchers have already done research on the term stress. For example Dr Gillian Butler, she states that there are at least three ways of defining stress. Where each individual definition contributes to the understanding of the term. A stimulus based definition suggests that stress is the result of pressure. Whether a person or a load-bearing beam, it will cave in when the pressure is greater than the recipient can bear. A response based definition suggests that stress is a psychological phenomenon. The body will respond and react to certain events and autonomic activity is automatically triggered. Dr Butler also states that stress is a dynamic process reflecting both external and internal factors. Like for example the characteristics of a person and/or his or her circumstances, as well as the interaction between them (Stress Management in General Practice, 1993).

Other researchers have also tried to define the term stress. For example, Dr Hans Selye, the first doctor to introduce the scientific concept of stress. He states that when any excessive environmental request is a given fact, stress is the non-specific response of the body to deal with it (1976).

Experience

The feeling someone gets when something happens that affects how you feel (Meaning of experience in English, 2023).

Healing environment

Jaap Koopmans describes healing environment in his report as "The creation of an environment in which certain conditions are provided that support and stimulate the inherent healing capacities of the people themselves. As well as their relations and surroundings." (2023).

Parents

The definition of what parent means is described in the book of Melton et al. (2018). Parents are the biological caretakers of a person. In the case such a person does not exist or is incompetent to take care of a person, a legal guardian, who is appointed and has legal authority to make decisions, takes over. A legal guardian only takes over until the person who was considered incompetent, is competent again. In this case you can think of a child who turns eighteen years old or of a parent who is being considered as competent again.

Child

The United Nations define a child in their report "Convention on the Rights of the Child" (1989) as: "a human being below the age of eighteen years unless under the law applicable to the child, majority is attained earlier."

THEORETICAL FRAMEWORK

Healing environment

Defining what a healing environment means is challenging. There is a lot of literature written about healing environment, but very few of them really give a definition. However, two definitions that can be given are the ones of Jonas B. Wayne (2003) and Jaap Koopmans (2023). Wayne describes healing environment as:

"A system and place comprised of people, behaviors, treatments and their psychological and physical parameters. Its purpose is to provide conditions that stimulate and support the inherent healing capacities of the participants, their relationships and their surroundings."
(*Wayne, 2003)*

Jaap Koopmans describes healing environment as:

"The creation of an environment in which certain conditions are provided that support and stimulate the inherent healing capacities of the people themselves. As well as their relations and surroundings."
(*Koopmans, 2023)*

When looking at the different researches, the aspects of healing environment that are given in the reports also vary. For example Jain Malkin (1992, p. 10) talks about the basic factors which are commonly used: air quality, thermal comfort, noise control, daylight, privacy, views of nature, visual serenity for those who are very ill and visual stimulation for those who are recuperating. According to Malkin, these eight factors are the basis on which can be built further. However, other literature takes different factors into account, with some overlapping ones. For example, Srazali Aripin, she leaves visual serenity and stimulation out of the equation, however, adds colour and texture (2006). Noor Mens and Cor Wagenaar are adding music and orientation, however, they leave privacy out (2009). And Roslinda Ghazali and Mohamed Yusoff Abbas mention: views of nature, colour, daylight, artwork, air quality and music as the main factors of a healing environment (2010).

When all the factors are organised in a table (Figure 2), it can be seen that the five orange-coloured factors (numbers 1, 2, 3, 4 and 6) are commonly used in the literature and that those five factors will be taken as a starting point for healing environment for adults.

	(malkin, 1992)	(Aripin, 2006)	(Mens & Wagenaar, 2009)	(Ghazali & Abbas, 2010)
1	Air quality	Air quality	Air quality	Air quality
2	Thermal comfort	Thermal comfort	Thermal comfort	
3	Noise control	Noise control	Noise control	
4	Daylight	Daylight	Daylight	Daylight
5	Privacy	Privacy		
6	Views of nature	Views of nature	Views of nature	Views of nature
7	Visual serenity			
8	Visual stimulation			
9				Artwork
10		Colour		Colour
11			Music	Music
12		Texture		
13			Orientation	

Figure 2: Table with the factors of healing environment

After reading the literature about the factors of healing environment, it is now important to clarify what the specific factors entail.

Air quality
Hospital environments are largely associated with a certain hospital smell (Mens & Wagenaar, 2009). Masking those odours would be beneficial for the healing environment of adult patients. Known is that pleasant fragrances lower the blood pressure and heart rate, whereas unpleasant odours increase the heart rate and respiration (Malkin, 1992).

Thermal comfort
The diverse requirements of staff and patients makes it difficult to preserve a certain temperature. Most of the time the patients' comfort is given priority to, because of their medical condition. If the thermal environment of a room is comfortable, it helps maintain the mood of the patient and improves their healing (Yuan et al., 2022).

Noise control
When a patient lies in the hospital, a lot of noise can come from the IV pole (Bögl, 2023). All the beeps can prevent a patient from sleeping well or getting sleep at all. This then causes the healing process to slow down because sleep has restorative capabilities (Vanhook, 2014).

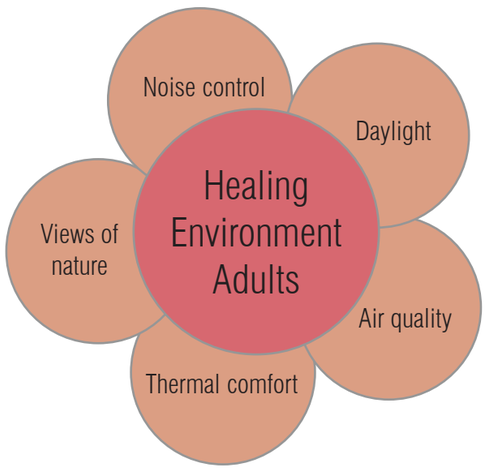


Figure 3: Healing environment factors adults

Daylight
Incoming sunlight appears to have positive effects on the length of stay of a patient (Soh et al., 2015). Also, the mortality and the experience of pain and stress appear to be less present when daylight is accounted for.

Views of nature
Roger Ulrich, the man behind the term healing environment, begins to state already in 1984 that views of nature are important in his research "View Through a Window May Influence Recovery from Surgery". He states that patients assigned to rooms with windows looking towards a natural scene had shorter hospital stays (Ulrich, 1984).

Healing environment for children

However, the four sources examined on healing environment do not include all there is to know about the topic, since it does only focus on the healing environment of adults. Also, Roger Ulrich only focuses on the adult healing environment. Much more could be achieved if the healing environment were to focus on children as well. Also, it can be questioned whether children have the same five demands, air quality, thermal comfort, noise control, daylight and views of nature. Or is there a need for the components to change and thus add and/or remove some components? Another thing to note is that the study of Malkin is more than thirty years old. This then ensures that, for example, new and digital technology is not included in the study.

Looking critically at how the healing environment is shaped now for adults, a factor that can be replaced is the views of nature. The reason behind this is that children like to look at other kids, instead of looking outside to the views of nature (Brabers, 2023). The reason behind this is that children master the technique of observational learning. By observational learning, children learn how to behave and discover positive behaviours (Rymanowicz, 2015). Therefore a factor that can be added is views of other children.

"Color has a large impact on our psychological and physiological responses."
(Park, 2007)

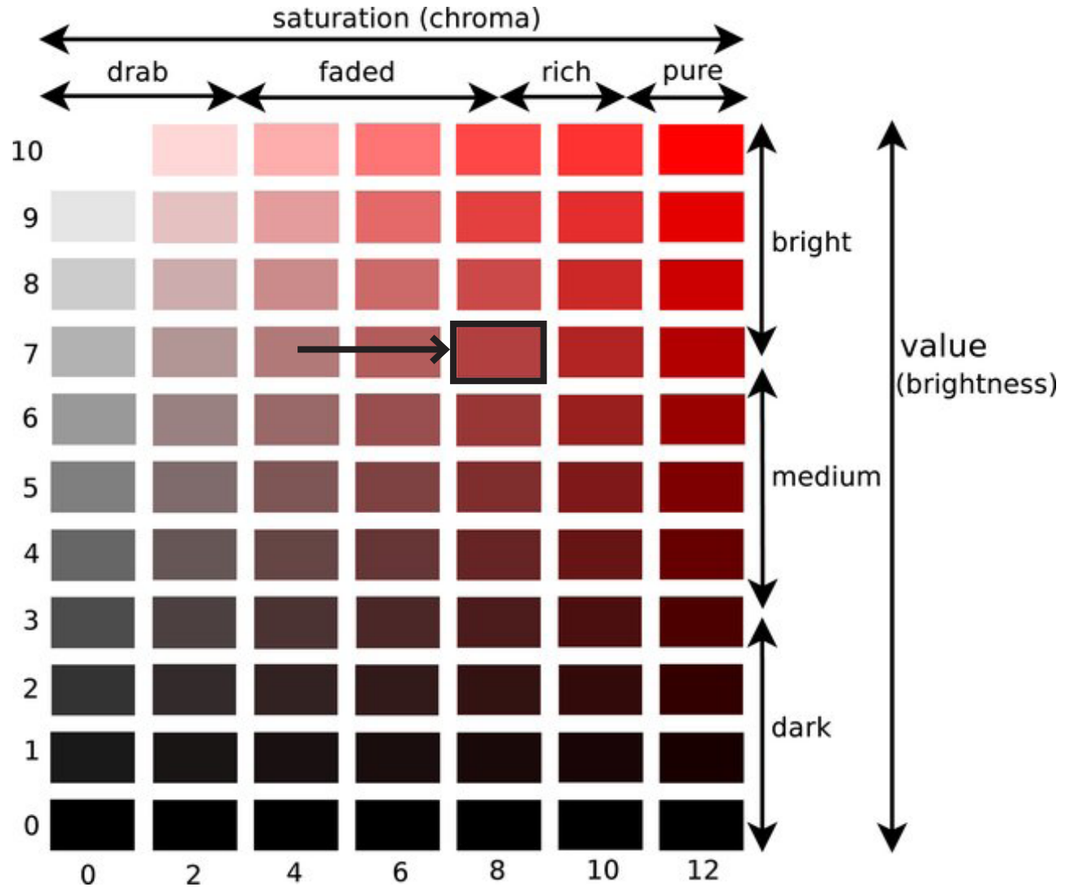


Figure 4: 5R red hue family, with 7/8 encircled

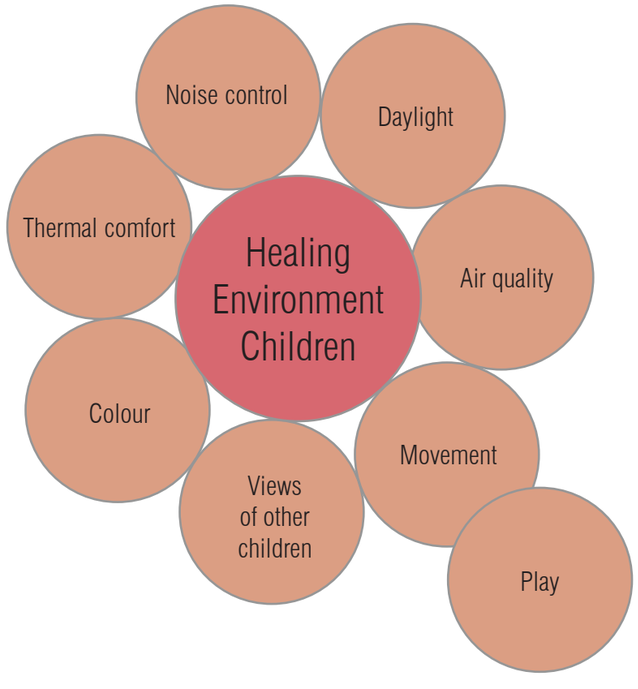


Figure 5: Healing environment factors children

Also, the factor colour is one that can be added. Research has shown that children experience colours differently than adults do and that certain colours make the patients feel comfortable, resulting in a quicker recovery (Park, 2009).

The colours that are the most preferred ones are measured based on the Munsell color system. The colours that seem to be the most preferred are in the red hue family, 5R 7/8. Other most preferred colours were 5Y 9/8 (Yellow), 5G 7/8 (Green), 5B 6/8 (Blue), and 5P 7/8 (Purple) (Park, 2009).

A factor that also can be added, and is closely related to the factor views of other children, is the factor of movement. Movement is, whether the child is sick or not, a basic need and their first and most important form of communication (Dziobek-Bepler, 2021). Also playing is an important factor that cannot be seen separately from movement, since playing plays a large role in the development of a child's personality (Burriss & Tsao, 2002).

When it comes to air quality, thermal comfort, noise control and daylight, it can be concluded that these factors also comply when it comes to children. The reason behind this is that the aforementioned explanations about these factors also have an impact on children. Imagine the odours from a hospital and then being a child with cancer. Most of the time taste and smell disorders occur due to chemotherapy and the cancer itself. Controlling the odours would be beneficial for the healing of paediatric patients (Cohen et al., 2016).

It can be concluded when looking at what is stated above that there are eight healing environment factors, especially when it comes to children. Some of the factors have an overlap with the factors from adults, but others are completely different. Figure 5 shows an overview of the healing environment factors for children, which will be taken into account in my further research.

RESEARCH METHODS

To be able to write this thesis, several research techniques will be applied to answer the subquestions and thereby the main research question. The research techniques that will be applied are in-depth interviews, anthropological fieldwork, literature study and a case study analysis. All these techniques will eventually lead to a sound basis for answering the main question.

Interviews

All the sub-questions require interviews to be able to answer at least one part of the sub-question. For the first sub-question, interviews will be conducted with parents of hospitalized children. For the second sub-question, interviews will be conducted with a nurse, a paediatrician and a paediatric oncologist. All the interviews will lead to an answer on how the staff and the users of the hospital experience the hospital.

The third sub-question, however, requires an interview with an architect who is working in the field of designing healthcare facilities. That architect is able to answer how the firm and other architects are already creating an optimised environment for children in healthcare facilities.

It is important for the research that the children who are interviewed comply with the age range of 0 – 18 years old.

Anthropological fieldwork

Anthropological fieldwork is used to answer the first sub-question. The aim is to obtain knowledge about the experience children undergo when they have to stay at a healthcare facility for a long time. The main method that will be used is sketching and making photos. When possible a diary will be kept of the things that occur. In the diary, a day in the life of a sick child will be described with sketches of how the environment looks like through such a day.

Literature study

Literature will be used to substantiate all the information that comes out of the other research techniques. Books, online literature, like research papers or literature reviews and dictionaries will be used to write this master thesis. For example, literature written by Jain Malkin, although it may be old, her book contains information which helps to understand the healing environment of adults. Jin Gyu Park, on the other hand, writes about how children experience an environment and clarifies their factors of healing environment, especially the one of colour.

Case study analysis

As already explained in the theoretical framework, eight points form a basis for healing environment for children to build further upon. Therefore it is important that when choosing the cases, the factors described in the theoretical framework are accounted for, for at least the biggest part. By this is meant that when one or two components from the criteria are missing in the case study, this is not the biggest problem.

The criteria that need to be accounted for, for at least the biggest part are noise control, daylight, air quality, movement and play, colour, thermal comfort and views of other children. The case study will be done to get an understanding of how healthcare facilities are already creating an optimised healthcare environment.

The three case studies that have been chosen are all located in the Netherlands. The first one that has been chosen is the new Maggie´s Center in Groningen, the second one the Prinses Máxima Centrum in Utrecht and the last one is the Buurtzorgpension in Ermelo.

INTERVIEWS

Paediatric oncological physician

What happens in the hospital and what at home?

What happens in the hospital, so far, is all the oncological treatment such as chemotherapy through the IV and every treatment that needs to be done under narcosis. There are some programs starting for chemotherapy at home, however, that is a very complex trajectory for the parents. Therefore, there is also a plan for a home program for the administration of chemotherapy by children's home care.

What happens at home further is administering other medication, like pills and administering protective/ supportive medication against nausea and infections. Parents are asked to make sure the children are getting enough food and are getting the good nutrition. Parents also need to make sure that the daily rhythm of the children is kept as best as possible, since this is often disturbed due to fatigue. So that means that they then need to seek the balance between what is achievable and what is not and what are the best moments of rest. The parents need to try to reconnect the daily rhythm again by giving the child time-outs, in the good sense of the word. What is meant by time-outs is chilling or other things, depending on what helps for a child. Furthermore, they also need to make sure that the children exercise enough, to keep their condition good.

