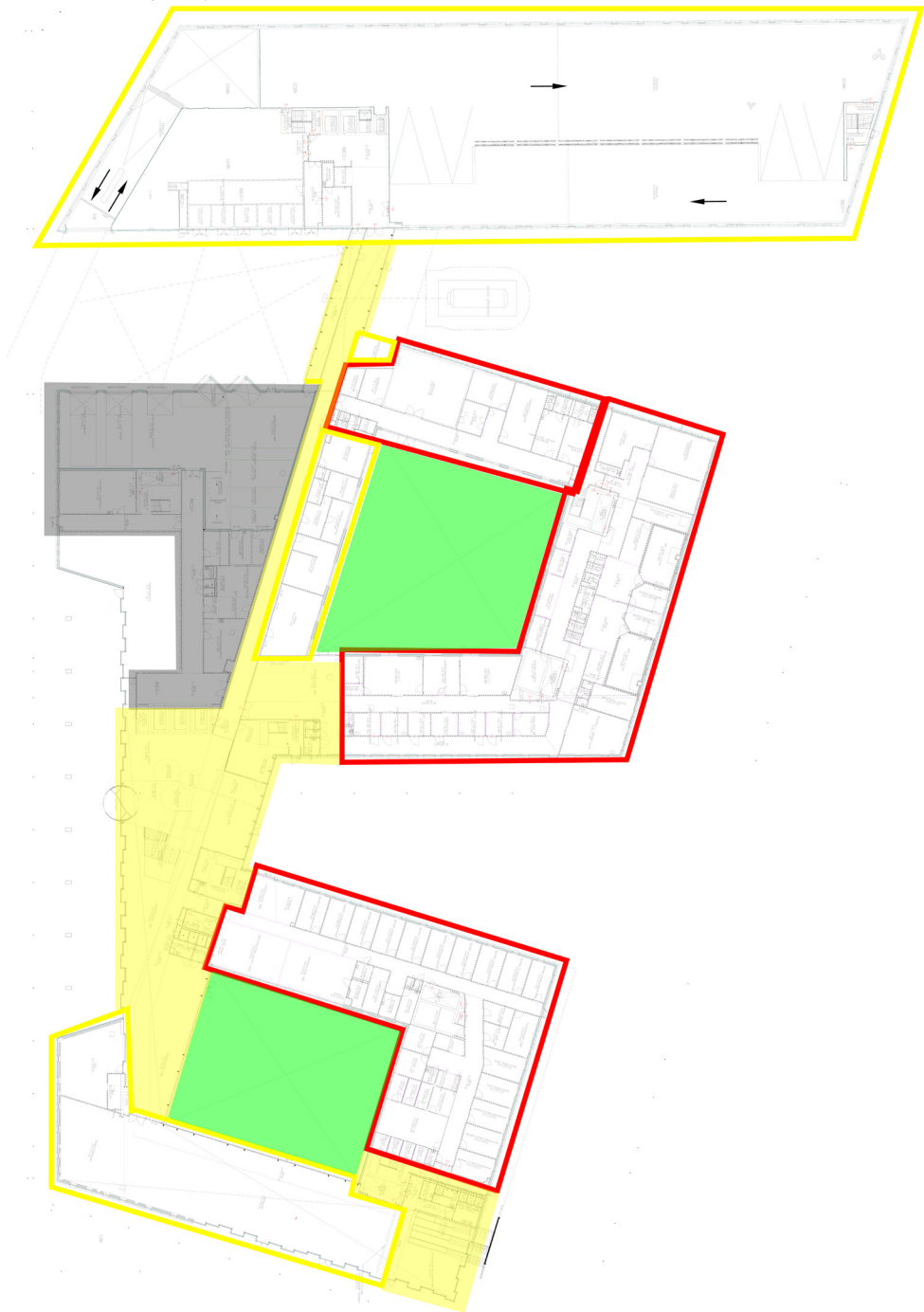
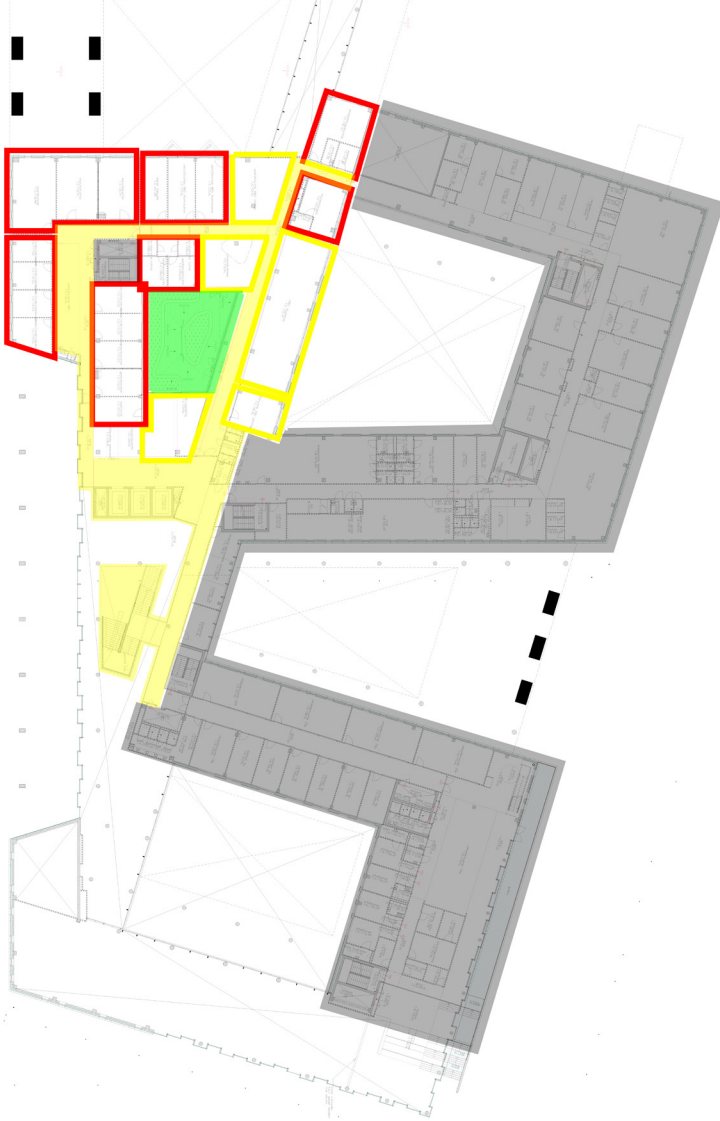
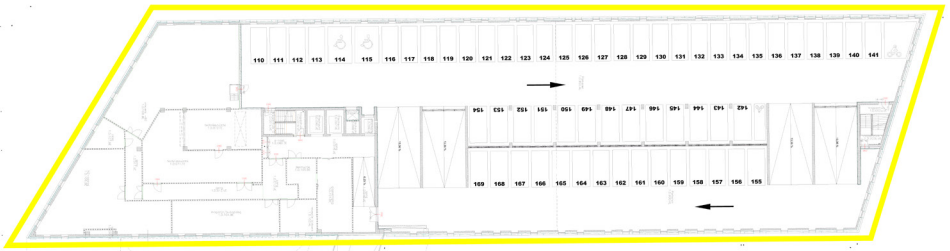
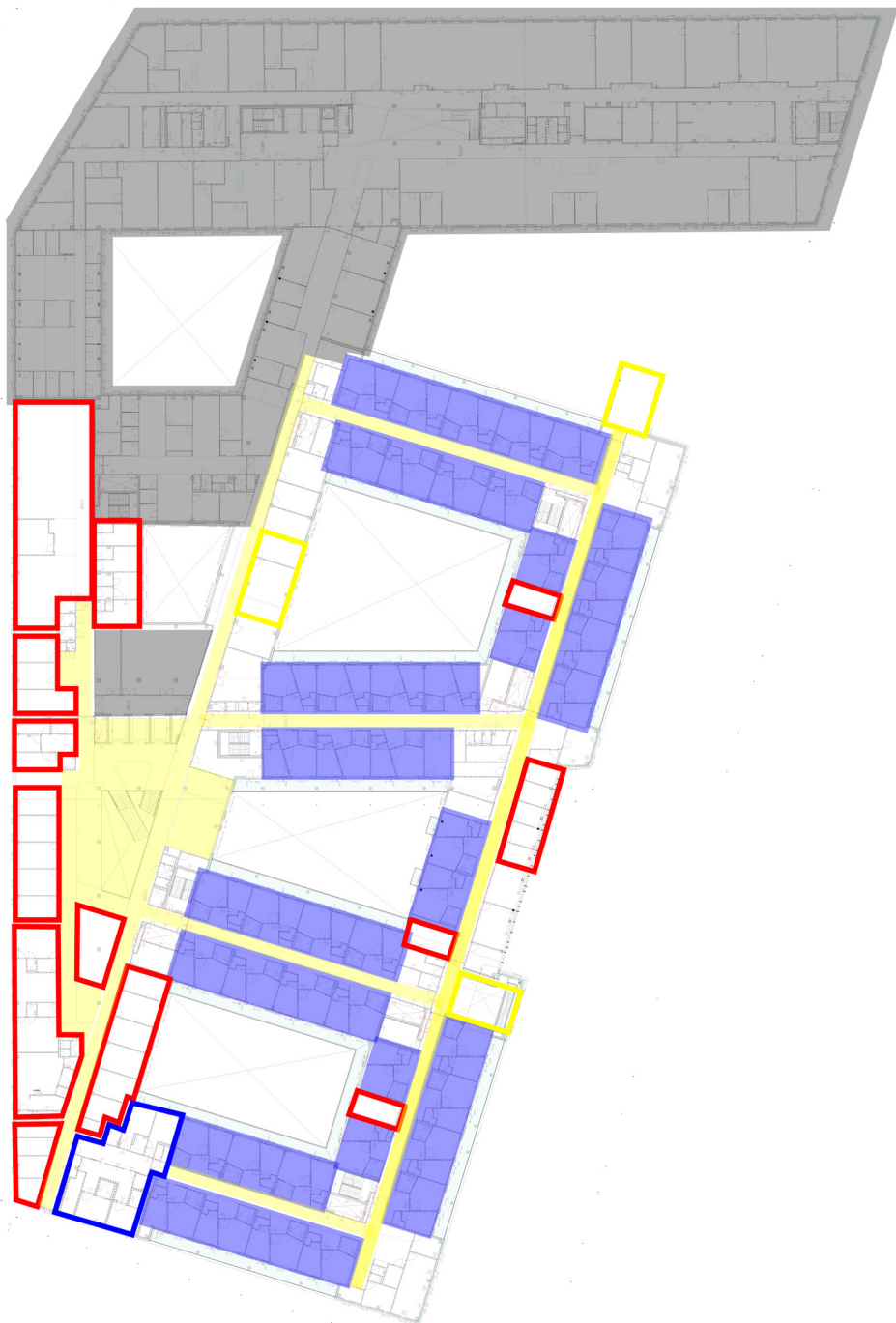


