NEW CHILDREN HOSPITAL MOELING SPACE

ABSTRACT

We built a modeling space with HUS,
Hospital District of Helsinki, to empower
innovative planning and co-design for
the New Children Hospital.

Project Aim was to create and co-test
the modeling space/room, and report
possible innovative ideas that come up
while doing it. The ultimate aim is to find
the best possible design for a (high-
dependency) hospital room. In a way
the goal was thus twofold: To create a
physical testing space and to gather
information and ideas.

See more at **hospital.pdp.fi**

OVERVIEW

If you were to build a new apartment how would you make sure your ideas, needs, and desires were understood by the architect?

The staff of the Helsinki Children's Hospital were struggling with a very similar problem. They had a lot of thoughts on how the New Children's Hospital should be designed, but they were lost as to how to best communicate their ideas. A tool was created with the aim to bridge the communication gap between the users and the designers (architects). The tool enables the hospital staff to present their ideas through a physical modelling process. By working together, a better hospital experience is now within reach!

THE PURPOSE

WHERE DOES IT HURT?

These days, the world is constantly upgrading. There are new phones available every few months, dozens of new cars released every year, style changes by the seasons, and ideas change with every new article on Buzzfeed and each new TED talk. Most of the world is quick to welcome change and quickly adapt new technologies. However, there are still many instances where adapting to change is an arduous process that can take years, yet it is still necessary to stay ahead of the curve. Products must fit the year they are finished, not the year they are commenced. Large projects that require huge budgets, tons of space, and years to plan, fundraise, and build, will always face greater challenges in staying innovative and keeping up with the times. Hospitals are no exception.

Health and medicine are under rapid change -- for good reason -- yet it is more time intensive to reconstruct a building than to purchase and install the latest technological innovation. To add to the challenge, a hospital cannot simply close its doors for renovation. Hospital construction is like building a new road while cars are still driving on it. Certain sections can be closed and patients can be rerouted temporarily, but full functionality can never be sacrificed. In many cases, this places a limitation on the innovation in hospital design. As there is minimum time or money to focus on new ideas, especially when these ideas would require time to test, old ideas are recycled for new buildings. Hospitals need to be around for decades, lives are on the line - building it wrong from the beginning are not an option. Innovation has now become a risk. To further add to the challenge, the experts - doctors, nurses, patients, parents, the everyone who uses the hospital spaces - time is already heavily taxed 24/7/365 with their everyday duties. To ask more of these individuals for research and design ideas can be an unfair task.

This time, however, as HUS plans to construct a new children's hospital in Helsinki, they have decided that it will not do to have a space that is less than perfect. Every aspect of the new space should be an improvement from the old space. This is why HUS has looked for outside help. Time and effort are being provided for the research, modeling, testing, and perfecting that such a project would not normally have. As part of this comprehensive effort a model will be applied to the design process to determine the optimum layout. With a successful model in hand, HUS will be able to test designs as they deem best in the building of the new hospital.

CHALLENGE EXAMPLE

Absence of dedicated parent space in the current hospitals.

Previously it was not permitted for a parent to stay in the hospital premises throughout the night hours. As time progressed, new regulations came to be, and today many of the parents choose to stay in the hospital building close to their children . However, this is not reflected in any current hospital plan — in order to solve this problem, architects and planners need to begin from the skratch.