So in therms of medication, it is mostly oral chemotherapy and all the supportive medication aforementioned. In terms of other care parents need to provide a lot of supportive care.

Many children have a drug called prednisone, which disrupts the night rhythm. They are more awake, they sometimes suffer more from anger and powerlessness, in the phase they are on it. They want to eat a lot more and that is why they need to be subdued, so eating is really an issue then. Is it enough, is it not too much and is the composition right. Sometimes it is tube feeding. I don't know what percentage of children, but a significant proportion of people tube-feed at home. Then they also have a tube-feeding pump at home.

There are children with hormone problems, and they really have a very intensive hormone support programme with sometimes injections, and in every case at least pills.

But also children with excessive urination. The parents then have to make them drink a lot again in order to avoid dehydration. Then the parents need to give the children pills to make sure the excessive urination stops, but with that medicine the children can not drink much, so they have to find this balance which is really hard, because parents often do not know whether what they are doing is right. There is this certain amount of insecurity that emerges when the child is diagnosed with cancer.

But as mentioned before, there is also children's home care. So if people have a child with a complex medication schedule or they don't have the cognitive skills or have an illness or condition themselves, children's home care can take over. Children's home care also takes over in a single parent family. The medical procedures like administering tube feeding, or administering medication in the morning or giving a growth hormone shot, is then being taken care of by them.

So treatments at home can certainly be taken of by parents in some cases, but if, for example, you have a child with artificial respiration at home, which is very exceptional, but they do exist, then there is a lot more home care. Because then you need to be a parent 24/7, of course you are always a parent, but not a medical expert, so when the beeps and alarm bells keep on ringing, it will exhaust you.

It can also be the case that we start things up in the hospital. For example, a child is sick, in addition to the cancer, has an infection, for example, needs antibiotics, then the antibiotics start working and the child recovers, but those antibiotics have to continue for a week in the IV. And then the question is where do you want to be then. Very often we then manage to send the children home with an IV and then work with home care to see how care is then shaped.

So to conclude, a lot can be done at home, and most of the care that needs to be done at home can be taken care of by the children's home care, however, at a certain point there is sometimes a moment when we say this really has to be done in hospital.

Grey area

There is currently a kind of grey area between what happens in the hospital and what happens at home. So because some parents at home indicate that it becomes too much to also do all those treatments that can be done at home, while they have no medical background at all.

What do you want to add?

Sometimes children are simply too sick to be at home but too well to be in hospital, the children are then most of the time sent home anyway. A lot of medical care then happens at home. And as I have mentioned before, children's home care can take care of the children as well, but there is this shortage of medical staff right now and that sometimes means that not every child can get the care they need. I also want to add that I do know and acknowledge that it is a big responsibility for parents to take medical care of their child at home. However, oncological patients are often able to go home with pills or other medication. Or, as I have mentioned, the supportive medications. And it would then be very expensive for the hospital to keep the child admitted, while the medical procedures can be taken over by the parents or the children's home care.

The parent council really wanted a window which was able to be opened, when they talked about designing this hospital. The window has now become a door. The door to the balcony, but they wanted to be able to receive fresh air.

The courtyards and indoor play areas are felt to be very good. You can leave you child alone and let them do their thing.

I hear very good things about the restaurant downstairs, people like being able to walk to somewhere and get something to eat or drink.

Maybe these things are also something for you to consider in your design.

Paediatric physician

What happens in the hospital and what happens at home?

That is very broad. In fact, it very much depends on the disease the child has. There are a lot of overlapping treatments that a child is subjected to. Because when you talk about getting an IV, which gives you fluids or medication, that happens with a lot of different problems. You can get a tube through your nose into your stomach for food and fluids. That also happens in a lot of different diseases. So that's not specifically something for an oncology patient. But for example, in my case, I see a lot of children with eating disorders, they also sometimes have tube feeding.

- Children with a tightness in the chest we regularly nebulise here. So they get air through a cap or a mouthpiece in their mouth so they inhale medicine for their lungs through that way.

- You can get oxygen, which is generally not possible at home, sometimes happens on trial, but generally doesn't happen.

- What happens at home is mainly tube feeding.

- There are also children who go home with an IV to then finish the antibiotic treatment at home and then home care comes in to take care of all of that.

- Parents of severely multiple disabled children often do a lot at home, in addition to feeding sometimes even administering oxygen. Sucking out, removing mucus at home.

- Treatments that require IVs will always involve home care.

The current trend is that you try to have as much as possible done at home and therefore as little as possible in the hospital. If I compare today's care with that of 25 years ago, we now have much sicker children in hospitals on a regular children's ward, where they used to go to intensive care or high care much more often, they are now with us. Which means less sick children can stay at home with support. There has been some kind of shift.

How do you think children currently experience hospital?

How do you think children currently experience hospital? I think the environment a child is in can definitely help. So through a colour, through drawings and illustrations, that that does create an atmosphere in a hospital. But I also think that the people who work in the hospital mainly create the atmosphere. So apart from the fact that it is nice that when a child lies on the examination table, there is something nice hanging above him, for example, which distracts them and what they like and what might make them less scared. Then it is still important that you ask yourself how do you approach a child and how much time do you take for a child and if unpleasant things have to happen, are there people who can guide that well? We have medical pedagogical assistants in the department, for example, because sometimes you just have to do unpleasant things. Those people prepare the children for those unpleasant examinations. I think that also contributes to how safe they feel and how comfortable they feel. But then of course that says nothing about the decoration of a hospital, so I think it's a combination of atmosphere, people and environment.

Everyone is of course familiar with the PMC mainly because we are a shared care hospital. But then when you think about the PMC, you can actually say that that is a big children's playground, and that also works.

What happens now when children are too well to stay in the hospital, however, to ill to stay at home?

Nowadays, when children are too sick to go home, but too well to stay in the hospital, they are sent home anyway. This is, in my opinion, a bad development that has taken place in recent years. It is my opinion that if children are too sick to go home, they stay in the hospital. Unless you can arrange for them to go home with home care for medical procedures. You shouldn't let parents just do medical procedures in my opinion. Unless you train them for it. Like with tube feeding. A parent can learn that, there are protocols for that and then they are supervised by a nurse who teaches them how to tube feed and then they are given some kind of sign-off list and they have to do some kind of exam and then the agreement is if a child goes home with tube feeding that there must always be two people within that family who can administer that, because something can happen to one of the two persons, so there must be two of them, those are all conditions, those are protocols, you can teach people that and then someone can go home with tube feeding. But if children are still too sick to go home, they stay in the hospital. Or when children are ill, the home care comes to their house, but in my opinion you shouldn't let parents do medical procedures.

There may be a problem because we often encounter that home care cannot be arranged. Simply because there is a lack of it, not enough manpower. And so then you do keep children in hospital, who don't really belong here anymore, who could just be at home with home care, so if there were enough room in that home care and you could arrange that sufficiently and quickly then maybe more children could go home earlier.

Do you ever notice parents missing something?

The funny thing is that especially the parents, who come to our hospital through shared care from Prinses Maxima Centrum, say: why can't we sleep in pairs here? They also have a system in the Prinses Maxima Centrum where the infusion pumps are outside the room with very long lines and that is not the case here and that they then find it annoying that the nurse comes in to look at that pump. People who have never been to the Prinses Maxima Centrum, they don't talk about that, so that has to do with your frame of reference.

Nurse

How do you think children and their parents experience the hospital currently?
I think they experience it as a old hospital building. since it is an old building. For example, when I go to the ultrasound with a child, I have to fit and measure whether the beds go between the doorposts. Also the rooms have very small windows and thus little daylight and the ventilation system makes a lot of noise. These are things that are mainly seen by parents. I think we have a very nice and friendly team. So I don't think only the building impresses the children and parents, but also the atmosphere you give of course.

What happens in the hospital and what happens at home?
Some children are really clinically finished here, so that they really only go home with medication. But with some children, the treatment is not yet finished, but it can continue in a home situation, so for example with paediatric home care that they go home with an IV. Or that they have to come back to the polyclinic the next day, but that really varies a lot, some go to another hospital, what I said, some are transferred to paediatric home care, but some are also really completely medically finished.

Do you ever notice parents missing something?
Privacy is sometimes a thing, that sound comes through the wall from another room. That, of course, is not the intention. Sometimes there is even a window between two rooms and you can even see things happening. You don't literally see things, but you see shadows moving and that is certainly not desirable these days. Also mentioned is that parents miss a fridge in the bedroom, actually all the conveniences and comforts of home.

What is also mentioned is the routing to the parent room. That it is far away from the rooms of the children. So the parents' ideal image is that there is some kind of partition between a room with a connecting door or a curtain, that you can talk together as husband and wife for a while without waking up your child. After all, you are now just sitting in your child's room, in the dark. So when your child goes to bed at 7.30, your day is also over. So if you could retreat for a while but still be a little closer to your child than now, that would be ideal.

Then there is also only one parent room for the whole ward and you all have different cultures and desires. Therefore, there is also no TV, you have to imagine all those parents then sitting around arguing over one TV. So that doesn't work. So you should either have several parents' rooms or a smaller room with all the children's rooms, which I think is a parent's ideal image.

What is also sorely missed now is a sleeping place for two parents. Now, at most one parent can stay overnight and that is rather limited. You notice parents saying that they would like to sleep with two parents, but we just don't have the space for that.

What is also pointed out is views. Some rooms overlook the park which is nice to look at in summer and in winter. But the other rooms overlook a bridge. And daylight. This has also a bit to do with recovery because sometimes the sun doesn't even shine in the rooms near the bridge and it's just dark there all day. And the windows cannot open. This is because of the danger of children falling out and also because of the ventilation system. But some parents just wish there was a window that could be opened. Because imagine being in isolation for weeks, which means you don't get fresh air for weeks.

What happens now when children are too well to stay in the hospital, however, to ill to stay at home?
They then often transfer to the periphery (that is a regional hospital). We are a teaching hospital, so then they go to a regional hospital, often closer to home. At least a hospital which is not an academic center. Or they are sent home with the help from children´s home care. They will then help with for example the IV or other medical procedures.

Architect (Thomas Bögl)

Did you already have a lot of knowledge about designing hospitals or in what way did you gain that knowledge?

We had no experience with hospitals, we were also chosen because we had no experience with hospitals, we did do a lot in school construction and therefore we knew a bit about how children experience a space. Then we were chosen, and hired a doctor and a doctor psychologist, for three months. To work with her to see what are remedies that work to reduce stress and what don't. We analysed 12 international hospitals, we were in contact with them, we requested documents from them and we categorised and examined them on topics we thought were important. How does the logistics work in such a hospital and how child-friendly is such a hospital. So that was desktop research. And we also made visits to other hospitals. We talked to a lot of people about hospital construction, but also about what their experiences were during being in a hospital. So not just people who come from the construction world, but actually with experience experts, doctors, nurses and people like that and used that to ultimately design the center.

How do you think children currently experience the hospital?

What I know and what I am told is that it does not have a hospital look and feel, which was very important to everyone when we designed the building, but it turns out that it also has not much of a hospital look and feel. Most people also call it center instead of hospital. At the same time, of course, treatments that belong in a hospital are performed there. But the appearance is not like that. So that is an important aspect.

For children, there is a wide range of opportunities to experience other things besides the treatments, we thought that was an important point. And I also think that this has been pretty successful. At the same time, I also know that teenagers in particular when they get cancer, they're in their rooms and then they sometimes tend to feel a bit lonely. Because it's always a barrier to look someone up or do something. The PMC also works hard to prevent that and really invite people in, come we have a teen lounge, a kitchen, a school, a library and a music centre, so there is a lot to do.

That's what I hear and what I see myself. Of course, it's a big building, but I do think you can feel at home fairly quickly, in the sense of knowing your way around. Because as a patient or as parents, you only use a small part of the building. And that is precisely how everything was meant, the use of the building as a parent or child is organised on one floor. So you don't have to go up and down the stairs.

We also did research by interviewing parents before we started designing. I always asked then of how did you experience that hospital where your child was located before and I was very often told that they were busy with their child and not concerned with the environment. So for parents, it is just a necessity that there is a building where they need to be.

So do you think it is relevant for a hospital to have a certain look?

Yes, I think it is very important that you can create a calming atmosphere through the resources you have as an architect. And of the bridge, I actually know from parents that it works. When you go through the bridge you always go to an environment where something frightening or something strange happens, because then you either go to the operating rooms or to the intensive care unit. But through the design of the bridge, I know that parents experience that as a kind of calming space and the care goes to the background, so to speak. By taking them out of the care with a different stimulus.

What resources did you use in the PMC to ensure that it would be a less stressful experience?

There are a lot of them. To start with, we looked at logistics, how can we make it as logical and simple as possible so that you don't have to search for a long time. So organising everything at one level. That you enter and actually already see there, there and there are things. Views and lots of greenery in the area, we were lucky enough to have that beautiful estate on the east side, so when you enter the building you immediately look outside again. From the beginning, we made demands on ourselves, including, for example, that when you walk into a corridor, you already look outside at the end. Lots of daylight, views, good logistics, use of natural materials like wood and bamboo. It turns out that you can also reduce stress with the use of wood and bamboo. We had research done on kitchens, if children with cancer are given chemotherapy, then the taste and smell changes, and so we did a study on where the kitchens are and how the airflows are going to take place in the building so that we could guarantee that none of the children would experience the smells from the kitchen anywhere in their daily lives, because then they might get nauseous.

We worked a lot with colour. Like that bridge again, where you actually walk through a rainbow. Instead of having to walk from a to b, you go through a kind of experience, entering a space that is very different from what you expect. And that as a result you have a kind of your own perception of yourself, you are green and then you are blue again and then you are red again. But also the environment changes of course it is all a bit crazy and a bit fun.

But it was also very small things like acoustics, we had conducted interviews where we spoke to a boy who spent 1.5 years in hospital in his youth and he told us that he was very bothered by the noises in the hospital. And in the room, of course, there is always an IV pump somewhere and then a nurse has to come back in, they have to do something about it, so you are also constantly disturbed by the nurse in your rest or whatever you are doing. And we then thought, well then at least for the night situation, we will make sure that the IV pumps are not in the rooms, but in front of the rooms. So now there is a niche in the floor plan where the IV pump can be placed and there are very small holes in the wall through which the IV tube can pass. So if it beeps at night, the nurses don't have to be in the room and you hear it less or not at all in the room, but the nurses can still do their work. And through that, we wanted to make sure that patients get more rest. We tried to include things like that and then, of course, Kopvol came up with the parent-child room, where parents and children can sleep together in two rooms that you can connect or not connect. So that's how we looked at the sensory experience of the building in lots of different ways.

And it was also about creating, for example, a teenage lounge where teenagers can chill with each other or that you have a play area for the youngest ones so that you also meet your peers, who are going through the same thing, in an informal way and that you might therefore also exchange what you are experiencing, but also that you have offers of distraction. So that's really very broad so it's about sounds, it's about smell, it's about sight how does something feel sometimes. We had thought of a garden where children could put herbs and then smell them when they touch them, things like that. So it is very broad.

You just mentioned healing environment what aspects does that entail?

Yes, that depends a bit, there have been many different studies and they all say something different, but smell is an important one, daylight, views of greenery, acoustics, the scale of the building, so how do you reflect the human scale in it, orientation and meeting places. It's sometimes very small things if you look at that patient room then every patient room has a small niche made on the corridor side and then as a child you can actually sit there and watch what's going on around me, but that's already an invitation to get out of bed. And you are very safe, you are in a niche and there is even a gaming computer there now, so you can even play a game there. And those kinds of aspects that all add up to ultimately create a healing environment. And for us in this case it was important to say, our very first proposal was to say, no, you're not going to divide the hospital according to clinical profiles, because that's actually how every hospital is divided, but you're going to divide it according to age groups. For those children from zero to two have a different stage of development than two to five or six to 10 or 10 to 12. And if you are at that stage then you actually learn the most from your buddy, and you learn from that and you develop through that. It didn't end up being feasible, but it was a thought, go with the idea that a child's development continues along with that they happen to have a disease, rather than just putting the disease stage first.

Is it ever indicated that something is not working in the center?