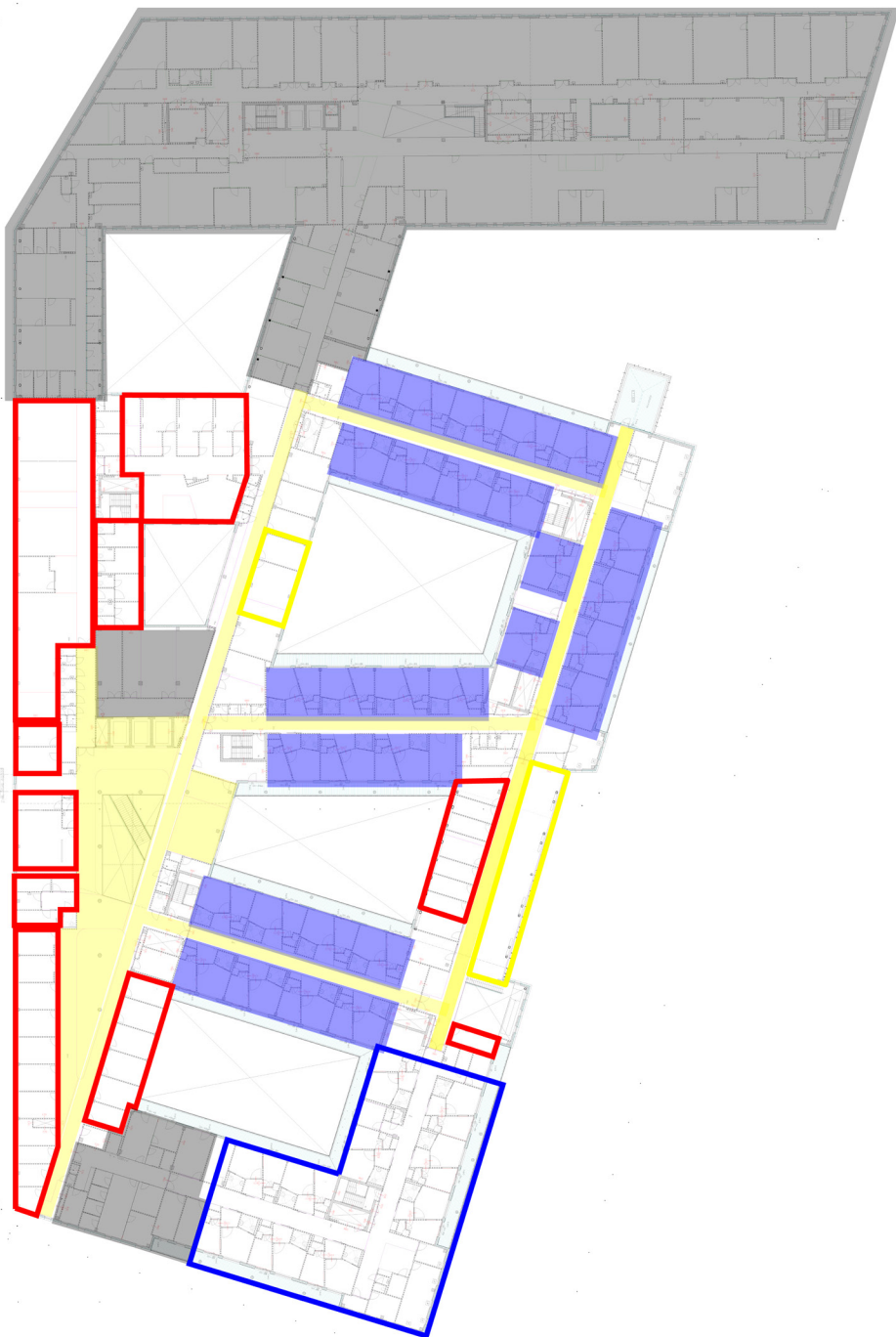
APPENDIX

APPENDIX A. FLOORPLANS PRINSES MAXIMA CENTRUM









APPENDIX B: PATIENT JOURNEY

When going to the hospital patients either visit the policlinic as out-patient or stay at the clinic in one of the OKEs as in-patient. In consult with an oncologist (A. Marvincurve, 2017) and a nurse (A. Dorsthors-Holtrop, 2017) it became clear that especially the patients at the policlinic have to deal with the most uncomfortable waiting times. Therefore, an observational research at the current policlinic (poli oranje) has been done. The goal of this research was to witness what patients will encounter at the policlinic, so which treatments are given there and what is done by whom. From this a patient journey for the current policlinic was created as well as a patient journey for the future situation. During this research there was no focus on how the patients spend their waiting time but it was endearing to see a mother and her daughter dancing through the halls to pass the time.