How do you make sure you consider all the possible opinions on such matter? A hospital nurse may have seen most of these cases through their years of work, but would it be optimal to simply ask them verbal questions? Ask them to draw a plan? How many hours would it take if you were circulating drawn paper prototypes back and forth?
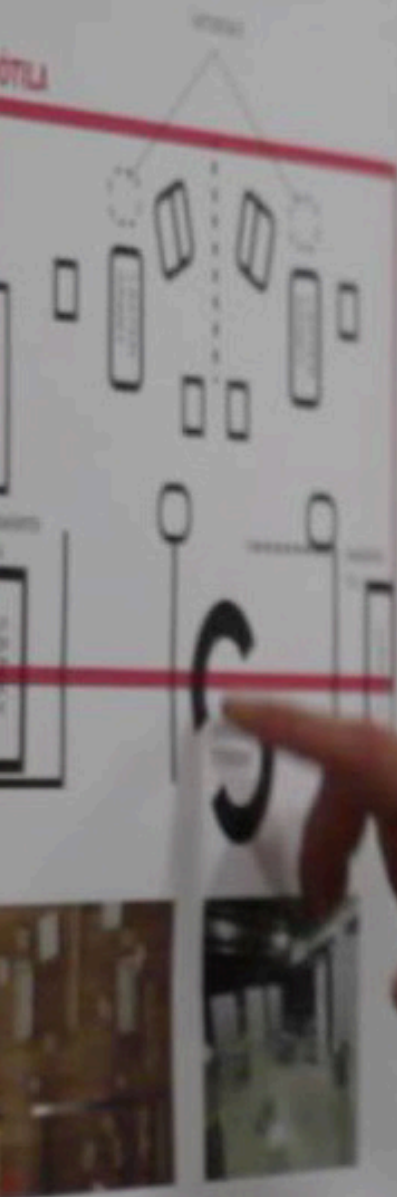
A way to fisrt layout sketch is sometimes rocky.

You are left with a two-fold challenge: to change the method of work, while still delivering the traditional material required for the building process. As always, time is your enemy.

THE RESULTS

Aalto group with the hospital partners develop methodology of a workshop series that would complement ideation. Through HUS we invited various groups of hospital personnel to build and test-drive spacial solutions for the new hospital.

THE HOW: A MODELING SPACE SESSION

To better understand the function of the model space, a situational example has been provided, presented through the eyes of the participant. See Appendix 1 for a full example of a workshop schedule.

1. Peter, the nurse

2. Peter receives invitation

3. Peter comes to the model space with the group

4. Peter does 1:10 and suggest bold ideas. Gets to feel power and strength.

5. Peter gets to see his idea become physical and tangible with 1:1 model. He gives more arguments in its favor and others agree.

6. Session hosts records all the notes as: ideas, problems and layout sketches. (see Appendix 2 for an example.)

7. Later that evening a team of x-ray technicians come to the model space and present alternative views to Peter's idea

8. A week later, when other teams have gone through the model, an architect is presented with the session results, while the best ideas are presented in the model. Peter's idea is discussed

a lot this evening. The architect notes that previously it was not clear how important this detail is.

9. New hospital in 2017 is one step closer to perfection.

DOCUMENTING AND PRESENTING THE IDEAS

What comes out of sessions and how you present it to the architect. (See the Appendix 2)

The main goal of the model space is the collection of ideas and insights from different user groups. The documentation of these ideas and perspectives is critical to ensure the valuable information obtained can be utilized in the final design of the space. For this purpose each test session that took place in the model space was carefully documented and reported to the hospital. After all the planning sessions with the hospital staff were complete, the designers of the New Children's Hospital were invited to the model space, where the results were presented. Layouts were prepared that illustrate the results of the sessions. Small presentations were performed to explain the thought process behind the layouts. The architects were then introduced to the model space, along with the planning techniques utilized.

The architect and the representative of Sweco were very pleased with our findings. It was commented that the presentations provided them new insights and inspirations, while presenting interesting themes for further discussion.

Actual hospital equipment in the model allows making realistic estimations about the space requirements

BENEFITS

One of the major results of the project was the determination that the type of model space developed is an effective and beneficial tool in the co-design process. The realitve low cost, flexibility of location, and relaxed approach provided benefits with respect to similar products.

COST

Total construction cost of the model space equaled 2194.84€. In comparison to similar projects, such as co-design room in Kouvola (estimated at 300 000€) , the model provides a low cost option for co-design. The project is clear proof that effective and beneficial results can be achieved with proper planning, guidance, and imagination, as opposed to spending large amounts of capital. A more accurate breakdown of expenses (including food and beverages) are presented in the Appendix 3-

ON-SITE LOCATION

The model space was built on HUS hospital property in an old ambulance hall. Thus, it provided easy access to the model space for the user, while at the same time providing a separation from their daily working environment. This was seen as a positive boost to the design process and the results . The easy access to the space proved to be time efficient.