Well, not working is a big word, but what they are saying, the PMC then, is that they very much need to make sure that those teenagers get out of the rooms, and that is what they are now considering whether those single rooms are the ideal thing for that age group. Whether it wouldn't be better to make double rooms

then. That's one thing where the question is now. But it was also, of course, when we started, the idea that everything was going to be focused on the parents and the children. And that therefore aggression would no longer occur, but that was an illusion. Because parents still get aggressive, because sometimes the stress just becomes too much. But I think as an architect you can only contribute to that to a certain extent to reduce it. What was also underestimated, in the beginning, is that 25 per cent of children with cancer die. And we did take that into account in the sense of designing our own route for that, for a child you want to say goodbye to. But we totally underestimated the impact on staff. But again, what should or could we as architects have done about that? That's a very difficult question. But a whole programme has now been built around that, with the aim of accommodating those people as well, but it has quite an impact.

And what, in your opinion, does child-friendly mean?
Well for example, the outdoor space. The outdoor space is designed in such a way that there is a very wide range of play space, which is also very fun for everyone. But at a certain point, someone comes up with the idea of putting up a fire truck for children to play with, but you have to realise that you are dealing with children from 0 to 18. So you shouldn't put that down then. So that's how we talked about it and that's why we also asked children what they actually want. You quickly think we're going to use red, blue and yellow. Children like that. But that's not it. It's about creating a warm inviting atmosphere where there is something to discover. Because that's what children do, they discover the world. And we wanted to create that without already filling in that exploration for them.

What do you want to add?
I can imagine that it is very stressful for a parent to take a child home. They undergo a treatment of which they understand little to nothing, sure they are educated, but parents never know as much as a doctor. And then you take the child home and the child says it has a stomach ache. And then what do you do? What does that mean then? I have a lot of respect for the parents who have to deal with a child who requires long-term care. It is no small thing they have to deal with.

Side note

I have conducted four very interesting interviews with a paediatric oncological physician, a paediatric physician, a nurse and an architect. My expectation was to also interview parents of children who require long-term care and when possible the children themselves. However, the topic is just too sensitive to talk about.

The research method of interviewing worked really well for the paediatric physicians, the nurses and the architect, but after a while I discovered that the research method did not work for parents and children.
That is the reason I changed my methodology and came up with a plan B.

I have watched two documentaries. The first one is a Dutch documentary called "Pilotenmasker" and it is about how the children use the healthcare facility when they are admitted. The second documentary is also Dutch and called "Stil water". This documentary addresses the topic of cancer and deals with the question: What if your brother, sister or child is diagnosed with cancer?

From conclusions of the interviews to guidelines for the design

Programmatic guidelines

1.

“Furthermore, they also need to make sure that the children exercise enough, to keep their condition good.”
(Paediatric oncological physician, 2023)

--> Sport facility

2.

“The courtyards and indoor play areas are felt to be very good. You can leave you child alone and let them do their thing.”
(Paediatric oncological physician, 2023)

--> Courtyard

3.

“I hear very good things about the restaurant downstairs, people like being able to walk to somewhere and get something to eat or drink.”
(Paediatric oncological physician, 2023)

--> Restaurant

4.

“But then when you think about the PMC, you can actually say that that is a big children’s playground, and that also works. ”
(Paediatric physician, 2023)

“For children, there is a wide range of opportunities to experience other things besides the treatments, we thought that was an important point.”
(Architect, 2023)

--> Playground and/or play area

Design guidelines

1.

“The parent council really wanted a window which was able to be opened, when they talked about designing this hospital. The window has now become a door. The door to the balcony, but they wanted to be able to receive fresh air.”
(Paediatric oncological physician, 2023)

--> Ability to open window or door

2.

“The funny thing is that especially the parents, who come to our hospital through shared care from Prinses Maxima Centrum, say: why can’t we sleep in pairs here? ”
(Paediatric physician, 2023)

--> Ability for both parents to stay over

3.

“I think the environment a child is in can definitely help. So through a colour, through drawings and illustrations, that that does create an atmosphere in a hospital.”
(Paediatric physician, 2023)

--> Use of colour and murals

4.

“Privacy is sometimes a thing, that sound comes through the wall from another room. That, of course, is not the intention.”
(Nurse, 2023)

--> Ensure privacy by the use of sound insulation

5.

“Also mentioned is that parents miss a fridge in the bedroom, actually all the conveniences and comforts of home.”
(Nurse, 2023)

--> Ensure the conveniences and comforts of home

6.

“What is also mentioned is the routing to the parent room. That it is far away from the rooms of the children. So the parents’ ideal image is that there is some kind of partition between a room with a connecting door or a curtain, that you can talk together as husband and wife for a while without waking up your child.”
(Nurse, 2023)

--> Ensure that parents are always able to be close to their children

7.

“What is also pointed out is views. Some rooms overlook the park which is nice to look at in summer and in winter. But the other rooms overlook a bridge.”
(Nurse, 2023)

--> Ensure that there are nice views

8.

“And daylight. This has also a bit to do with recovery because sometimes the sun doesn’t even shine in the rooms near the bridge and it’s just dark there all day.”
(Nurse, 2023)

--> Ensure that there is enough daylight in the rooms

9.

“And the windows cannot open. This is because of the danger of children falling out and also because of the ventilation system. But some parents just wish there was a window that could be opened. Because imagine being in isolation for weeks, which means you don’t get fresh air for weeks.”
(Nurse, 2023)

--> Ability to open window or door

10.

“Views and lots of greenery in the area, we were lucky enough to have that beautiful estate on the east side, so when you enter the building you immediately look outside again. From the beginning, we made demands on ourselves, including, for example, that when you walk into a corridor, you already look outside at the end.”
(Architect, 2023)

--> Ensure that there are nice views and that there is a lot of greenery in the area

11.

“Lots of daylight and good logistics.”
(Architect, 2023)

--> Ensure that there is enough daylight in the rooms and that the logistics works well

12.

“Use of natural materials like wood and bamboo. It turns out that you can also reduce stress with the use of wood and bamboo.”
(Architect, 2023)

--> Make use of natural materials

DOCUMENTARIES

Pilotenmasker

In the Dutch documentary "Pilotenmasker" children are very closely followed during their stay at the Prinses Máxima Centrum in Utrecht (de Jong, Pilotenmasker, 2017). This center is a paediatric oncological center where children with cancer are diagnosed and treated. You can see them enduring a lot, from scans and injections, to operations and hair falling out. The filmmakers made the documentary in such a way that you can see the children cope. The documentary is really made from the child's perspective.

The children are also given a camera themselves, so that they can film what they are doing during the day or what is happening. You can see ceilings from hospital beds, the endless series of tubes they are attached to and the orange footsteps in the corridor they need to follow. The period in hospital is an emotional rollercoaster. How do they endure the sometimes painful procedures, how do they react to disappointing results and how do they cope with their illness?

The documentary starts with Owen a child, who needs an MRI. You can tell by the way the mother speaks to the child, that they have practiced the procedure the day before with a social worker. Owen does not want to lay down on the bed and they start doing breathing exercises, but this does not help. The mother tries to bribe Owen with a small present, but Owen is really postponing the moment of the scan. Eventually, they manage to get Owen to lie down and mother can stay with him during the scan.

During the documentary we also meet Isa, she needs to be admitted and walks in with her suitcase. They start looking at the "Kanjerketting" this is a chain of beads, where one bead is added every time something special happens. Like chemotherapy, or an injection or the start of dexamethasone (a kind of prednisone). About the start of dexamethasone, the mother says that that makes Isa so very happy and nice all the time. Sarcastically.

We then meet Florence. She has an appointment with the physician about the progress of the treatment. Her mother is asked whether she manages to give all the medicines at home. She says that she manages, as long as the medicines are in a sweet and liquid form. Florence even says that she likes the medicines.

In Vera's case, the patch needs to be changed. You can clearly see that she doesn't feel like doing this and is putting it off. Eventually, the nurses manage to take off the patch together with the mother. But then comes the worst part, the needle prick to connect the central line, to eventually draw blood. The tears begin to flow. The social worker tries to distract her from what is happening, but it is not working. The nurse puts the central line in very quickly and then the tears stop. She gets to pick two beads for her "Kanjerketting", the bead for taking off a patch and the bead for pinning on the central line.

Then we are back with Owen, he is standing in the windowsill, looking at the views. But then, he needs a new tube for tube feeding and he absolutely does not want that. His mother has to hold his hands and the nurse puts in the tube.

Then we are back with Vera, she is drawing on the window of her room and films that with her own camera. She is talking to herself about the drawing and that her mother is on her phone. We then see her walking to the elevators with the IV pole, she is attached to. She needs to be measured and weighed. Then she needs an ultrasound of her belly and she asks her father to stop filming.

Owen is not doing well. Owen's parents have a conversation with the doctor about him not having long to live. He is allowed in with the police car. Because of the dexamethasone, he has a very swollen head. He is not happy. Sadly he died in the end.

Figure 6: Vera looking directly into the camera

Stil water

In this documentary, three families must learn to cope with the reality of having a child or sibling with cancer. The lives of the family members around Fien, Matthijs and Bente are disrupted by this disease (de Jong, Stil water, 2023). The children Fien, Matthijs and Bente were all diagnosed with cancer and since then their lives have not been the same. It is tough, not only for the sick children, but also for their parents and siblings.

Matthijs (11)

The documentary starts with the father of Matthijs, talking about it also being a blessing that Matthijs was diagnosed with cancer. It brought the family closer together and he realises more and more how much he loves him.

Dad: "I was much more interested in what Steven and Reinier were doing, they are very smart guys, and Matthijs started playing the clown at one point. And he did get attention with that, but at some point we did notice that everyone started to find it annoying."

Physician: "I have good news, the MRI looks good. We actually see no sign at all that the disease is returning on this footage.

Fien (6)

We then meet Fien, her parents have an appointment with the physician. It is not going well with Fien, therefore the parents need to prepare themselves a bit more and more. The mother recalls the day when they just found out. She asked the physician if she would still live to be six years old and they said we don't know. "And I thought, that's in five months, she might not make it. I was really shocked. That's when you really realise that she is so sick, that she is going to die".

Mom: "I sometimes feel guilty about the fact that Fien cannot do much. Now she can go to the toilet on her own again, but she couldn't even do that for a while. And then she could also act like a princess and that is also difficult. Because you want to help her, but you also want to raise her, you are in a split, so to speak."

Physician: "Well, here we are again. The MRI actually confirms that there is growth. Taking the growth rate into account, there really is a reason to go back to radiation."

Sister: "Much more often we say we're going to go for a walk together"

Mom: "I just don't want her to suffer."

Sadly she died in the end.

Bente (3)

Bente's mom says: "Your emotions go all over the place. Taking care of a child with cancer is also difficult, because everything you normally stand for, suddenly doesn't really stand anymore. Like screen time and eating. It's just hard."

Physician: "You are now almost four weeks into treatments and that means we are going to reduce the dexamethasone, which is good news regarding the wanting to eat all the time and the tantrums."

The scene begins with Bente's brother Tim wondering whether Bente is coming home happy. Unfortunately, she is not; she is cranky and wants a breadstick. The mother wants to grab the breadstick, but Tim volunteers and grabs it. Meanwhile, the mother grabs the food from the freezer and reads the letter that has been written. It turns out the food was made by the parents of a friend of Tim's and she starts crying.

Mom: "Sometimes we do say that we have to make sure that we continue to be there for all of the four children in a good way. Of course, we do say that the focus is now a bit more on Bente, but the other three also deserve our attention."

Mom: "We notice from Tim that things are not going so well, he keeps bottling things up. So for him we have also brought in a children's coach so he can also tell his story."

From conclusions of the documentaries to guidelines for the design

Design guidelines

1.

“Then we are back with Owen, he is standing in the windowsill, looking at the views.”

(de Jong, Pilotenmasker, 2017)

--> The ablility to stand comfortably and safely in the windowsill to be able to look at the views or draw on the window.

2.

“I sometimes feel guilty about the fact that Fien cannot do much. Now she can go to the toilet on her own again, but she couldn’t even do that for a while.”

(de Jong, Stil water, 2023)

--> Toilets and bathrooms accessible for disabled children

3.

“Sometimes we do say that we have to make sure that we continue to be there for all of the four children in a good way. Of course, we do say that the focus is now a bit more on Bente, but the other three also deserve our attention.”

(de Jong, Stil water, 2023)