Most of the children that come to the policlinic will be admitted at the day-care either for chemotherapy or for small surgeries such as lumbar- and bone marrow punctures. The group that receives chemotherapy is the largest, so the focus for this patient journey is on patients that receive chemo (although the patients that are there for a different reason are likely to follow a similar route).

As a part of the DOC, the Prinses Máxima Centrum aims to reduce hospital visits to a minimum. One of the ways to achieve this is by scheduling multiple appointments on the same day when possible. The benefit of this is that the child will only miss one day of school and the parents only need to take one day off at work. However, it also means that child and parent have to stay at the hospital

the entire day and have to go from appointment to appointment resulting in long days at the hospital.

This means that when a child comes in for chemo it is very likely that he or she will also be visiting other departments such as the radiology department for a scan or a different specialist for other check-ups.

Aside from these non-chemo related appointments the day of every patient is very similar. The medical staff of the Prinses Máxima Centrum (Dorsthors-Holtrop, 2017) has created a flowchart to show the route the patient currently follows at the Prinses Máxima Centrum department inside of the WKZ (figure 6). Every patient needs to qualify in order to get chemo, this means that his or her blood will be checked to see if the blood levels suffice. If the blood levels are too low the patient will not get chemo and has to come back next week and follow the same route again.

CURRENT PRINSES MÁXIMA CENTRUM

The Prinses Máxima Centrum currently makes use of several departments at the WKZ most of these are located at the first floor; the main department is department Pauw, this is the place where all patients go to check-in. This department has a day-care area and several rooms for hospitalisation. At department Oranje the policlinic takes place. Here the PAC is connected and blood samples are taken. This is also the place where doctor consults take place.

Next to the day-care on Pauw there is also a day-care area at department Kameleon. And there are additional rooms for hospitalisation at department Giraf which is situated on the 4th floor. Blood samples can be collected via the PAC when a nurse is connecting it. But it also happens that the blood samples will be taken at the lab. Furthermore, most of the other appointments have to do with scans at the radiology department. Figure 7 shows a map of the 1st floor of the WKZ.

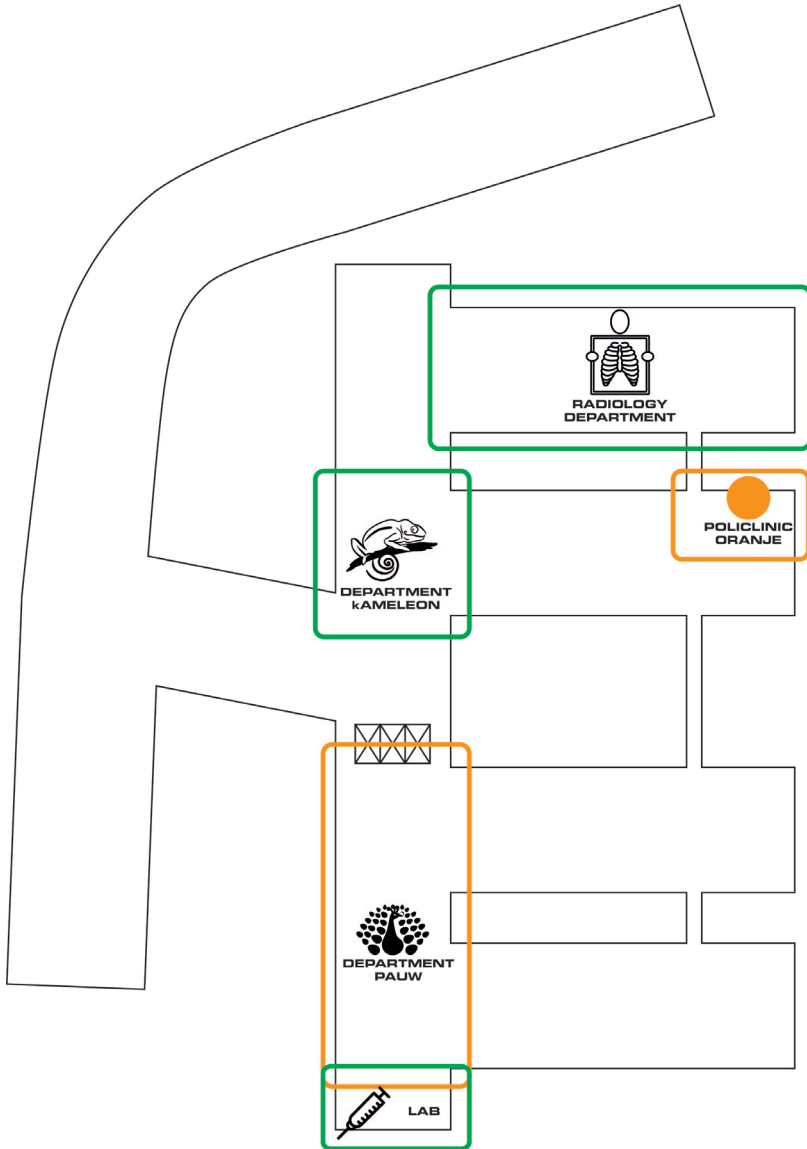


Figure 7: Map of the WKZ

CURRENT PATIENT JOURNEY

When a family arrives at the hospital they first check in at the desk of department Pauw. If a child has appointments (for example a visit to the audiologist) aside from the chemo related appointments these take place first. After these appointments the family goes to poli oranje. Here the medical assistant takes the measurements (height, weight, blood pressure) then the nurse connects the PAC and uses it to take blood samples. These blood samples are sent to the lab to be tested and the family is advised to go to the restaurant or elsewhere in the hospital. They will receive a phone call when the results are in. The medical assistant checks if the results are in and calls both the family and the doctor when they do. Both the family and the doctor come to poli oranje and meet in a treatment room to discuss the results. When the child qualifies he or she will be admitted either at the day-care or in one of the hospitalisation rooms and the treatment is started. When the child does not qualify the family needs to make a new appointment for next week and the entire cycle will repeat itself. This route is converted to a swimlane diagram (figure 7), to show the different people involved and to get a sense of the timespan.

The swimlane diagram shows that there are currently several things that take a long time when at the hospital. The other appointments can take up quite some time especially if you have multiple. However, this is different for each patient. Some patients have no additional appointments at all while others spend multiple hours on the different appointments. Within the sequence that every patient needs to follow when getting

chemo there are actions that take a long time for every patient. For example the testing of the blood values. Currently the blood values need to be tested at the lab of the UMC, which means the blood has to reach the lab first, then it needs to be tested and the results need to be recorded in HiX. This usually takes 30 to 45 minutes. In the meantime the medical assistant is constantly checking HiX to see if the results are already in so she can call the family and the doctor. Another thing that takes a long time is receiving the chemo itself. This is also variable for each patient and the kind of chemo they get, however it generally takes 1 to 4 hours for the chemo to be injected.

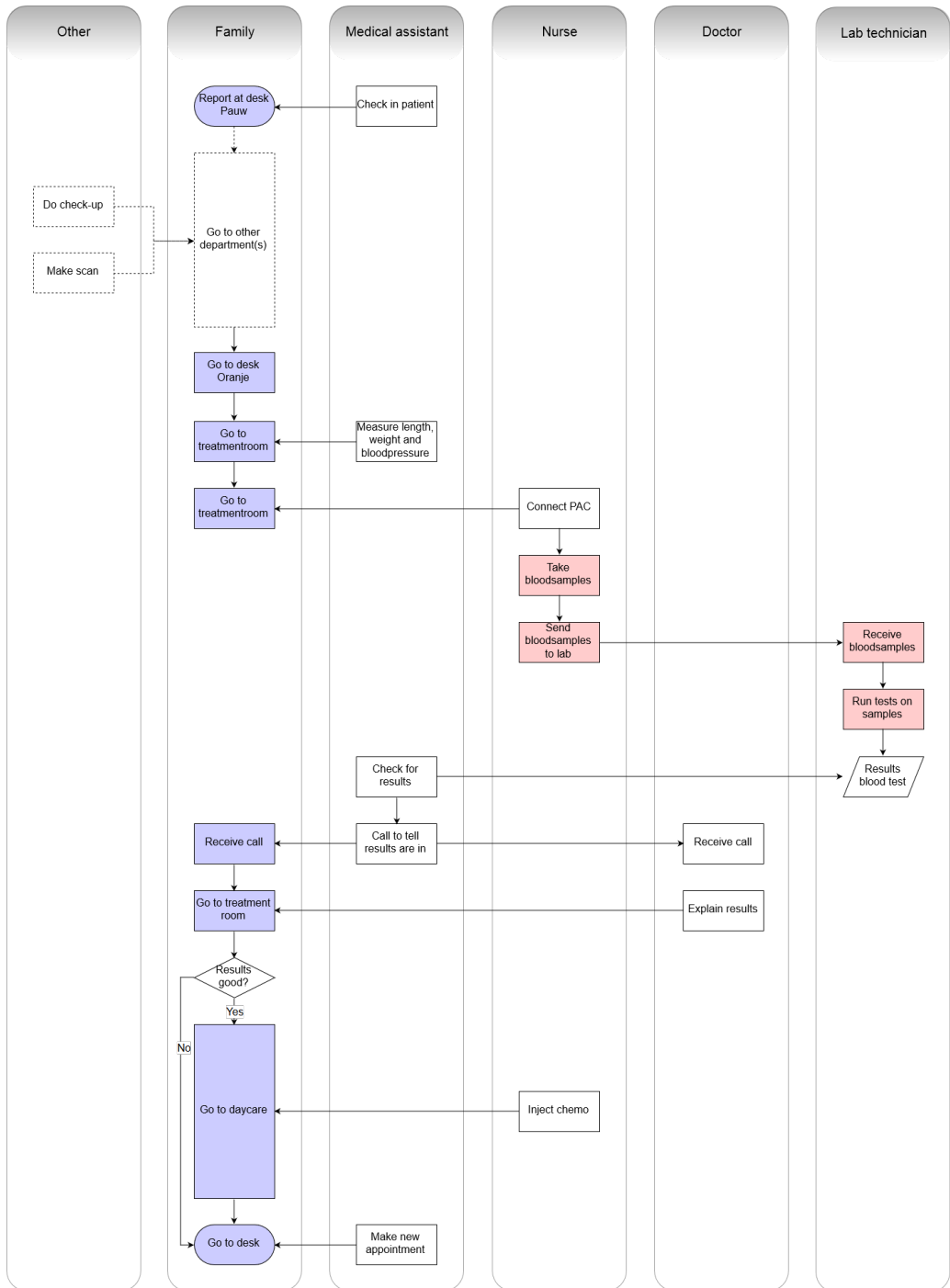


Figure 7: Swimlane diagram of current situation

FUTURE PRINSES MÁXIMA CENTRUM

In the new to build Prinses Máxima Centrum the aim is to bring the care to the patient so all chemo related activities are centralised on one floor and in one wing of the building as shown on the map in figure 8. All treatment rooms, the day care and the lab will be centralised on the same floor. The Prinses Máxima Centrum will have its own radiology department seated at the ground floor of the building. So it is not necessary to go to the WKZ for scans. However, the other non-chemo related appointments with specialists will probably still take place at the WKZ.

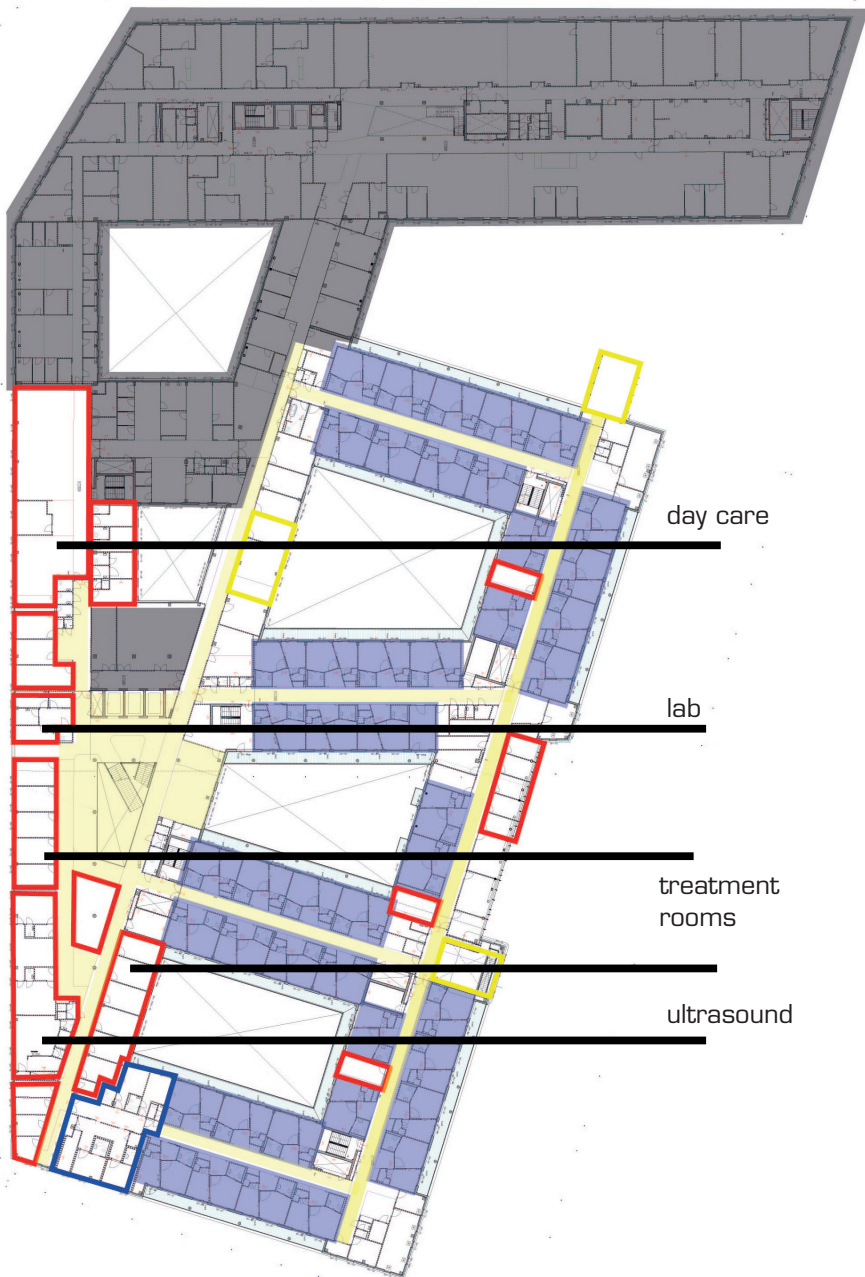


figure 8: Map of the Prinses Máxima Centrum 2nd floor

FUTURE PATIENT JOURNEY

Although the same activities need to take place in order to get chemo the travel distance will be significantly shorter and the efficiency of the activities will also increase. Figure 9 shows a swimlane diagram for the future situation.