--> The ablility for the siblings to also stay over

OBSERVATIONS

Parent - Child Unit

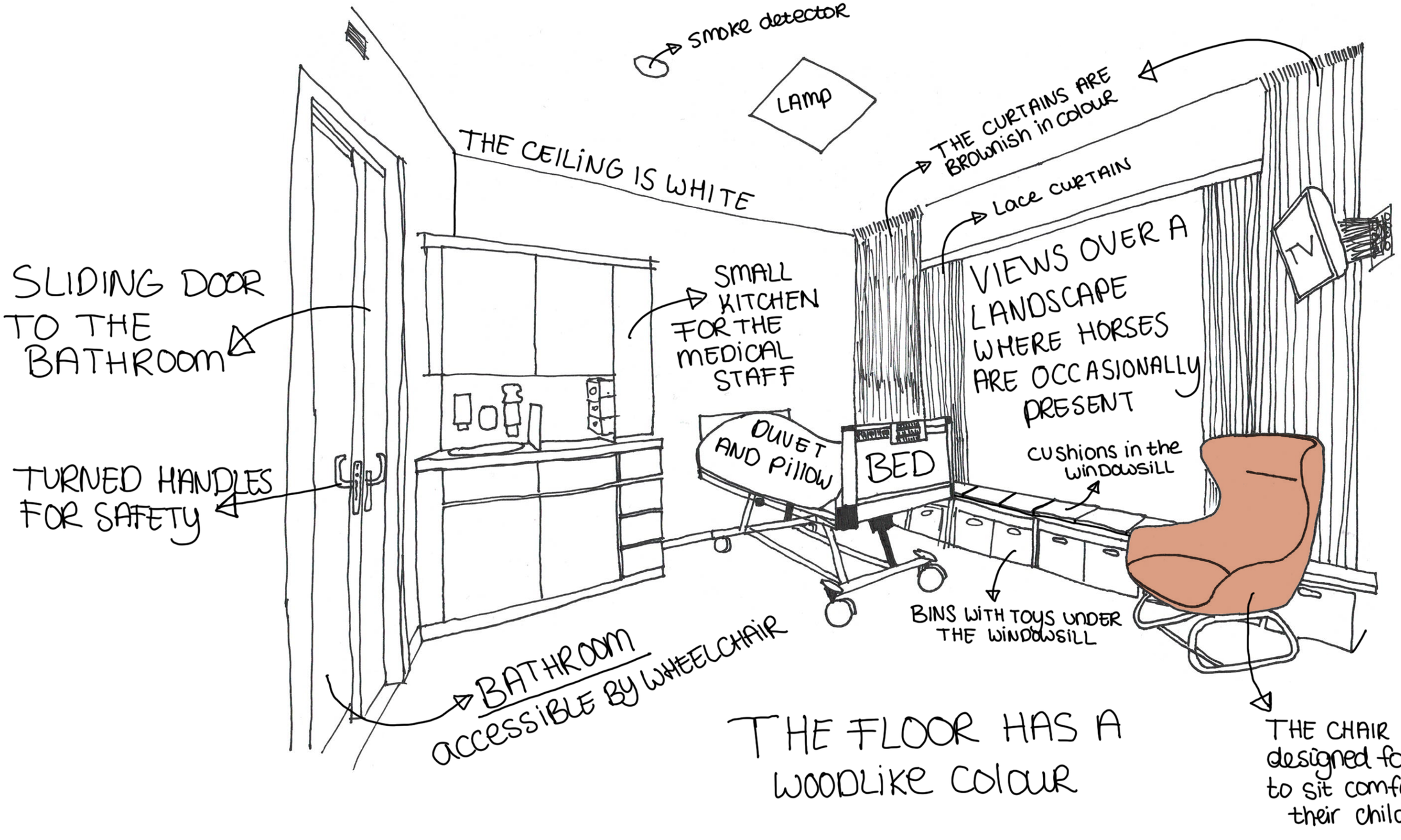


Figure 7

OBSERVATIONS

Parent - Child Unit

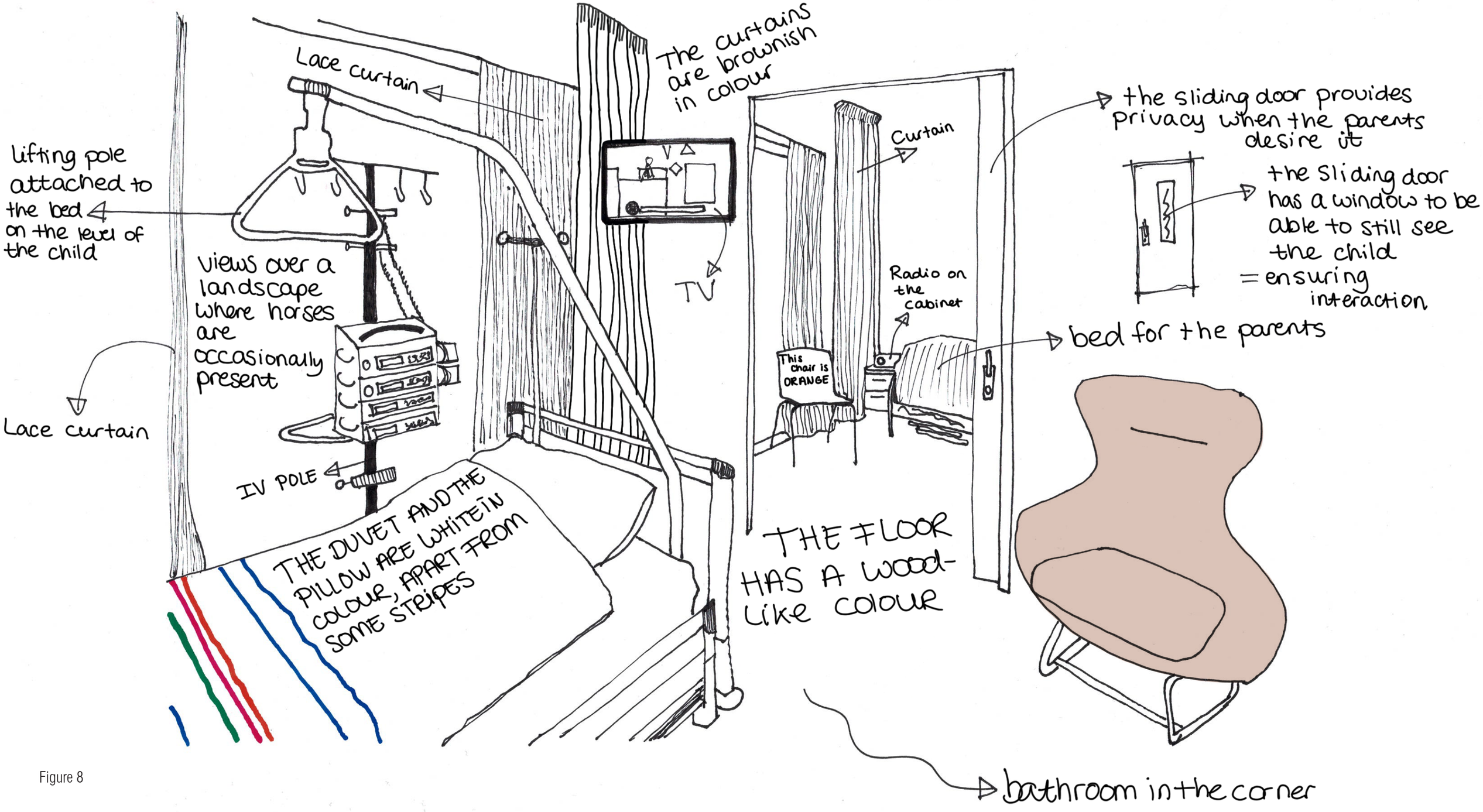


Figure 8

OBSERVATIONS

Control room

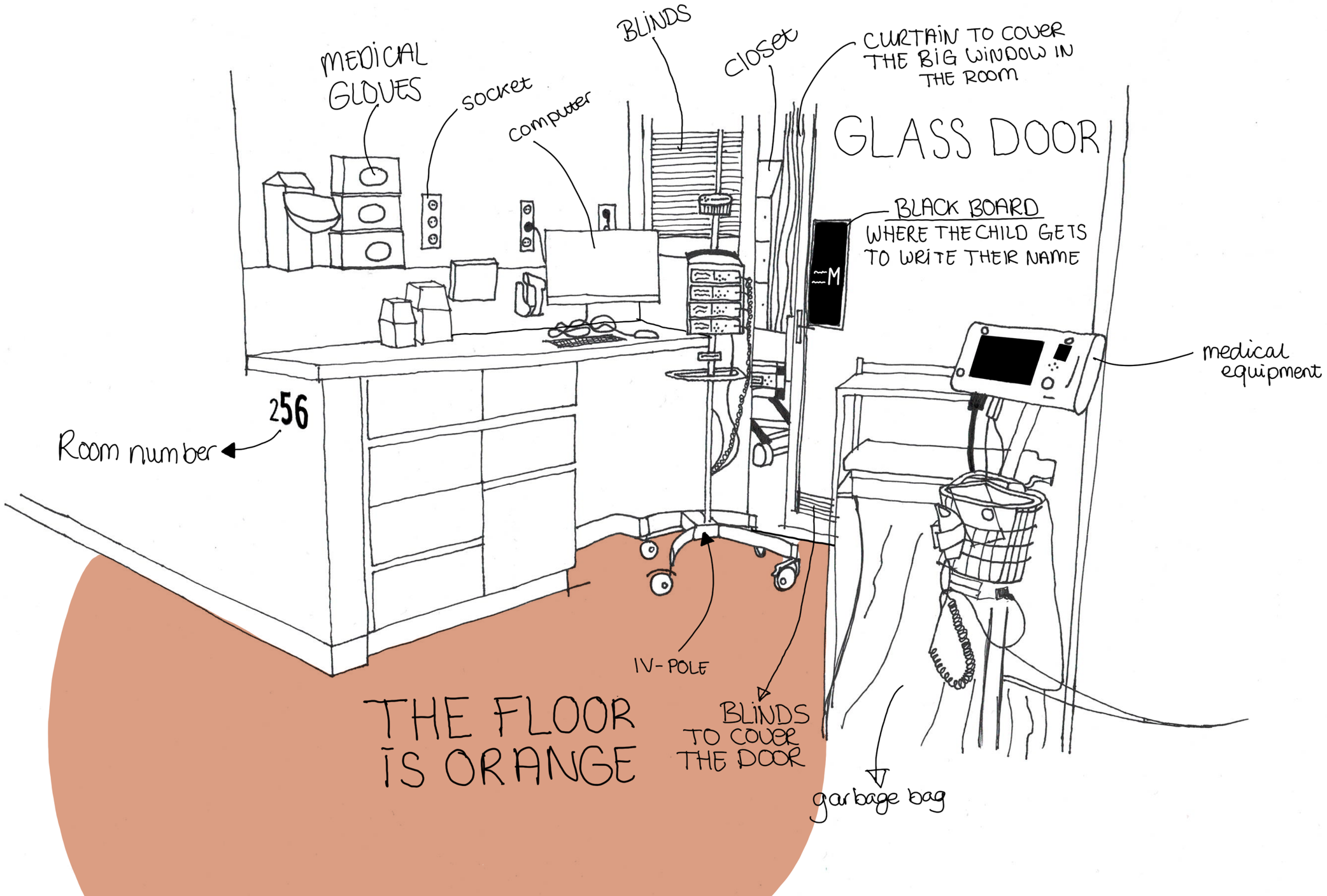


Figure 9

OBSERVATIONS

Little play area

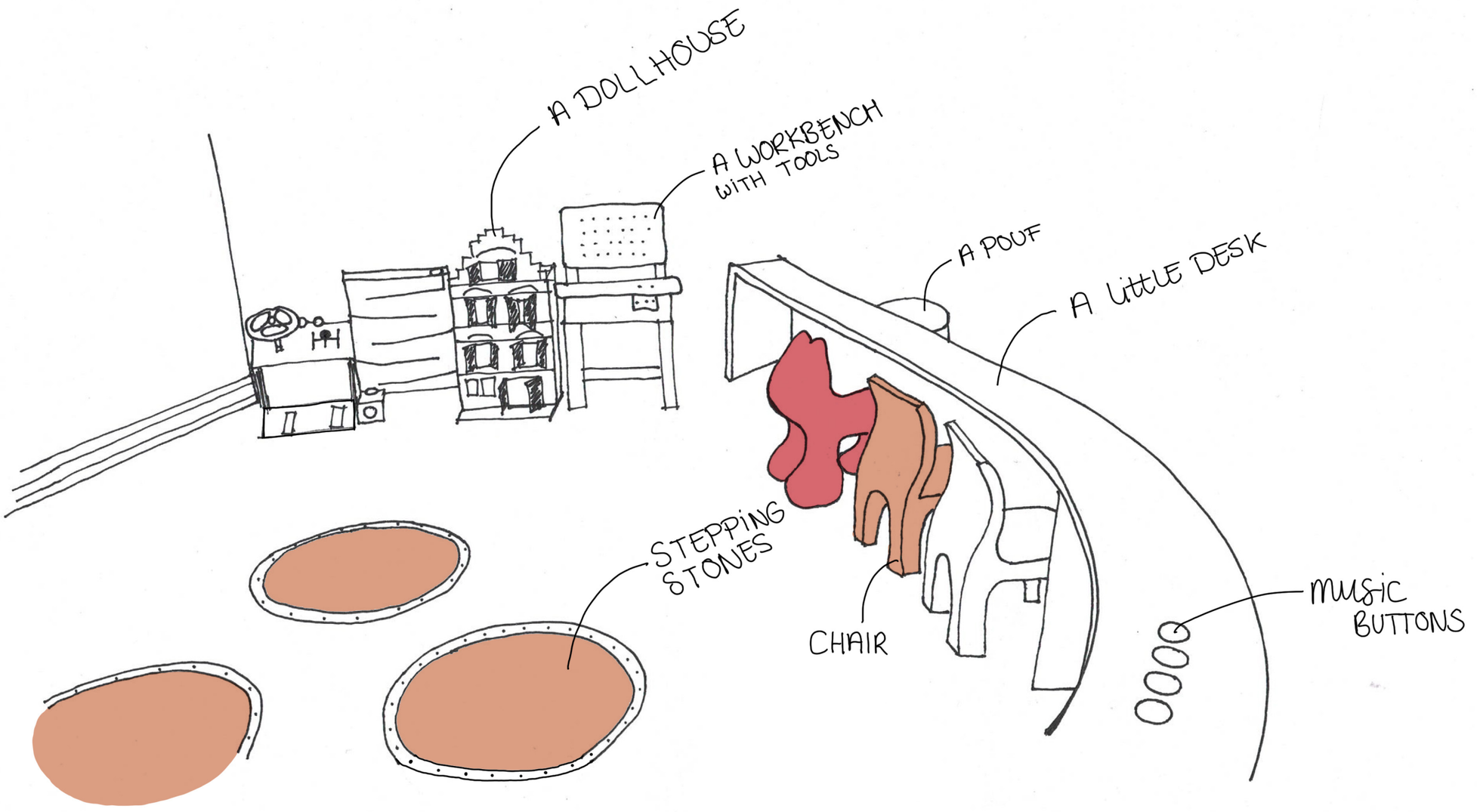


Figure 10

OBSERVATIONS

Waiting area

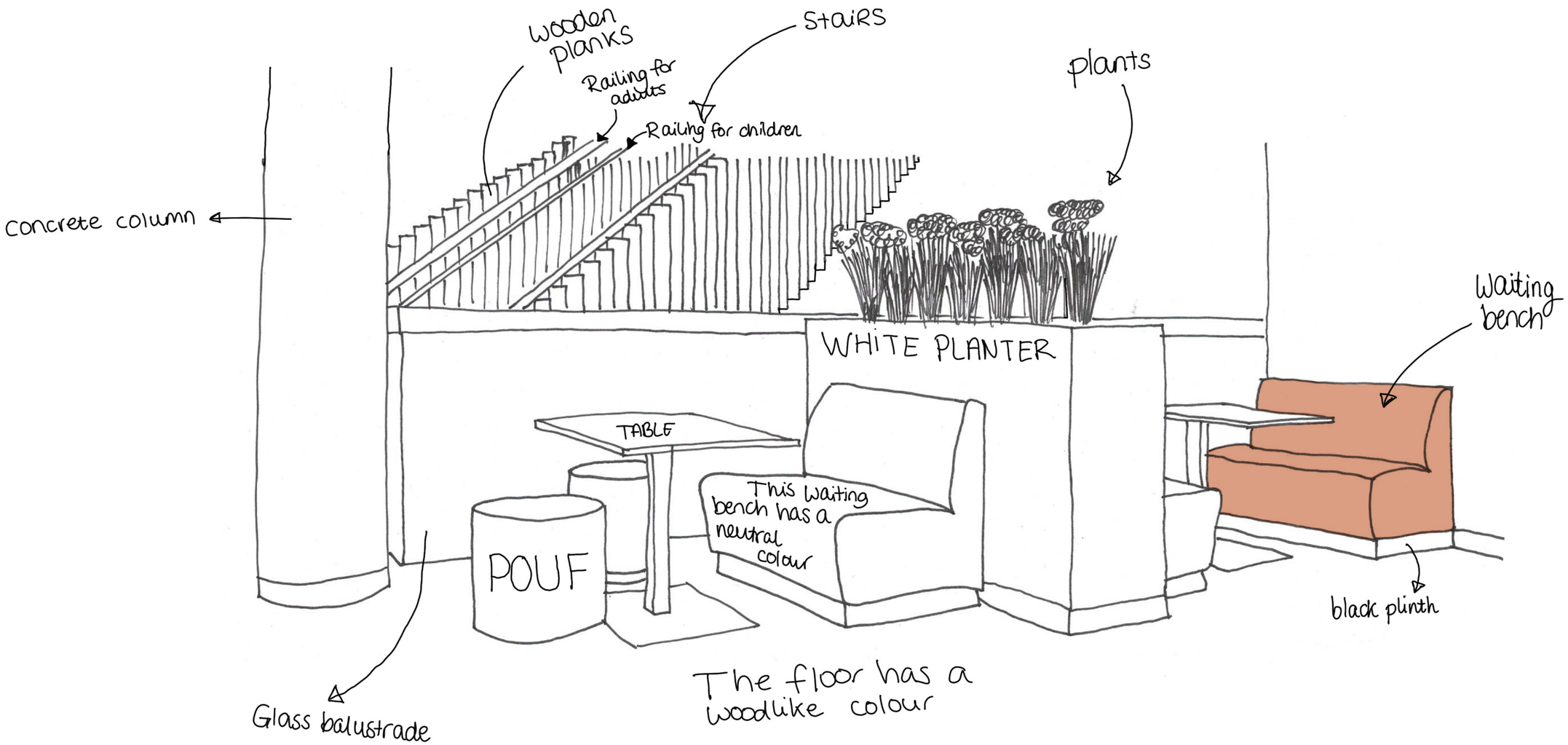


Figure 11

OBSERVATIONS

Reception

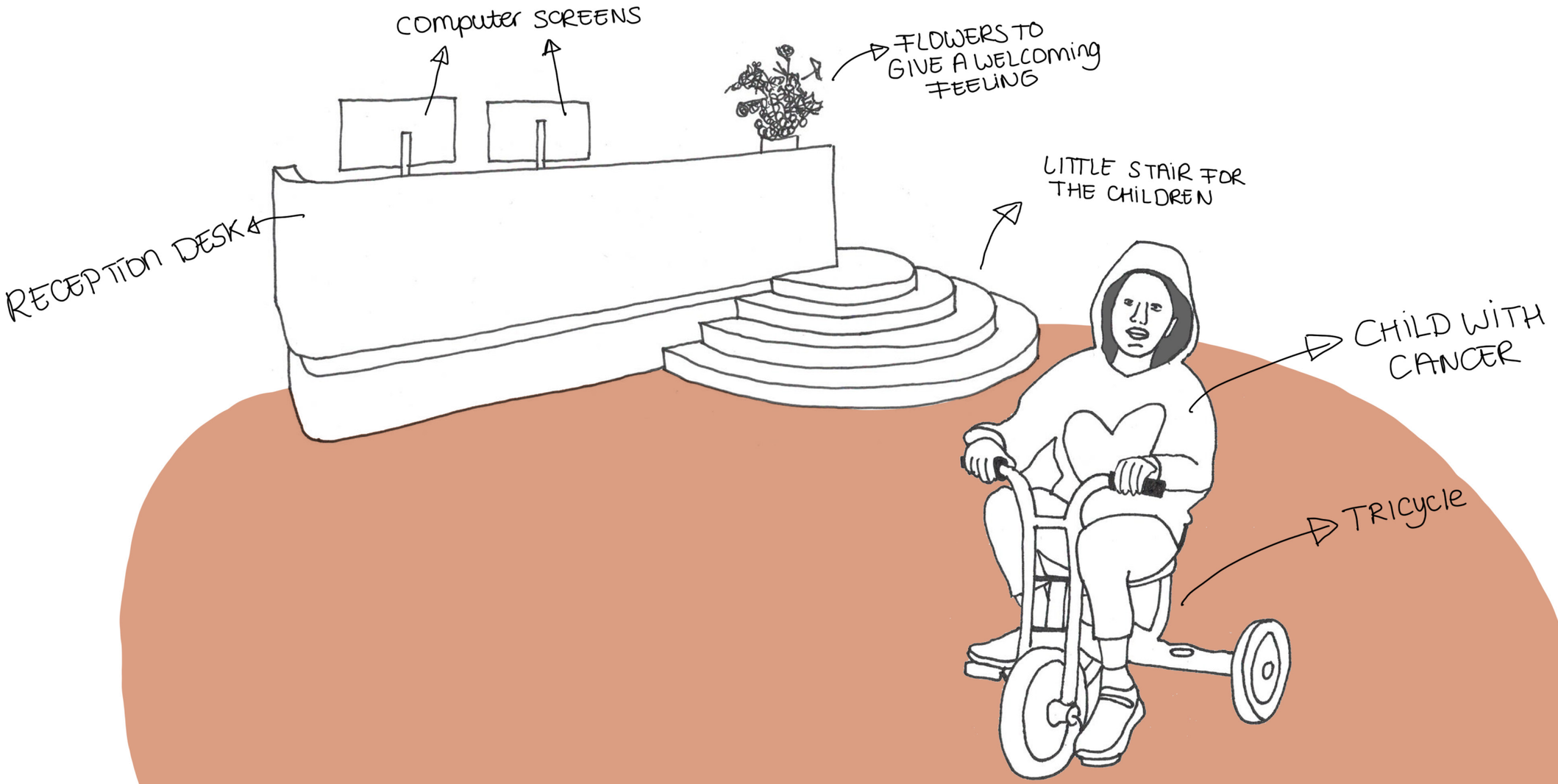


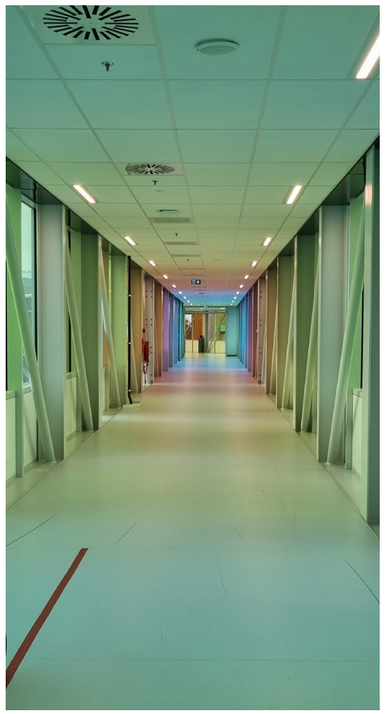
Figure 12

OBSERVATIONS

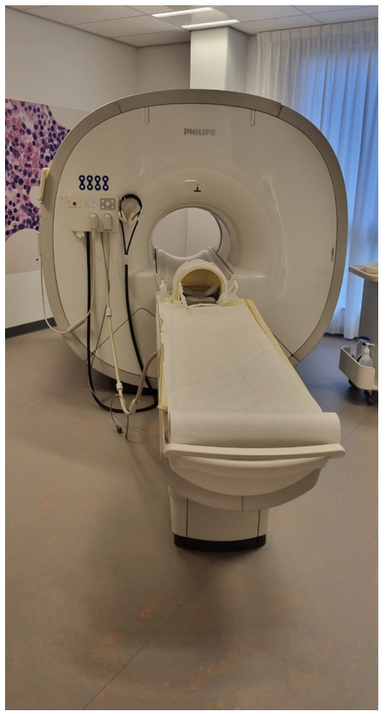
Moodboard own photographs












OBSERVATIONS

Side note

I was going to keep a diary about what a day in the life of a child with cancer looks like, however, this did not work out because I was not allowed to have contact with the parents and children during the fieldwork week. And since, as also mentioned before, I did not manage to get in touch with parents who have a child with cancer, I did not get it done any other way either.

Despite the above, I learnt a lot during my fieldwork week. By sketching some spaces, it has become clearer how a hospital works and which design guidelines I can formulate.

From conclusions of the observations to guidelines for the design

1.
--> The ability to stand comfortably and safely in the windowsill to be able to look at the views or draw on the window (figure 7 & 8)

2.
--> A TV (figure 7 & 8)

3.
--> The use of a sliding door to the bathroom (figure 7)

4.
--> Bathroom accessible by wheelchair (figure 7)

5.
--> The ablility to 'own' a room by putting up your name on a blackboard (figure 9)

6.
--> A play area for the little ones who are not able to go outside alone (figure 10)

7.
--> Thinking of the children in small ways. For example, by the use of a little stair by the desk where you can check yourself in or by the use of a railing for children only (figure 11 & 12)

CASE STUDIES

The need for a study on different cases emerged when it was obvious that visiting the chosen cases was not possible. However, studying cases that are in the scope of the to be designed building, allows for a better understanding of how existing buildings are designed. By doing case studies, the program of the to be designed building can be determined.

For the selection of the cases, cases have been chosen that comply to the criteria of healing environment for children. However, not every case has children as the main user of the building. For example the new MAGGIE'S CENTER and the buurtzorgpension have adults and elderly as the main user of the building. The reason these two cases are studied anyway is because they have something to do with cancer or home care. Since this is something that came out of the interviews to be important. The cases are also studied because the architect used research for healing environment of adults and this has an overlap with the healing environment of children, as you can see on page 11 and 13 of my theoretical framework.

All the case studies are designed by Dutch architects and are realised in the Netherlands. By ensuring that the context of each building is somewhat the same, the aspects that will follow as being important will also be comparable.

Every case has a short introduction of the background of the project. Furthermore, this study will focus on several aspects, which are:
- The floorplans
- The facade
- Outdoor spaces
- Area of spaces
- Programmatic arrangement

Figure 13

Figure 14

Figure 15

CASE STUDIES

MAGGIE'S CENTER - Groningen

The concept of Maggie's Centers originated in the United Kingdom. Most of the Maggie's Centers in the United Kingdom are designed by famous architects, such as Zaha Hadid and Rem Koolhaas. The aim of the Maggie's Centers is to create a place where there is a sense of home and where architecture plays a role in the healing process (Weessies, 2018). It should also be a place where cancer patients and their loved ones can go to for practical, emotional and social support (Maggie's center Groningen, 2023).

The Maggie's Centers can be described as a friendly and calm environment with a warm feel. It is a homely place where clients, before, during or after treatment in a hospital can prepare themselves, recover and/or chat (Maggie's center Groningen, 2023).

The majority of healthcare buildings in the Netherlands are characterised by an institutional appearance.
(Maggie's center Groningen, 2023)

.

By introducing healing environment into the design process, a whole other level of healthcare facilities can be achieved. According to Marlies Rohmer Architecture and Urbanism, the essence of healing environment rests on the idea that the environment in which people stay affects their health, and that a well-designed building contributes to the patient's healing (2023).

Figure 16

Figure 17

Figure 18

Figure 19

Floorplan

Inspired by the monastic typology, a system of intimate, informal to inviting collective spaces have been designed. And according to the different moods of clients, a differentiation of atmospheres. The choice lies with the visitor whether there is a need for seclusion or social interaction (Weessies, 2018).

The floorplan is almost mirrored, in a sense that the spaces along the front facade are mirrored over the axis of the entrance. The spaces on the other side of the building are almost mirrored over the axis of the entrance. The group rooms together are bigger than the exercise group room. This makes that the facade on this side is a bit different and even more playful. The outdoor space, on the other hand, differentiates itself by protruding and recessing parts.

North-east facade

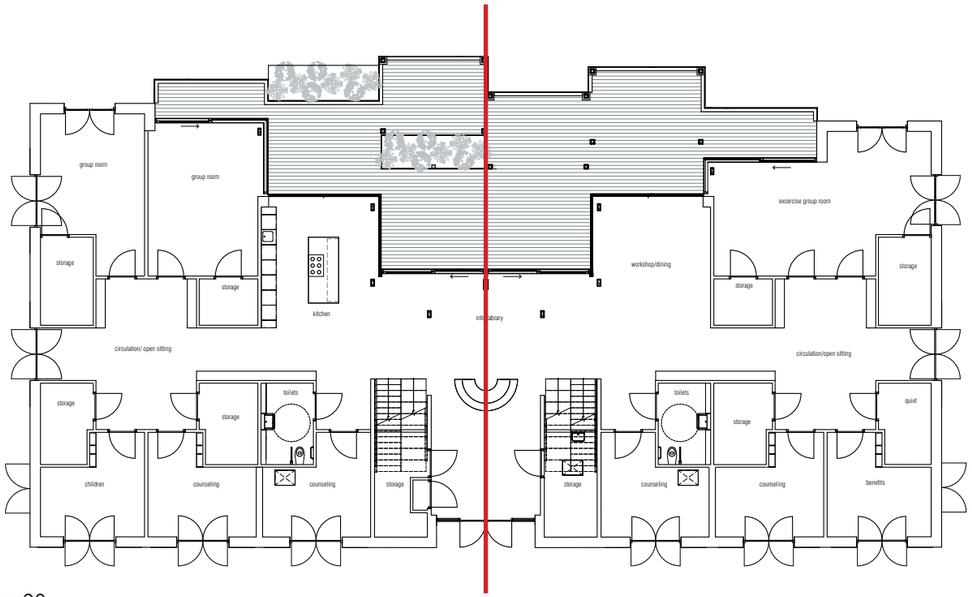


Figure 20

Proton building UMCG

Facade

The facade of Maggie's Groningen has, so to speak, two faces. The front facade of the building is somewhat more closed because of the proton building of the UMCG on that side of the building. The spaces that require more privacy are situated on the side of the proton building. Because this side is orientated towards the south-west, shutters are designed to keep the sun out when necessary. The other side of the building, on the other hand, is much more open and contains much more glass. Windows covering floor to ceiling are designed to fully open up the building to the landscape. The experience of all seasons was a starting point.

Outdoor spaces

The ground floor features one big outdoor space on the North-East side of the plot. This side is chosen because of the landscape into which it blends. This side is also chosen because on the other side of the building, the South-West side, the Proton building of the UMCG is located. To be able to give the visitors a sense of privacy when they go outside, the outdoor space is designed by Piet Oudolf. He is an expert in the composition of plants and the orchestration of seasons, again with a place for every emotion. The outdoor space enables each individual to find a place to take a moment to find yourself.

The outdoor space is 126 square meters and thereby occupies 22 percent of the building and the outdoor space together.

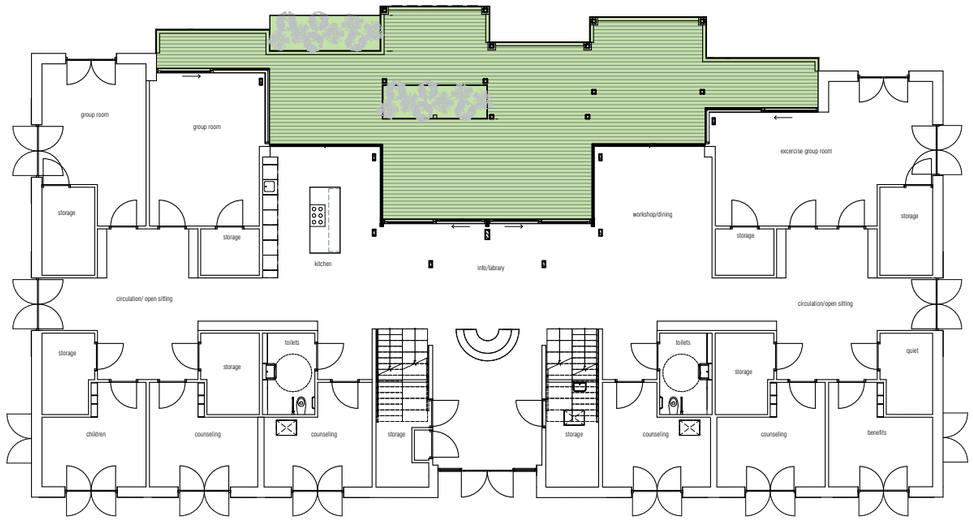


Figure 21

LEGEND

Outdoor space

Area

The whole area of the building, including the outdoor space, occupies 583 square meters. The biggest space of the building is the plaza with 202 square meters. This occupies 35 percent of the whole building, including the outdoor space. As already mentioned before, the outdoor space occupies 22 percent and therefore the other 43 percent is occupied by other spaces like, for example, the mutiple storages but also the exercise group room and the counseling rooms.

Plaza	= 35 %	= 202 m²
Outdoor space	= 22 %	= 126 m²
Staff	= 3 %	= 15 m²
Storage	= 10 %	= 61 m²
Other spaces	= 30 %	= 179 m²

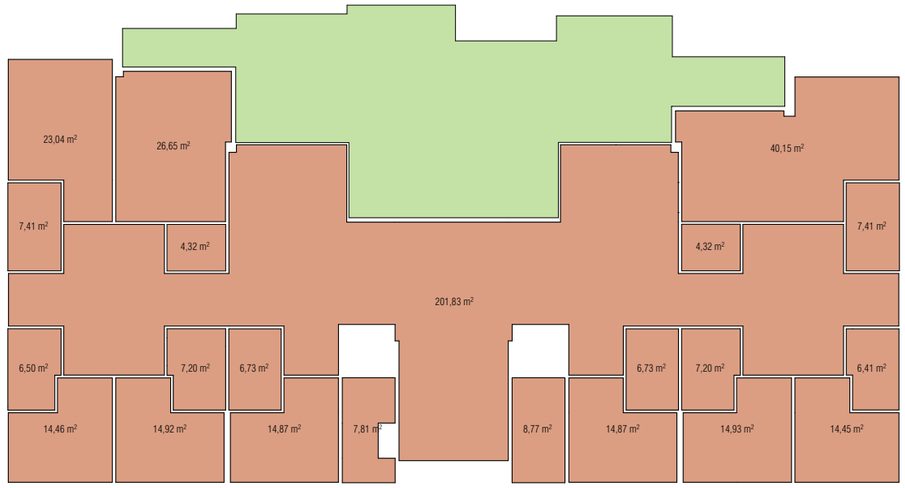


Figure 22

LEGEND

Indoor space

Outdoor space

Programmatic arrangment

The floorplan shows a diverse set of functions. From an exercise group room to counseling and from a quiet space to a children's room. Also the plaza shows a diverse set of functions. From a dining and a kitchen to a library and an open sitting area. This allows people to choose whether there is a need for seclusion or social interaction (Weessies, 2018).

The kitchen, located in the plaza, has a glass facade completely from floor to ceiling. This glass facade forms the bridge between inside and outside and brings the nature inside. As a result, the kitchen functions as the beating heart of the building.