The new Prinses Máxima Centrum will have their own machines to check blood values so the blood no longer needs to be send to the lab of the UMC but can be processed immediately. So the time it takes to analyse the blood will only take 10 minutes. For other tests the blood and other collected samples will still need to be send to the lab at the UMC. However the other activities that take a lot of time will still be there. So the families will still spend long days at the hospital.

CONCLUSION

Even though the Prinses Máxima Centrum aims to be more efficient in the new building, dealing with cancer (in this case chemotherapy) just takes a lot of time. So even though the time will be better spend the families still need to spend a lot of time at the hospital and need so see a lot of different people at set times. Not to mention the chance of not qualifying for the chemo, in that case the child needs to undergo the same routine twice for the same chemo.

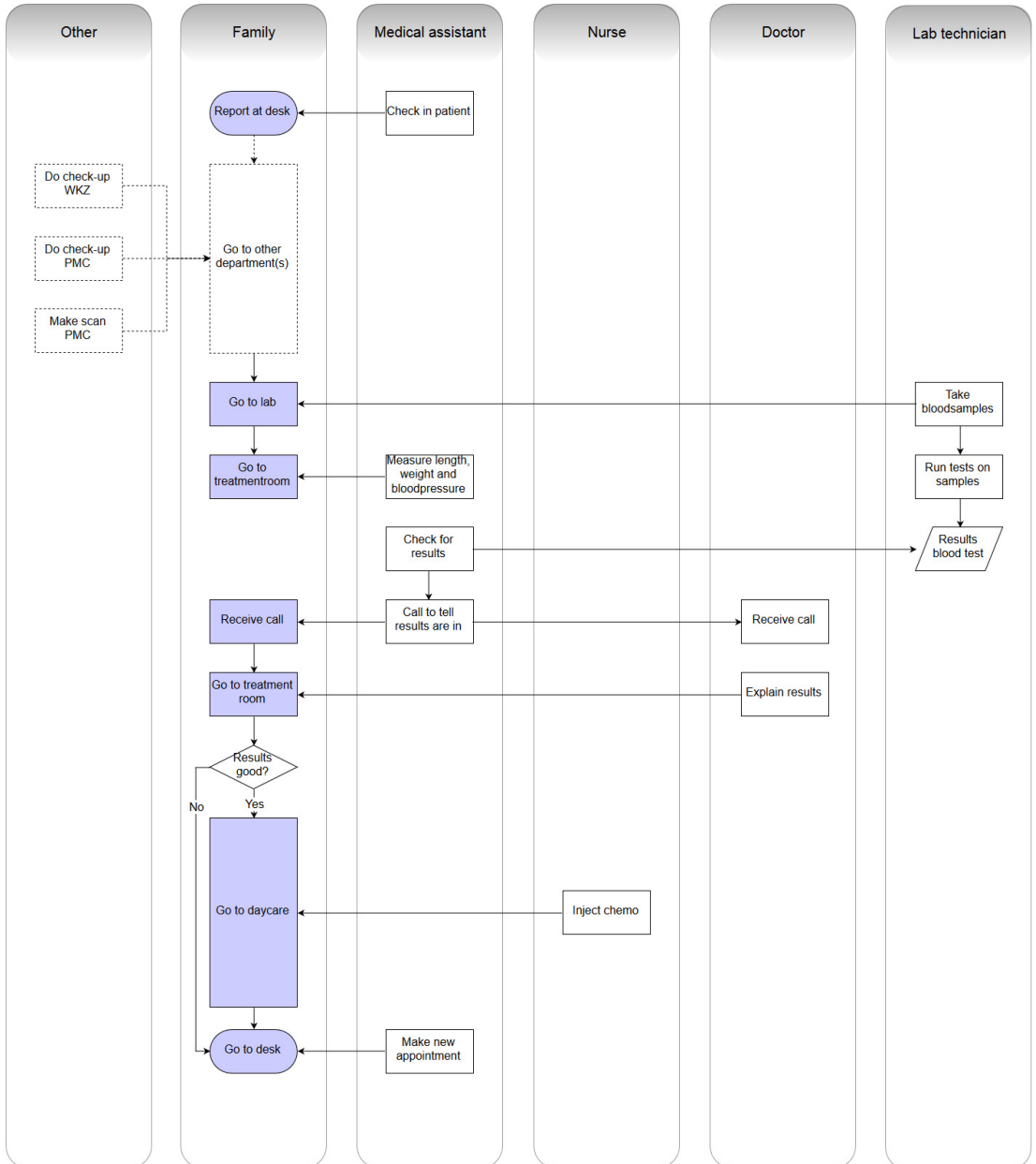


figure 9: Swimlane diagram of the future situation

APPENDIX C: PERSONAS

Jannie Dijkstra Pinto Leite, is hired by the Prinses Máxima Centrum to make a product to give children and parents more insight in what they can expect when they are dealing with cancer. She herself is the mother of a cancer survivor so she has experienced the process up close. With her Industrial Design background she wanted to visualise the process to make it more clear for herself but also to explain better to others what they were going through.

Together with Mobiquity, a company that specializes in creating digital platforms to enhance user experiences. And Thijs van Bruxvoort a co-worker of Jannie, who is focussing more on the journey of the health care professional, she has organised several creative sessions in order to make reliable persona's. I was offered the opportunity to join in with these sessions.

During the first session several members of the healthcare team were asked to describe several families they have encountered. The group included:

- An oncologist
- A nurse
- A nurse specialist
- A psychologist
- A child life specialist
- A social worker

In total they have come up with over 30 different families, all these families had unique stories and had different demands and wishes. Some families wanted to know every detail of the treatment, while others only wanted to know the basics. There were families that distrusted the medical staff and families that put the care of their child completely in the hands

of the staff. Some of the families had additional difficulties like language barriers or a child that requires special care (for example down syndrome). While others had difficulties at home with for example divorced parents or had organisational challenges with a sibling that is a high ranking athlete.

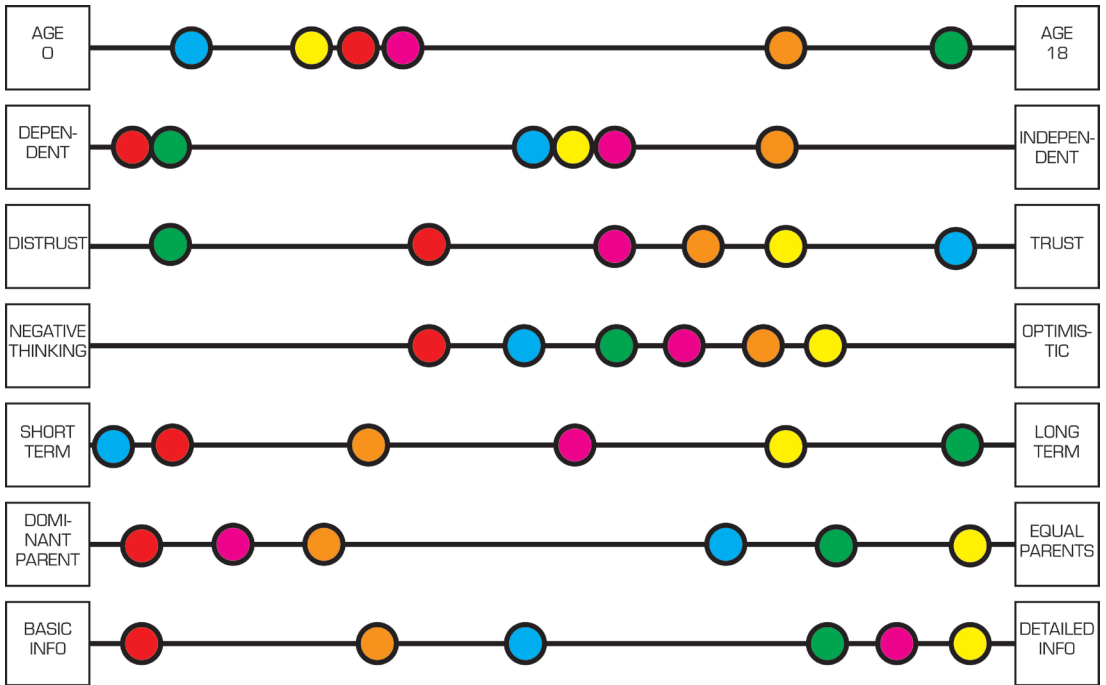
Together with the healthcare professionals the families were clustered. Resulting in six different groups. In a second session without the healthcare professionals, these clusters were further developed resulting in seven variables over which six different personas could be created.