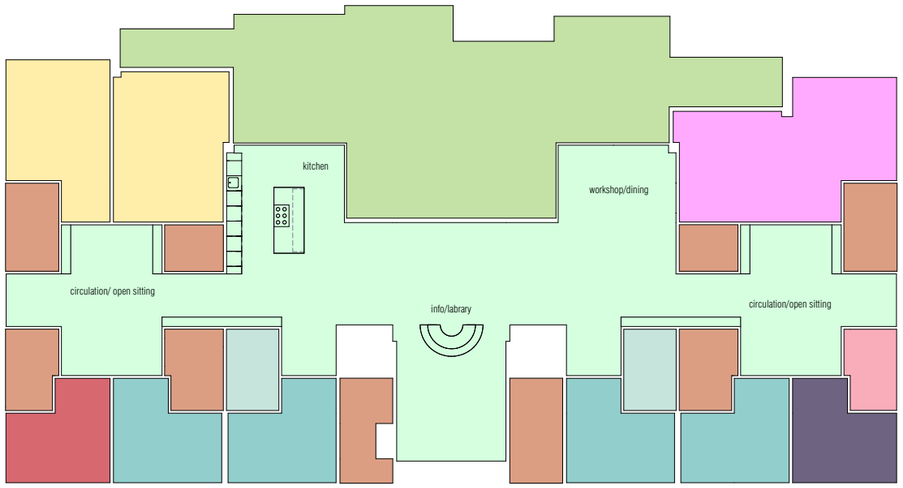


Figure 23

LEGEND

- Exercise group room
- Children
- Quiet
- Storage
- Group room
- Plaza
- Toilets
- Counseling
- Benefits
- Outdoor space

CASE STUDIES

Prinses Máxima Centrum - Utrecht

The average of children diagnosed with and dying because of cancer is declining since 1970. Where in 1970 238 children were diagnosed with cancer, is this number in 2016 61. The biggest decline in childhood cancer mortality occurred in the 1970s and 1980s. After that, childhood cancer mortality declined more slowly (Steeds minder kinderen sterven aan kanker, 2018).

In the Netherlands almost 600 children are diagnosed with cancer for the first time every year (de Ruwe et al., 2023). It is because of that that it was decided a couple of years ago that the care for children with cancer needed to be centralised. This in order to be able to provide the best care possible (Bögl, 2023).

The choice for the location was Utrecht, since this is a central location in the Netherlands Now, the Prinses Máxima Centrum in Utrecht is open since 2018 and provides paediatric care for children with cancer. All children aged zero to eighteen years are welcomed as if the building is their second home (Bögl, 2023). The building has a total of 85 parent-child-units and has an average bed occupancy of 69. The average length of stay of the paediatric patients is 7,5 days (de Ruwe et al., 2023).

Figure 24

Figure 25

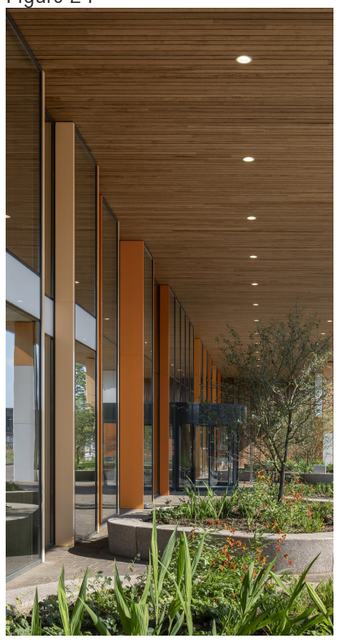


Figure 27

Figure 26

Figure 28

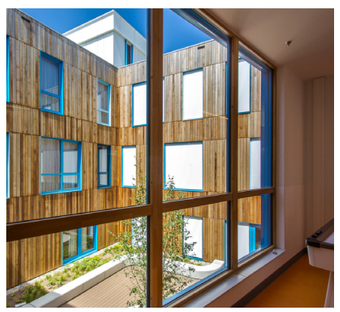


Figure 29

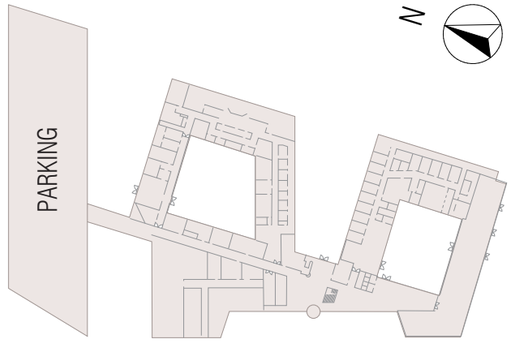


Figure 30

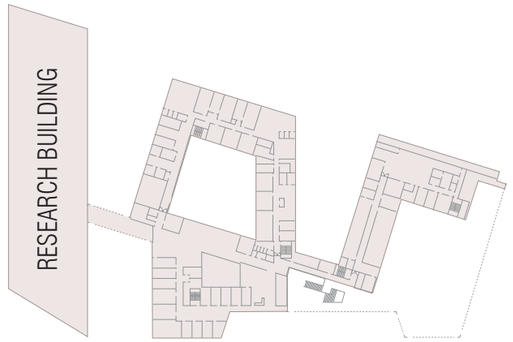


Figure 31

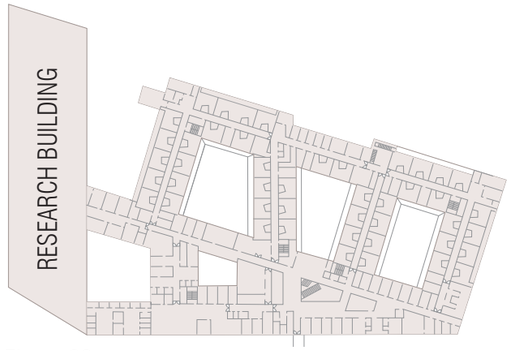


Figure 32

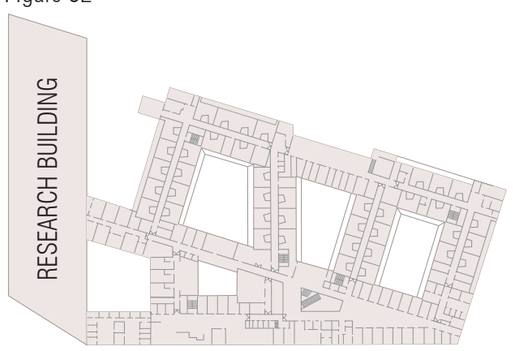


Figure 33

Floorplans

The researcher only received information about the spaces where patients are able to go. Therefore, spaces such as the research building will be excluded from the research.

The building is shaped in such a way that a lot of daylight can enter the building. The courtyards contribute to this. All the spaces are orientated towards an outdoor space. Internal corridors ensure that every space can be reached.

As you will see in the analysis of the program, the second and third floor of the area where the patients are allowed to come, are dedicated to care. The bedrooms where the children sleep are situated on that floor and also other care facilities are situated there. The first floor, however, is dedicated to the staff. Spaces like offices and the laundy dominate this floor.

Facade

The facade is made out of materials which are low-maintenance. This is done with the goal to ensure that most of the money and time is spent on care and not on the maintenace of the building (Kamp Coating Groep, 2023).

The facade is made out of panels which are white. When one looks to the facade from the front, the building appears to be white. However, when one looks at the building from an angle, the building has a colourful barcode. The colours of the building are determined by the associations which a hospital evokes. The white facade refers to the white coats which are worn by the healthcare professionals. The coloured, vertical parts refer to the coloured barcodes that dna scientists work with. With these parts the building is supposed to radiate optimism and warmth, through its many colours (Bögl, 2023).

What is also special about the facade, are the 714 solar screens that are placed. These solar screens work based on a weather station on the roof of the building. When the sun begins the shine or when it starts raining, the solar screens will adapt automatically (De Groot en Visser, 2023).

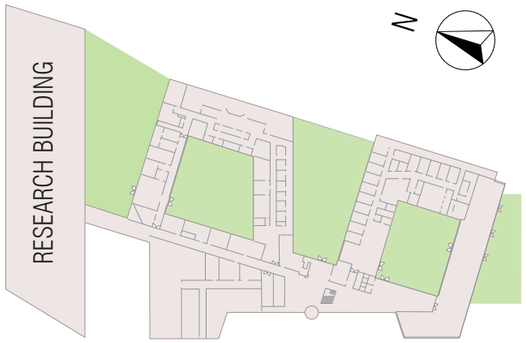


Figure 34: Outdoor spaces ground floor

Outdoor spaces
The ground floor features two enclosed courtyards, two semi-enclosed courtyards and one garden on the right side of the building.

The outdoor spaces are designed in such a way that there is something for everyone. The first completely enclosed courtyard is an area commonly used by the physiotherapist. The area is also designed in such a way that there is place for him to do exercises with children. However, the children are also welcome to play in the area when they do not have physical therapy.

Figure 35: Outdoor spaces

Conclusion
Because of the design of the outdoor spaces and the quantity of them, almost every space inside the building has the ability to look towards a green area. Also daylight is taken care of inside the big building because of these courtyards.

Figure 36: Courtyard commonly used by physiotherapist

Area
The whole building has an area of around 45.000 square meters and is still expanding today. This makes the building the largest paediatric oncological center in Europe. The ground floor has an area of 8.610 square meters. This is including the parking garage on the ground floor underneath the research building. When the parking garage of 2.780 sqare meters is excluded, the area of the building is 5.830 square meters. This includes a restaurant, a place where children and adults who have had cancer can come for their check-ups (later-polie), the physiotherapist and radiology. The overall area of the building where patients are able to come is 29.615 square meters. The area hereby excludes the large research building on the North side of the plot, which is partly connected to the care building. Also, when calculating the percentages, all the floors of the research building and the parking garage were excluded.

Third floor	= 7564 m²
Second floor	= 7564 m²
First floor	= 4621 m²
Ground floor	= 9866 m² (INCL. OUTDOOR SPACE)

When zooming in on the functions of the building, it can be said that roughly 5.767 square meters of the building belongs to the staff.

Staff	= 19,5 %	= 5.767 m²
Care	= 47,8 %	= 14144 m²
Entertainment	= 3,7 %	= 1101 m²
Outdoor space	= 14,1 %	= 4.168 m²
Other spaces	= 14,9 %	= 4.413 m²

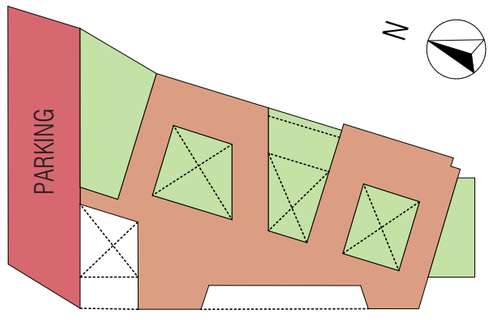


Figure 37: Ground floor PMC

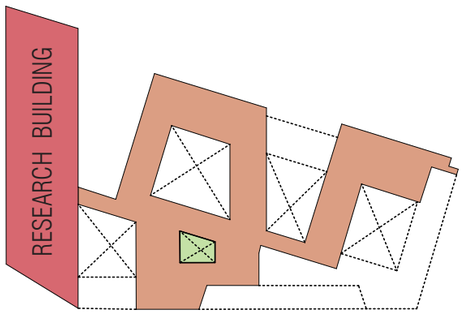


Figure 38: First floor PMC

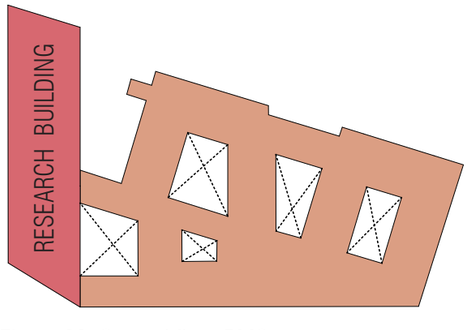


Figure 39: Second floor PMC

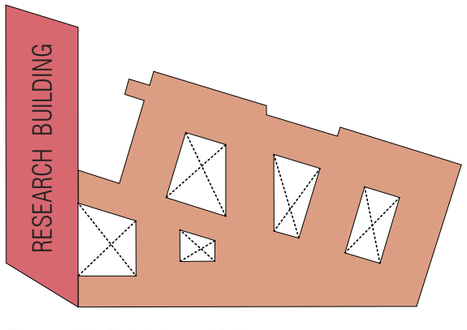


Figure 40: Third floor PMC

Programmatic arrangment

Care on the ground floor consists of a sport and movement area, where children who are admitted can do workouts. A radiology department and a department for children and adults who have had cancer. On the first floor there is no care. This floor is meant for the staff. There is also a part of the floor meant for the children to play and learn. This area consists of a school, a theater, a library and much more. The second and third floor of the building are dedicated to care. It can be seen in figure 43 and 44 that the staff and the other functions are less present on this floor. Four wards on each floor, eight wards altogether, form the main area for care. Each ward has a specific name, for example, castle or windmill, to make sure that parents and children can find their way around.

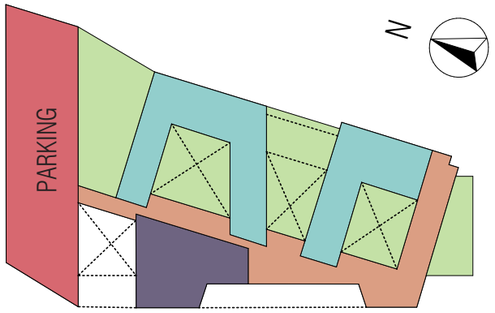


Figure 41: Ground floor PMC

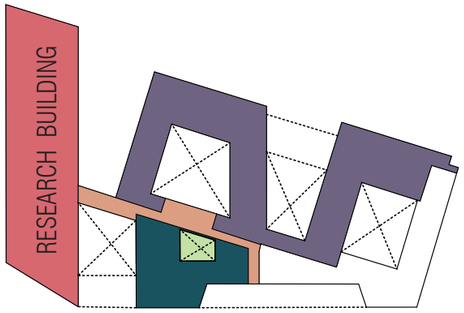


Figure 42: First floor PMC

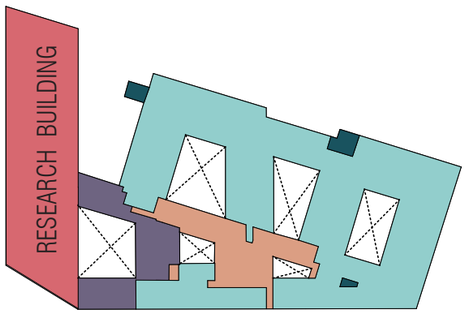


Figure 43: Second floor PMC

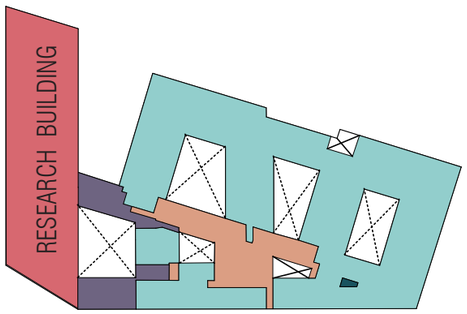


Figure 44: Third floor PMC

LEGEND

- Parking / research building
- Other spaces
- Outdoor space
- Care
- Offices
- Entertainment

Parent-Child-Unit

The care department consists of parent - child units. Each child that is admitted to the hospital, will have his or her own room.

The parent - child unit is the room where children stay when they need to be admitted to the center. The unit is specially designed for parents to be able to stay over when their child is admitted to the center. This unit is equipped with everything a child and a parent needs and is designed in such a way that the space is used to its full potential. Privacy is taken care of by separating the parents from the children, however, the sliding door with glass ensures that children are always able to see their parents.