Each color represents a persona, so there is for example red which is a family with a young child which is very dependent. Its parents show a slight distrust in the medical team and they also have a tendency to negative thinking. Furthermore they are focusing only on the now and want very basic information. Also in this family there is one parent extremely dominant and in control.

Together these persona's give a good representation of the families that can be found at the hospital which is a very mixed group of people that all have different demands and wishes to keep in mind when designing.

A template was created for each of these persona's and presented to the medical staff in a third session. Resulting in more realistic persona's.

From all these sessions the following six persona's were defined.



FAMILY NAME: VISSER



FAMILY MEMBERS

Daisy 18months
Patient. Sweet but quiet

Sabine 19 yr cashier
Mother. Tries to make ends meet, has been through a lot.
Father: Unknown

Barbara 42yr Cleaning lady
Grand mother. Does not know how to express her emotions. Is angry a lot.

FAMILY DESCRIPTION

This is an all girl family that has been through a lot, The father of Sabine has passed away and the father of Daisy does not want to be part of her life. Barbara has never been good at expressing her emotions which results in her being angry all the time, mostly at Sabine.

Sabine was studying to become a hairdresser but had to quit when she got pregnant. She is the main breadwinner of the family and works very long days to provide for her family.

INTERACTION

The family keeps to themselves although Daisy likes the nurses and is always happy to see them. When the doctors or nurses explain things Sabine listens but asks only a few questions. She does follow the instructions but does not desire more information. Her focus is mainly on the now. She just wants to know what she needs to do and where she needs to be.

Barbara is more sceptical. She doesn't visit the hospital a lot, but when she does she likes to let everyone know that she thinks it is nonsense that such a big fuss is made. It sometimes feels like she blames Sabine for the entire situation.

DISEASE

PARTICIPATION

Sabine works a lot so it is not uncommon that Daisy is left alone at the hospital. When Daisy needs to be admitted Sabine doesn't stay over. She doesn't ask any questions and shows little initiative when it comes to taking care of Daisy. Although she does show affection for her child she seems to have complete faith in the nurses when it comes to caring for her child.

FAMILY NAME: VAN BENNEKOM

FAMILY MEMBERS



Max 3yr
Patient. A cheerfull little guy.

Joost 39yr CEO of IT company
Father. Works a lot but always tries to make time to go the hospital with his son.

Marieke 37yr Manager
Mother. Always comes prepared. She likes to keep a list of questions and wants to be kept up-to-date

Sarah 6yr
Sister. Comes to visit her little brother frequently.

FAMILY DESCRIPTION

The family has a steady home situation, Marieke has taken sick-leave while Joost keeps on working. However, they both like to spend time in the hospital with Max and want to be there when descisions are made. The recovery of Max comes before everything although they do try to make time for Sarah as well.

They can count on friends and family especially both grandmothers like to assist and spend a lot of time babysitting Sarah and cooking diner.

INTERACTION

The family is very loving and are eager to help where possible. Max doesn't let the treatment bother him although he is not very fond of the needles. Marieke is the one that does all the talking although it is obvious that both parents are very well aware of the situation. They have done their research and want the medical team to be fair and honest with them. Their focus is on current situation but they want to be prepared for the future as well.

DISEASE

Max was diagnosed with a neuroblastoma last year. A "wait and see" strategy was applied. Unfortunately the tumor did not decrease so now Max just had surgery and he will start with chemo really soon.

PARTICIPATION

Both Parents try to be at the hospital as often as possible. When Max is admitted they alternate who stays the night.

They are very involved and even though they do believe that the medical team knows best they are eager to know everything and closely monitor their child. Marieke keeps a diary in which she writes down everything that has happened to Max and how he responded both physical and mental.

FAMILY NAME: VASEN

FAMILY MEMBERS



Danny 15yr 3 havo
Patient. Wants to be "normal"

Angelique 45yr Flight attendant
Mother. Wants to be in control.

Bastiaan 50yr Pilot
Father. Divorced from Angelique. Wants to be involved

Harold 52yr Horse breeder
Stepfather. Tries to assist where possible

Merel 17yr 5 havo
Sister. Is graduating this year.

Vincent 7yr
Half brother. Looks up to his big brother.

FAMILY DESCRIPTION

The family is very active. Danny and Vincent like to play tennis and Merel does dressage on a very high level and needs somebody to transport her horse to competitions. Angelique and Bastiaan divorced 10 years ago after which Angelique married Harold, with whom she got Vincent. Bastiaan is away from home a but wants to be involved in the care of his son. Angelique is the manager of the family she is always trying to arrange everything for everyone. Danny does not want his mothers involvement in his life. He feels fine and doesn't want to be treated different.

INTERACTION

Angelique is obviously the backbone of this family she is usually the one that comes to the hospital with Danny. She is very present, something Danny is not really fond of. He wants to take control over his own life and feels his mother is smothering him.

They do have a lot of visitors but do not often accept help,

Bastiaan isn't at the hospital very often but when he is he tries to get a grasp on the situation. His ex-wife is not very forthcoming with information so he seeks help from the nurses.

Danny has ALL and needs to undergo a 2 year treatment.

He is now half way and participates in a new study as well. He needs to go to the hospital every week.

PARTICIPATION

Angelique is very on top of things but does not want to think about the future. She is very organised and expects the same of the medical staff. She follows instructions to the letter and her questions are generally related to practical and logistical matters.

Danny wants to be kept in the loop. He really wants to know what is going to happen and why. And he is especially interested in the side effects of the treatment and what he can and can't do.

FAMILY NAME: NOWAK



FAMILY MEMBERS

- Ozella 10yr
Patient. A smart and very mature girl.
- Tosha 34yr Fulltime mom
Mother. Is very emotionally involved and likes to be in control.
- Marcel 37yr Gardener
Father. Finds comfort in his faith
- Pjotr 7yr
Brother. Looks up to his big sister but sometimes feels a bit neglected

FAMILY DESCRIPTION

The family is very religious, finds a lot of comfort in their faith and feels very much supported by their church community. But they rely mainly on their own strength and try to keep the illness of Ozella to themselves. Mother Tosha used to work as a child life specialist but has given up her job to take care of Ozella. Marcel has his own company but struggles to provide for his family. Although he is not very outspoken he is very close with his family. Resulting in a very loving but strict family.

INTERACTION

The family likes to eat and pray together even when Ozella is in the hospital. They really value this quality time as a family. Tosha tries to make the life of Ozella as comfortable as possible.