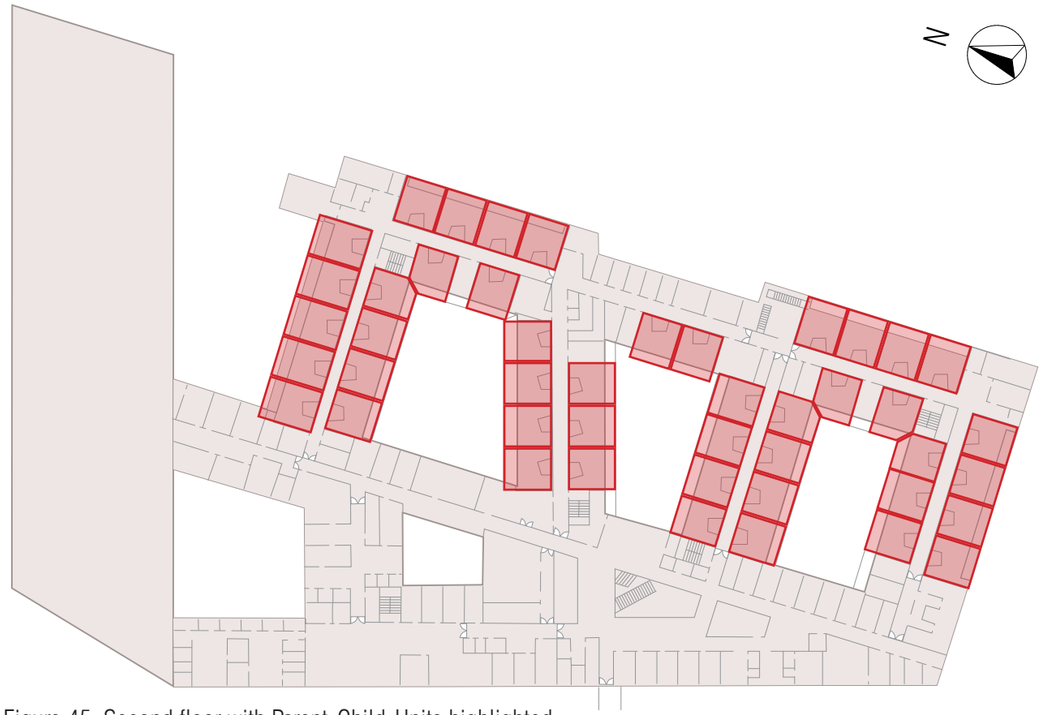


Figure 45: Second floor with Parent-Child-Units highlighted

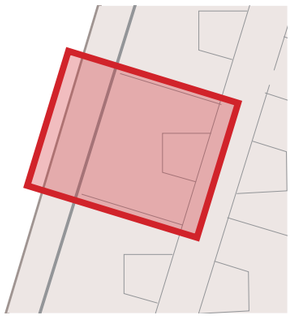


Figure 46: Parent-Child-Unit

Figure 47: Top view Parent-Child-Unit

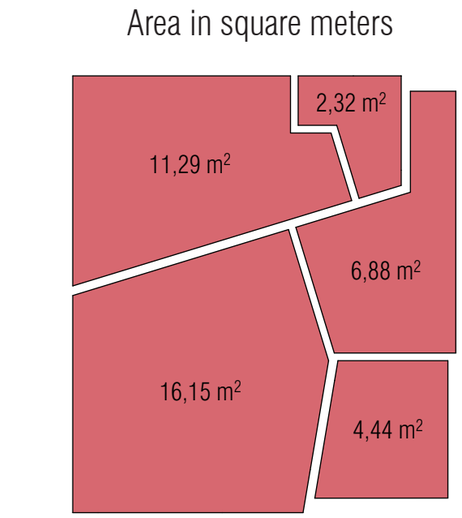


Figure 48

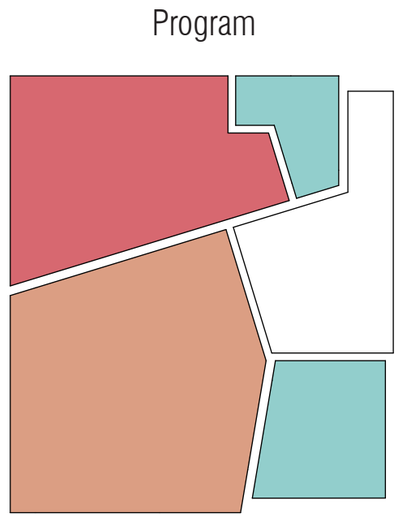
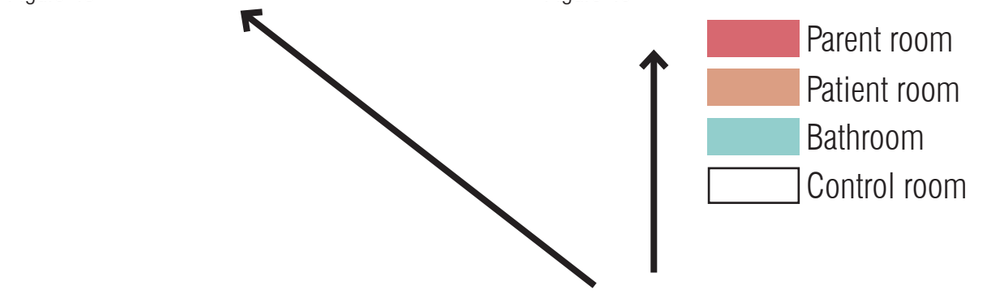


Figure 49



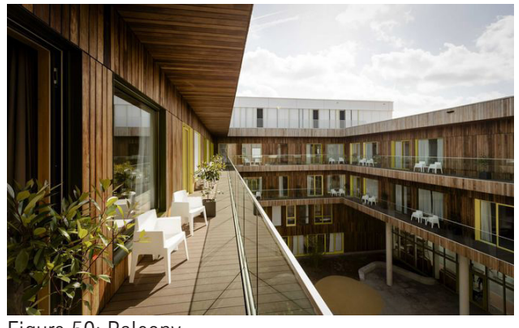


Figure 50: Balcony

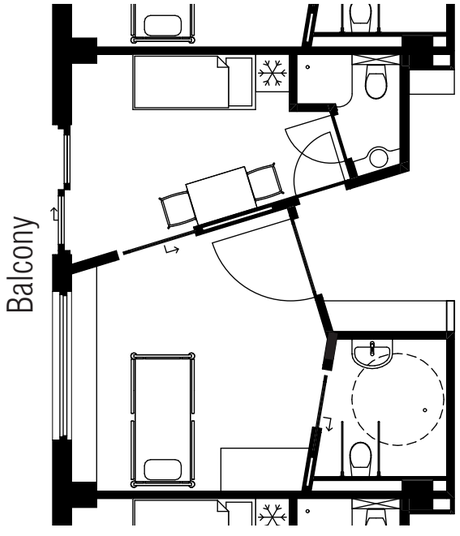


Figure 51: Floorplan

CASE STUDIES

Buurtzorgpension - Ermelo

As previously mentioned, there is a shortage of medical staff (Ministerie van Volksgezondheid, Welzijn en Sport, 2023), this causes the children to have less one-to-one time with a medical expert and they will therefore receive less medical care. For adults and elderly there is a solution for this shortage. OOMS architects designed a building where care for people who require care, is being taken care of. Most of the time this is due to a surgery or due to other medical interventions. Also elderly who cannot take care of themselves for a while at home, are welcome there.

There is at least one nurse present, 24 hours a day to provide the temporary nursing and care.

By concentrating the the people who require care, less personnel is needed to provide the same care. This place, however, is only for adults and elderly and not for children (Buurtzorgpension, 2023).

The building is designed with a focus on healing environment. OOMS architects is also specialised in designing with a focus on healing environment. Their ambition is to design according to healing environment and the circular architecture, for a sustainable way of treating people and the earth (OOMS architecten, 2023).

Figure 52

Figure 53

Figure 54

Figure 55

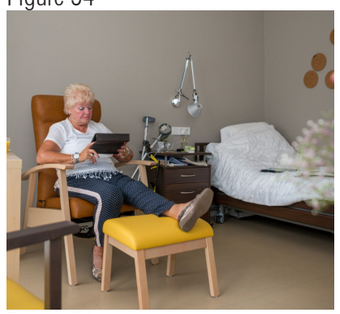


Figure 56

Floorplan

The healthcare facility has 19 bedroms and thus place for 19 people. Each room has its own bathroom. There is place for people who are able to walk to their bathroom but there is also place for people who require a wheelchair or something similair. Each room, however, is wheelchair accessible. Four out of the 19 bathrooms have toilets that can support the person who is in need of a pee.

The entrance is situated on the North side of the building, along with the technical area. The bedrooms are situated on the North, East and South side of the building.

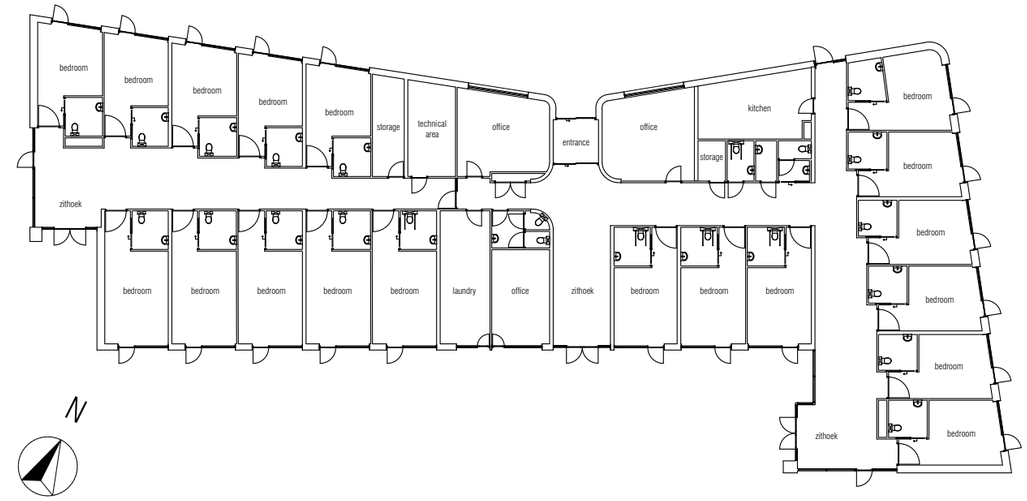


Figure 57

Facade

The facade is made out of wooden panels and the edge of the roof is finished with zinc. Each room has its own window with a door to an outdoor space. This door and the window are completely made out of glass. Therefore sunshading is applied to make sure that the heat of the sun does not overheat the building.

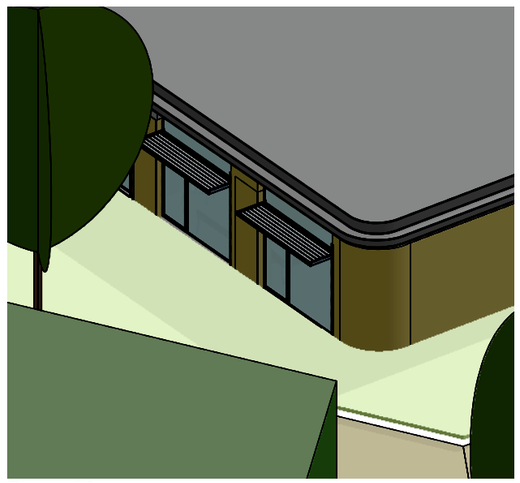


Figure 58

Outdoor spaces

As can be seen in figure 59, each bedroom has its own outdoor space. The outdoor space can be reached by opening the door to the outdoor space. The outdoor spaces are not big, they have a depth of one and a half meter and have a width of three meters. This makes the area of the outdoor space four and a half square meter per bedroom.

Figure 59

Area

The whole building has an area of 898 square meters, this is without the outdoor spaces. When the outdoor spaces are included, 86 square meters are added. The largest part of the building consists of bedrooms, with 392 square meters. Then comes the corridor with 185 square meters and then the bathrooms.

Bedrooms	= 39,9 %	= 392 m^2
Bathrooms	= 9,8 %	= 96 m^2

Sitting area	= 5,5 %	= 55 m^2
Storage	= 1,9 %	= 18 m^2
Corridor	= 18,8 %	= 185 m^2
Outdoor space	= 8,6 %	= 86 m^2
Offices	= 7,4 %	= 72 m^2
Technical area	= 1,6%	= 16 m^2
Laundry	= 2,4%	= 24 m^2
Kitchen	= 2,5 %	= 25 m^2
Toilets	= 1,6 %	= 15 m^2

Figure 60

Programmatic arrangment

The ground floor is well organised and consists of many functions. Because the building has one level, everything is organised on the ground floor. The function that is the most present is the bedrooms. 19 bedrooms are designed to accommodate people. As you can see and as already mentioned before, each bedroom has its own bathroom. There are extra toilets for the staff, visitors or for the people who do not want to go back to their room when they are sitting in the sitting area.

There is also a laundry to wash the dirty sheets of the beds and the towels. A kitchen is designed to be able to cook meals for the people who are staying over.

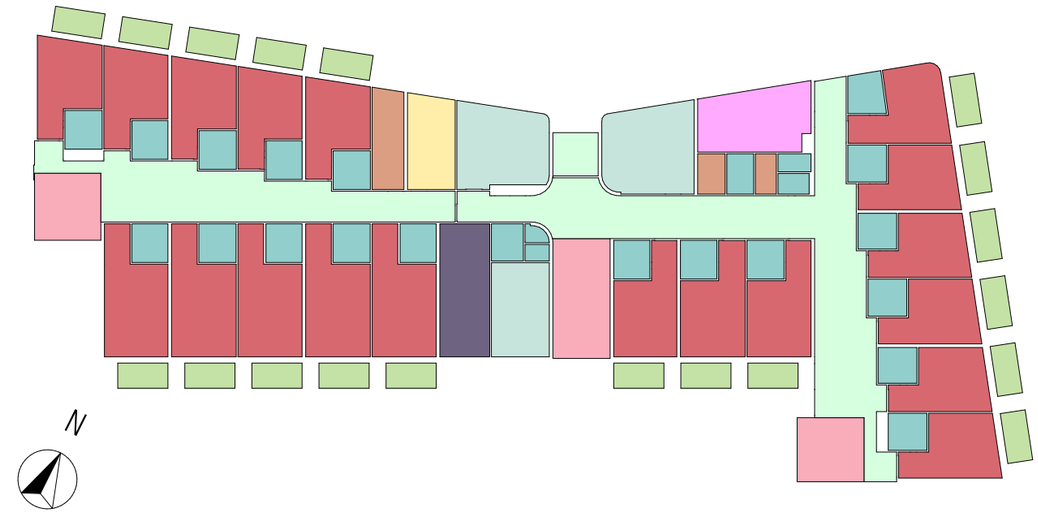


Figure 61

LEGEND

- Bedrooms
- Sitting area
- Storage
- Electrical area
- Corridor
- Outdoor space
- Offices
- Bathroom/toilets
- Laundry
- Kitchen

CASE STUDIES

From conclusions of the case studies to guidelines for the design

Program

The analysis of the three buildings gave an insight into how the program of the to be designed building can be shaped. Below are the functions listed that can be added to the guidelines under the paragraph program.

1. Offices (around 7% of building)

2. Kitchen (around 3% of building)

3. Laundry (around 3% of building)

4. Storage (around 6% of building)

5. Outdoor space (around 15% of plot)

6. Electrical area (around 2% of building)

7. Sitting area (around 6% of building)

8. Play/entertainment (around 4% of building)

9. Counseling (around 3% of building)

10. Exercise/sport (around 7% of building)

The average of the three case studies is taken to come up with the percentages. These percentages are a guide, not a fixed fact.

LITERATURE STUDY

In this research, it has become clear that there are several wishes/desires for a concept to become a good and well-designed building. However, these wishes/desires (guidelines) are yet to be scientifically substantiated. Therefore, research is going to be conducted on what the scientific importance is of most of these guidelines.

On page 13 of my theoretical framework are the factors of healing environment for children shown. However, by reading more researches on the topic of healing environment, it is possible that more aspects will come forward. The diagram showing the aspects (figure 5) may expand when it becomes clear that there is a need for another aspect to be added.

Site

Hospitalisation is often seen as an unpleasant experience. Not only for adults, but also for children who suddenly have to leave their familiar place of home and the persons who are important for them. Most of the time they also have to stop their favourite activities, including playing (Koukourikos et al., 2015).

Playground nearby

The reason why a playground nearby the healthcare facility is important, has everything to do with the importance of play itself. See page 13 of my theoretical framework as well, because play is one of the eight factors of healing environment for children.

Play is often disregarded when a child is admitted to a healthcare facility, however, the role and value of play increases when a child is repeatedly admitted to a healthcare facility. The reason of this is that play decisively contributes to emotional well-being, mental well-being, self-confidence and self-esteem (Koukourikos et al., 2015). Furthermore, it ensures that the children move more often, since playgrounds provide a space for children to engage in physical activities. For pediatric patients undergoing rehabilitation or physical therapy, having access to a nearby playground can support their recovery by offering a fun and engaging environment for exercise. Next to the aforementioned factors, a child's development also plays a role when it comes to play. Whether it is inside or outside, playing plays a large role in the development of a child's personality (Burriss & Tsao, 2002). Therefore, a playground or several playgrounds nearby the to be designed healthcare facility is an important guideline to consider while choosing a design site.

Accessibility to the healthcare facility

Accessibility to health facilities is a critical factor in effective health treatment. The ability for patients to access facilities, in terms of an acceptable distance, is a key factor in enabling effective treatment. Also, adequate transport provision is important (Murawski & Church, 2009). It is, of course, also important for the children's home care nurses to be able to reach the healthcare facility on time, when they are not able to stay there in shifts. It appears that quick access to healthcare facilities allows for individuals to receive timely medical attention and intervention. This is critical for conditions that require immediate medical care. Therefore it should be taken into account when choosing a design site, that the location is accessible.

Human-Animal-Interactions (HAI)

Research on Human-Animal-Interactions (HAI) is relatively new. The results are still mixed, but some studies have shown positive health effects. The interaction with animals has shown to be positive, in a sense that it proves to decrease the levels of cortisol in the blood. This hormone is a stress-related one, so the decrease of the hormone also shows a reduction of stress. Also, when looking at the blood pressure it appears to be that HAI lowers blood pressure (Wein & Hicklin, 2018). Other studies, conducted after the outbreak of COVID-19, have shown that a pet can contribute to lowering the levels of loneliness and provide emotional support (Kretzler et al., 2022). Looking more specifically at children, it can be said that when children have to look after an animal, they become more responsible and social, but most importantly, it develops their character. Furthermore, when looking more closely at petting farms, interaction with animals at such a farm encourages the development of empathy and compassion in children (Endenburg & van Lith, 2011). Next to the fact that oxytocin is released while interacting with animals, also dopamine, and endorphins are released. These are hormones that promote relaxation, happiness and recovery. Therefore, it is important to keep in mind that, for example, a children's farm is close by the to be designed facility.

Program

The importance of movement/sport

Movement is, as already mentioned before, a basic need of a child, whether it is sick or not, and the most important form of communication (Dziobek-Bepler, 2021). It is therefore also a factor of healing environment for children and thus part of my theoretical framework on page 13. However, when looking specifically at children with cancer, it can be stated that movement is much more important for them. A study showed that aiming, catching and other ball skills decreased significantly during the 30 month follow-up period after cancer diagnosis in children. Also, the balance of the children was affected. It was affected the most at 2 months after cancer diagnosis (Hamari et al., 2020). This is a very common phenomenon among cancer patients, who often receive chemotherapy to treat their cancer. However, side effects of chemotherapy are, among the most known ones, such as hair loss, weightloss and nausea, also fatigue and deterioration of someone's stamina. This is due to the decrease of muscle strength. That is the reason that exercise is often recommended, to help someone stay in shape (Kanker.nl, 2021).

The conveniences of a play area/playground

Just as a playground is important in the neighbourhood, a playground or inside play area close by is also important. Not every child is able to go outside or walk a certain distance to a playground. It would then be beneficial for them to have a playground close by, since this contributes to the overall emotional well-being, mental well-being, self-confidence and self-esteem (Koukourikos et al., 2015). And, a child's personality is also developed while playing (Burriss & Tsao, 2002). Therefore, a playground or play area close to or in the healthcare facility is an important guideline to consider while creating the program of the building.

Design

Conveniences and comforts of home

Nowadays, more and more people who are admitted to a healthcare facility have the desire to have the conveniences and comforts of home. This includes the ability to open a window, but also the ability for parents and siblings to stay over in the healthcare facility. And there are more desires when it comes to having the conveniences and comforts of home:

- Ability to open a window
- Ability for both parents to stay over
- Ability for siblings to stay over
- The proximity of parents in relation to their child
- A fridge
- A TV
- Ensurance of privacy through sound insulation

These desires to have the conveniences of home is not strange, the opposite in fact. When someone is removed from their home and enters the intimidating environment of a healthcare facility, it can cause acute anxiety and stress, not only for the parents, but also for the child (Smeltzer et al., 2010) & (Potasz et al., 2013). These negative feelings are intensified when a child has a chronic or severe life-threatening illness. The main causes of these aforementioned feelings include fear of pain, death, medical examinations and uncertainty (Koukourikos et al., 2015). Therefore, when one thinks about what the reason might be why parents have the desire to have the conveniences and comforts of home, it can be hypothesised that it reduces stress and anxiety and improves the overall well-being. However, the question is whether that is true. The study of Douglas and Douglas (2004) states that the environment in which we stay, has an influence on the well-being of people. So, the immediate surroundings in which we stay, does have an effect the health of people. Therefore, having a fridge and a TV is not an odd thing to desire. Especially when you need to be admitted for several weeks or even months.

The reason behind the desire to open a window is that people want to be able to receive fresh outdoor air. Although it is scientifically proven that fresh air only stays in a room for about thirty minutes to one hour (Solvo, 2006), people still want to be able to open a window. The reason behind this is, that opening a window

gives a sense of control over environmental conditions and opening a window is such a factor that influences their immediate environment. And, of course, opening a window immediately reduces certain odours which are released during medical treatments or because of cleaning agents. By giving people the ability to open a window, a more pleasant and comfortable environment is promoted, along with a feeling of control.

Also the desire of children and parents for them to stay over or for siblings to stay over is not strange. It has become clear that there is a wish for both of the parents to stay over when their child is admitted to a healthcare facility. It has even become clear that there is also a wish for siblings to stay over during an admission. Children with cancer are frequently hospitalised during their course of treatment. Hospitalisation can last several weeks or even add up to several months. However, questioned is what the importance is of parents and siblings staying over, when rephrased, it is questioned why it is important for parents and siblings to be close to their child or sibling during a period of illness. Parents staying overnight and thus close to their child in the hospital when their child has an illness is important for several reasons. It was already proven in 1968 by Brain & Maclay that there was a significant reduction of emotional and infective complications when the sick child is accompanied by their parents. Next to emotional support it is according to Judy Rollins, Rosemary Bolig and Carmel Mahan (2005), that since the 1980s it is allowed for parents to stay overnight in a hospital. This was because at that time it was scientifically proven that parents are the primary source of psychological support for their children. So comfort and a feeling of security is also involved when looking at the importance of parents staying overnight (Vollmer & Koppen, 2021).

It can now even be stated that family-centered care has become a standard for providing quality health care for children. Parents of children with chronic illnesses have reported less stress and better emotional well-being when they rated care as more family centered. With regard to pediatric cancer, parental distraction of their child during venipuncture has been shown to be associated with higher amounts of child coping behaviour and lower amounts of momentary distress, crying and screaming (Holm et al., 2003).

The ability for siblings to stay over is something closely related to parents staying over. Therefore, when looking at this topic it can be stated that emotional support is a very important reason for why siblings should also have the ability to stay over in the healthcare facility. Also, paediatric cancer affects the whole family. By allowing siblings to stay overnight, it fosters a sense of family unity and togetherness. It also helps maintaining a normal family dinamic during the difficult period.

Finally, the ensurance of privacy through the use of sound insulation or other techniques in a healthcare facility is crucial for several reasons. First is patient confidentiality, hospitals handle sensitive and private information about patients' medical conditions. Sound insulation helps prevent the unintentional disclosure of this information by reducing the chances of conversations being overheard (Rasmussen et al., 2023). Also, maintaining a sense of dignity is one of the reasons to use sound insulation. Patients may be undergoing various medical procedures or experiencing challenging situations. Sound insulation helps maintain their dignity by minimizing the risk of personal conversations or sounds associated with medical care being heard by others. Furthermore, it enhances rest and recovery (Fausti et al., 2019).

Healing environment

Much has been written about the healing environment of adults. Far less to zero has been written about the healing environment of children. This section describes the guidelines which can be subsumed under healing environment of children and adults.

- Views of greenery
- The ability to stand in the windowsill
- Use of colour and murals
- Daylight
- Make use of natural materials
- The ability to 'own' a room by putting up your name

Adults are taken into account in this section, because it is proven that it has an effect on children when parents are allowed to stay over. To provide parents with a pleasant environment, for example views of greenery will be a guideline to consider while designing the building and while choosing the design site. Views of greenery may seem an obvious subject, however, scientific research on views of greenery was conducted as early as 1984 by Roger Ulrich. He found that patients who were assigned to rooms overlooking natural environments spent a shorter time in the hospital, received fewer negative evaluations and used fewer painkillers. Healing and recovery is thus stimulated when a patients has views over a natural scene. Although children do not have this factor of healing environment, adults and thus parents do have this factor.

One topic that is related to views of greenery, is views of other children. To provide the best environment for children to look at other children who are, for example, playing outside, standing in the windowsill is a very important guideline. The documentaries have shown that children frequently stand in the windowsill to look outside or to draw on the window.

One topic that is also important to keep in mind while designing is the use of colour and murals. Much has been written on the different effects of colour and murals on people's sense of well-being. And it appears that colour design is of vital importance in the creation of a pleasant, ambient environment. However, until now, there is limited supporting evidence about the influence of colour on someone's mood (Stone, 2001).

However, there is supporting evidence that murals of nature decrease the heart rate of paediatric cancer patients. The results indicate that the placement of murals can mimic the effects of real nature scenes Moreover, the placement of murals improve physiological markers, such as measured by heart rate and systolic blood pressure (Pearson et al., 2019). Also, Pati Debajyoti and his researchers (2016) stated that, in general, studies have already shown that most forms of exposure to nature, including natural murals, have a positive influence. This is shown in, for example, the study of Roger Ulrich (1984) and more recent in the study of Gregory B. Diette and his researchers (2003).

From conclusions of the literature study to guidelines for the design

1.

“Other studies, conducted after the outbreak of COVID-19, have shown that a pet can contribute to lowering the levels of loneliness and provide emotional support.”
(Kretzler et al., 2022)

--> Facility nearby a children’s farm

CONCLUSIONS

To conclude the research that has been conducted, it can be said that a lot of knowledge has been gained about how the healthcare system in the Netherlands is shaped now. Nowadays, when a child is too ill to stay at home, however, too well to stay in the hospital, the child is sent home anyway.

To the extent that medical care in, for example, hospitals decreases, supportive care will increase (figure 62). Parents are then expected to take care of their child at home since the children are then most of the time too well to stay in the hospital. However, not every parent is able or capable to take medical care of a sick child. This causes a lot of stress above the stress the parents are already experiencing because of the illness of their child. This means that external help is needed to provide the care the child needs. One solution that is currently in progress is the help from children's home care. The children then still stays at home but the children's home care comes to their house to do the medical procedures, which the parents are not able to do. This can relieve parents of some of their medical responsibilities and as a result can the stress they experience be reduced. However, the shortage of medical staff nowadays, sometimes means that not every child has enough one-to-one time and they will therefore receive less medical care.

Concentrating the medical care for children whose parents are not able to take care of them at home or for the children who are sent home anyway while they are too sick, would be a solution. By concentrating all the children who are in need of special medical care, the quantity of the medical staff can be reduced.

Therefore, the aim is to design a building where parents and their children can stay, so that the medical staff can provide the specialised care the parents are not able to provide. This building will not be a hospital, it will be an approachable building where you can stay over as long as needed. This building will also have the potential to be built in other cities, as long as the architectural design guidelines are met as a requirement.

In this research an answer was sought to the question: "How can architecture contribute to an optimisation of healthcare facilities for children who require long-term care?"

To be able to answer this question, a study has been conducted on the healing environment of children. Research has shown that the concept healing environment a big influence has on the optimisation of healthcare facilities where long-term care is provided, because it has a positive effect on the length of stay and thus recovery of patients.

The most important aspects of healing environment for children are:

- Colour
- Daylight
- Movement
- Play
- Views of other children
- Noise control
- Thermal comfort
- Air quality
- Human-Animal-Interaction

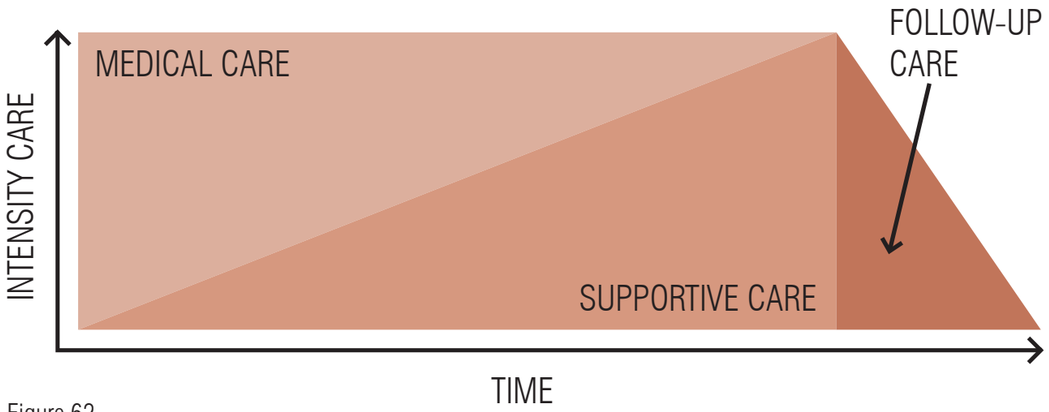


Figure 62

However, architecture can contribute to an optimisation of healthcare facilities in multiople ways. Not only by the use of healing environment for children, also by the use of other techniques.

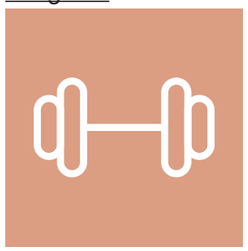
By interviewing healthcare professionals and an architect, by watching documentaries, by doing observations and case studies and finally by doing a literature study, guidelines have been formulated which can contribute to an optimisation of healthcare facilities. Architectural guidelines like views of greenery, ensuring that the facility is accessible by wheelchair and ensuring the privacy of people in the healthcare facility, will optimise the healthcare facility.

All these aspects are shaped into practical guidelines which are described in the chapter guidelines.

GUIDELINES

Site

Playground nearby

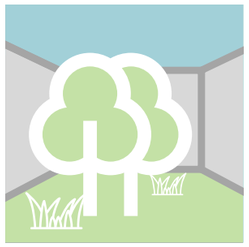


A sport/exercise facility

Offices

Electrical area

Accessible



A courtyard/outdoor space

A kitchen

Sitting area

Children's farm nearby

A restaurant

A laundry

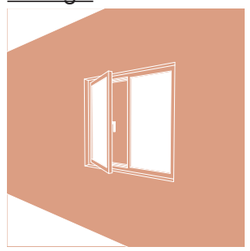
Counseling

A play area / playground

Storage

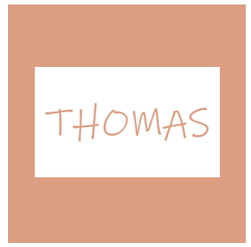
Program

Design

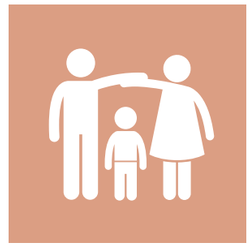


Ability to open a window or door

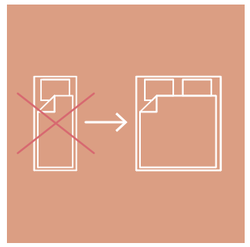
A fridge



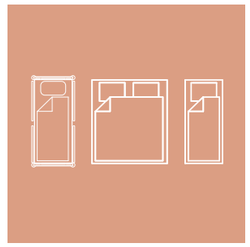
The ablility to 'own' a room by putting up your name on a blackboard



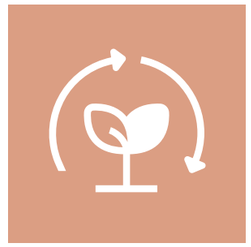
Ensure that parents are always able to be close to their children



Ability for both parents to stay over

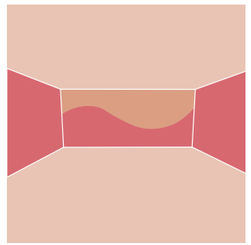


Ablility for the siblings to also stay over



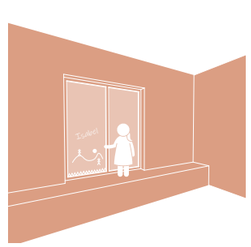
Make use of natural materials

A TV



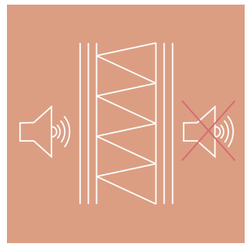
Use of colour and murals

Views of greenery

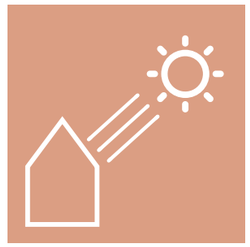


The ability to stand comfortably and safely in the windowsill

The use of a sliding door to the bathroom



Ensure privacy by the use of sound insulation



Enough daylight

Toilets and bathrooms accessible by wheelchair

Views of other children

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