Pjotr looks up to his big sister but is sometimes a little bit jealous of the attention she gets.

The family knows their way around the hospital and are well informed about the cancer and the consequences.

DISEASE

Ozella has been battling bone cancer for quite some time now, Unfortunately the doctors have recently found metastasis which means that she will have to undergo even more severe treatment and her chances of survival have decreased dramatically. However, she tries to stay positive and enjoys the moments when her disease is not taking over her life. For example when she is having a good time with friends.

PARTICIPATION

Tosha is very strict and although she trusts the medical staff she wants to check everything. She is very punctual and expects the same precision of the medical staff. She wants to make sure that Ozella receives the best possible care and strives to make things as comfortable as possible for her daughter.

Marcel is much quieter and more inward. But it is clear that he finds it very hard to see his daughter suffering.

FAMILY NAME YILMAZ

FAMILY MEMBERS

Emre 6yr
Patient. He is very quiet and scared,

Ibrahim 43yr Painter
Father. Feels responsible for his family

Elif 38yr Fulltime mom
Mother. Is very loving and emotional

Ayse (11)
sister. Is very worried for her brother

Hawa (6)
sister. Does not really know how to react
seeing her twin suffering so much

Derya (2)
Sister. Does not grasp what is going on.

FAMILY DESCRIPTION

The family Yilmaz is very traditional, especially Ibrahim feels that he is responsible for his family and wants to be in control when it comes to descision making and discussing treatmentplans. Elif is very loving for her children who all seem to go to her for support. She has difficulties with the language and when her husband is not around relies on Ayse to do the translating. Other family members such as the grandparents and uncles and aunts frequently join the family to the hospital.

Emre is battling a medulloblastoma, the tumor has been removed and he now has chemo- and radiotherapy. He is doing very well and is now 6 months into his treatment.

INTERACTION

When Emre needs to go to he hospital the entire family usually joins him, Sometimes his grandmother will be there as well to assist Elif in taking care of the 4 children. They like their privacy to be respected especially when praying. It is a big family and it can feel really crowded when entering the room.

PARTICIPATION

Most of the contact with the family goes trough Ibrahim, he feels that he needs to make sure that he knows what is going on and asks for confirmation a lot. Elif is more concerned with the day to day care of Emre and leaves the big descisions to her husband. Ayse is het translator of the family, She has the best knowlegde of the language and seems genuinly interested in the medical procedures. So when something goes wrong she is usually the first to notice and informs her mom.

FAMILY NAME: DE GRAAF

FAMILY MEMBERS

Peter 17yr
Patient. Loves to make jokes

Sandra 45yr Baker
Mother. Knows what is best for her son.

Richard 51yr Baker
Father. A friendly guy but very protective of Peter

Sophie 23yr preschool teacher
Sister. Shares her parents concern and tries to support them in every way

Johan 26yr Software engineer
Boyfriend of Sophie. He is Peters best friend and loves to make him laugh

FAMILY DESCRIPTION

Richard and Sandra own their own bakery and live above the shop. Peter has down syndrome and his parents don't know any better than to take care of him. His sister is a preschool teacher and lives, together with her boyfriend Johan, very close to the bakery. They are very involved in the care for peter as well. Peter himself is a big fan of football and has found a buddy in Johan who loves taking him to matches or play Fifa with him.

DISEASE

Peter was recently diagnosed with AML, Which is not uncommon for children with down syndrome although it usually develops at an earlier age. He is currently 2 months into his treatment so he has a long way to go.

INTERACTION

Peter is a real fun guy and is always making jokes to the medical staff, as long as they do not touch him that is. Then he can make quite a tantrum.

His parents follow every move the nurses make. And want to make sure that they treat him properly. They are very kind though, it is not uncommon for them to bring a pie from the bakery.

Especially when Sophie and Johan are there they have a good time and enjoy themselves with games and jokes.

PARTICIPATION

Sandra and Richard have always taken care of Peter and have had some bad experiences with medical staff that did not know how to approach their son. So they are very protective of him and (when possible) insist on doing things themselves.

Sophie and Johan come to visit regularly, Johan focusses on entertaining Peter with games on his tablet for example, while Sophie is more concerned with his medical health and supports her parents by lending them a listening ear.

APPENDIX D: LIST OF REQUIREMENTS

- 1 GENERAL**
 - 1 PERFORMANCE
 - 1.1.1 The product should provide the user with information about appointments (time, location, participants)
 - 1.1.2 The user should have access to the product throughout the hospital. This includes the public spaces and the day care area but does not have to include the treatment rooms and radiology department
 - 1.1.3 It should be possible to notify the patient through the product. These notifications can refer to waiting times, but also to treatment related information as well as personal messaging
 - 1.1.4 The product should encourage exploration through the hospital
 - 1.1.5 The product should provide the user with a sense of control (evoke dominance), this does not have to relate to waiting
 - 1.1.6 The product should make the user feel comfortable in the environment
 - 1.1.7 The product should provide the user with some kind of distraction
 - 1.1.8 The product should be relevant throughout the entire treatment phase
It should be possible to trace the location of the product to:
 - 1.1.9 Locate the user (e.g. when a child runs away)
 - 1.1.10 Recover the product when lost
 - 1.1.11 Discourage theft
 - 1.1.12 Receive directions
 - 2 USER
 - 1.2.1 The product should be useful for families in the treatment phase
 - 1.2.2 The product should be useful for families at the day care (Polyclinic)
 - 1.2.3 The product should be suitable for children aging 6 to 11 and their parents
 - 1.2.4 Via recommendations 3-6 and 12-18 should also be considered
- 3 HYGIENE**
 - 1.3.1 The product should be easy to clean
 - 1.3.2 The product should contain little to no cavities
 - 1.3.3 The product should be resistant to water

- 1.3.4 The product should be resistant to detergents
- 1.3.5 The product should be resistant to acids
- 1.3.6 The product should be non-toxic

2 PRODUCT SPECIFIC

1 APP

- The app should provide the parents with information about:
 - 2.1.1 The appointments
 - 2.1.2 The location of their child
 - 2.1.3 The medicine intake (which medication does your child receive and when should you give it?)
 - 2.1.4 The app should be customizable
 - 2.1.5 By adding or removing functions
 - 2.1.5 By changing the colour scheme
 - 2.1.6 The parent should be able to communicate with the child via the app
 - 2.1.7 The app should be able to receive notifications about changes in the schedule
 - 2.1.8 The location of the phone should be traceable

2 WEARABLE

- 2.2.1 The wearable should weigh less than 50g
- 2.2.2 The wearable could be dropped from 1m height without being damaged
- 2.2.3 The wearable should be water resistant
- 2.2.4 The look of the wearable should be appealing to both boys and girls aged 6-11
- 2.2.5 Putting on the wearable should take minimum effort
- 2.2.6 It should be possible to adapt the wearable to new functions and features
- 2.2.7 The location of the wearable should be traceable
- 2.2.8 It should be possible to use the wearable for direction
- The wearable should receive notifications when:
 - 2.2.9 It is time for an appointment
 - 2.2.10 A message arrives
- 2.2.11 The notifications should be distinguishable
- 2.2.12 The child should not be able to remove the wearable from the bracelet
- 2.2.13 The battery of the wearable should last 10 hours without charging
- 2.2.14 The wearable should be fully charged overnight
- 2.2.15 Placing the wearable in and removing it from the charger

- 2.2.16 should take minimum effort
Connecting the wearable to the patients' account should take minimum effort
- 2.2.17 Using the product should require little to no explanation
- 3 BRACELET**
- 2.3.1 It should be possible to wear the bracelet without wearable.
- 2.3.2 The bracelet should fit P10 to P90 of children age between 6 and 11
- 2.3.3 The bracelet should be durable and withstand pulling forces
- 2.3.4 The material of the bracelet should be easy to clean
- 4 PORTAL**
- 2.4.1 The portal should be placed at a height suitable of children (Dined average height 6-11 year olds 1993 1372mm)
- 2.4.2 The casing should be able to contain a tablet, NFC reader and wiring
- 2.4.3 The material of the casing should be durable and withstand regular tapping and touching over 3 years
- 2.4.4 The portal should fit the style of the Prinses Máxima Centrum
- 5 PATCHES**
- 2.5.1 The appearance of the patches should fit the style of the Prinses Máxima Centrum
- 2.5.2 The appearance of the patches should appeal to the children and entertain them
- 2.5.3 The material used for the stickers should be able to withstand tapping and touching over a 3 year time period
- 2.5.4 The adhesive used for the patches should last 3 years
- 2.5.5 The patches should be easy to clean
- 6 GAMES**
- 2.6.1 The game should provide distraction
- 2.6.2 The game should stimulate physical activity
- 2.6.3 The game should encourage social interaction
- 2.6.4 The game should make use of some sort of reward system
- 2.6.5 The contents of the game should be suited for the location of the portal
- 2.6.6 It should be easy to end the game when it is time for an appointment

APPENDIX E: SKETCHES FROM IDEATION PHASE

APPENDIX F: DEVICE COMPARISON

The device on which the game can be played could either be a hand held device that includes the entire game (iPod) or via portals that can be accessed through a wearable. To make a proper analysis between these two options a SWOT analysis has been done and a Harris profile was created.

HANDHELD

The handheld device will consist of an iPod in a waterproof casing that includes an induction charging system. This iPod will be connected to the Wi-Fi network and is used to display the game and to receive notifications.

WEARABLE

The wearable used for this comparison will be a bracelet in the most basic form possible. So it will make use of an NFC chip to log in to the portals and a Wi-Fi antenna so a signal can be received that activates an alarm consisting of a vibrating motor and an LED light. This alarm can be used to let the patient know that a message has been send which can be read on one of the portals. The portals will consist of an iPad and an NFC reader. The game will be displayed on the portals.





SWOT ANALYSIS

Both the wearable and the handheld device have very clear advantages and disadvantages these are summarised in a SWOT analysis. Normally SWOT is used to describe a company's internal strengths and weaknesses and external threats and opportunities. However, in this case it is about a product. So the strengths and weaknesses refer to the product itself, where the threats and opportunities refer to the interaction with the device.

From these SWOT analyses it becomes clear that the main advantage of the wearable is that it is a very small and compact device that, since it is attached to the body is difficult to lose and even when lost the impact isn't significant since the wearable is cheap to produce. Whereas the handheld is a much bigger and heavier device that is much more vulnerable and easier to lose. And since this is a much more expensive device the impact of losing one is much bigger. However, the main advantage of the handheld is that the entire game can be played on that one device, so the player is not dependent on the location of the portals or other players occupying them which is the case for the wearable.

WEARABLE

- It is attached to your body, so difficult to lose
- The wearable is cheap to produce
- It is a small, compact device
- It is disposable

- To play the game, you are dependant on external portals
- The portals are expensive
- there are different body sizes to consider (ergonomics)

- In a later stage other features can be added to the wearable (such as a heartrate monitor)
- It is a unique device. it can't be compared to things they have at home
- It could replace/incorporate the hospital wristband

- When the child lacks mobility the game can not be played
- when the child gets a notification. it needs to find a portal to get the message. This leads to a delay in communication
- Parents do not have direct communication with their child
- making adjustments or adding features require a new production

HANDHELD

- The entire game can be played on one device
- It is visually appealing
- There is direct communication with the child

- It is a heavy and big device
- the handheld is expensive and vulnerable
- It need charging and cleaning (maintenance)

- adding features requires only a software update
- It can be traced (keeping track of child/ find it back when lost)
- It can be used for other purposes as well (monitoring movement)

- It is easy to steal / loose
- It could increase stress for the parents (feeling responsible for the device)
-

HARRIS PROFILE

Since the pros and cons are valid for both devices, a clear choice cannot be made from this comparison, so a Harris profile was created, comparing the devices on different points.

The points on the Harris profile are rated from most important to least important. From the Harris profile, it becomes clear that features such as portability and price of the device are more important than the adaptability to new features and the dependence of external factors. So the main advantages from the wearable as defined in the SWOT analysis are more important than the main advantages of the handheld, while the most important disadvantages are less important. Thus the wearable is the more favourable choice.

WEARABLE

The wearable used in the comparison only has the most basic features. But still seems to be the better option. However there are several features that can even enhance the use of the wearable. By adding a gyroscope and accelerometer chip it is possible to determine the position of the wearable thus making it possible to send directions and by adding a button with the single function of directing the user to a portal the user can always make optimal use of the portals and the wearable.

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	Handheld				Wearable			
	-2	-1	1	2	-2	-1	1	2
Provide distraction			1	2			1	
stimulate movement			1				1	2
Encourages social interaction			1	2			1	
portability (is it easy to carry around)			1				1	2
Direct communication			1	2			1	
Hygiene			1				1	
Sturdiness		-1					1	
difficult to steal/lose	-2	-1					1	
Costs (of the entire system)			1			-1		
Costs (of portable device)	-2	-1					1	2
Appearance			1	2			1	
Uniqueness			1				1	2
independent of external factors for use			1	2		-1		
adaptable to new features			1			-1		
Useful for children that are immobile			1		-2	-1		
location tracking			1	2			1	
independent of other players			1			-1		

APPENDIX G: LED PATTERNS

APPENDIX H: COMPONENTS

APPENDIX I: COST CALCULATION IN DUTCH

	€	aantal	sum
ELECTRONICA			
inkoop electronica wearable	15	250	3750
inkoop electronica portal	20	20	400
inkoop tablet portal	400	20	8000
inkoop tag patch	1	200	200
inkoop electronica wearable lader	5	5	25
inkoopkosten (uren)			4000
printplaat design wearable			14000
printplaat productie wearable	50	250	12500
productiebegeleiding			5000
BEHUIZINGEN			
productie behuizing wearable	2	250	500
inkoop armband	5	500	2500
productie connector	1	500	500
productie behuizing portal	100	20	2000
productie behuizing wearable lader	200	5	1000
inkoop patches	2	200	400
industrial design			40000
inkoopkosten (uren)			2000
productiebegeleiding			5000
ASSEMBLAGE			
assemblage wearable	10	250	2500
assemblage armband	1,5	500	750
assemblage portal	35	20	700
opplakken patches	3	200	600
productiebegeleiding			2500
bouwkundige voorzieningen portals	50	20	1000
AANVULLENDE KOSTEN			
inkoop server			4000
phonesoap	4	50	200
software licentie (Solidworks oid)			6000
3D printer inclusief filament en slicing software			10000
		<i>sub 1</i>	<i>130025</i>

PROGRAMMEREN

1) programmeren chip: sturing wearable + communicatie	50000
2) gegevensuitwisseling wearable-portal via nfc, interface nfc en touch-PC	10000
3) interface nfc en touch-PC	10000
4) gegevensuitwisseling chip-tag via nfc	10000
5) gegevensuitwisseling portal-server via wifi	10000
6) gegevensuitwisseling chip-server via wifi	10000
7) inrichten server	40000
8) ouder-app	20000
9) games (per spel)	10000
10) koppeling HIX	0
<i>sub 2</i>	<i>170000</i>
<i>total</i>	<i>300025</i>

APPENDIX J: RENDERINGS