EASY AND RELAXED APPROACH MIXED WITH REALISTIC TAKE ON PROCEDURAL TESTING

To facilitate the flow of co-design ideas, playful yet convenient design tasks were presented as part of the held sessions. The first step to the relaxed atmosphere was the separation of the user from his/hers daily environment.

In this way the user can focus solely on the task at hand. Second, after the consuming task of thinking, planning, and designing the room configurations, users had to simulate different scenarios in the model they built. Thus, the users became testers of their own invention. In these playful scenarios subgroups, such as cleaning staff and maintenance staff, were invited in order to obtain additional results and ideas. This was a strength of the model space; the ability to get many different users and sub-users involved in order to build a network of intelligent ideas.

UNDERSTANDING THE NEEDS

The starting point for the project was the observation of the current state of the hospital, and the determination of the main problems. As a means to understand the situation, various research methods were utilized to study how the current hospital works. The hospital was visited several times, where the hospital staff were interviewed. The provided a base information on the the opinions and experiences of the current employees.

BACKGROUND WORK

FIELD RESEARCH - CURRENT HOSPITAL STRUCTURE AND EQUIPMENT

From the time of the very first visits, it was quite clear that there are remarkable problems with the current space solutions at the hospital. The functionality and flexibility of the rooms was moderate, with the space given for the patients and nurses relatively small, due to the rooms being fully equipped with various pieces medical devices and furniture. At this point, the research team understood that the medical equipment would play an important role of the new hospital rooms. At the same time the research team knew it was lacking the knowledge about even the basic principles of the technologies and medical devices utilized in patient room. For this reason the specific research task for the collection of information on the typical devices, their specifications, and their methods of usage was conducted at the hospital. Each different piece of equipment was photographed, with the physical measures recorded. The end result of which was the creation of specific equipment cards to aid in the education of the project team.

THE PATIENT JOURNEY

After the current condition of the hospital was familiar to the team, the actual situations the take place daily were explored. Extensive research is essential when working with a complex system task such as this, even more so when an unfamiliar field is tackled. For this reason, a great deal was of time was devoted to the understanding the small details, along with the big picture.

To fully understand the task, it was required to conduct research on everything, ranging from a visit to a hospital, to the devices and procedures used. Research began through the discovery of the patient journey. The patient journey was determined through interviews with three nurses at the current Children's Hospital. It aided in the formation of the idea of what the patient goes through during their visit to the hospital.

CONTEXTUAL INQUIRY

Additionally, four contextual inquiries were conducted - a method which consisted of interviews and observations of the users in their environment. The contextual inquiries were made in the current children's hospital with four nurses. As a result, information was gained with regard to the common procedures in the space, the initial problems that occur in the space, and some new ideas that may occur in the space later. This information was utilized to develop the method - to determine what should there be present in the model space, and what type of procedures could be tested in the space. An example of a contextual inquiry (appendix 4) and other design methods (appendix 5) are represented in the appendix.

Kids do not desire privacy as much as adults. They invent a conversation window that will let them talk, while keep the sickness locked

A CHILD'S DREAM OF A HOSPITAL
In order to capture the patient's view on how the New Children's Hospital should look like, research was conducted with five 4 to 5 year old patients. Two of these patients were male, while the other three were female. All the patients had cancer or a blood-related illness. The study was conducted in the current Children's Hospital's play room.

The patients were divided into two groups both of which were interviewed for approximately an hour. The children were asked what their dream hospital room would be like, after which they were asked to answer the question using toys, drawings, and colorful papers to illustrate their ideas.

The study turned out to be quite successful. The children focused on the given task surprisingly well. They were able to express their thoughts through toys and other tools that they had been provided with. While working they were also inspired by each other's ideas and they were able to improve the ideas together. Many of the ideas that the children came up with were very innovative and imaginative.

What was a bit problematic in conducting the research was that the children were not only inspired by the toys, but at times also lead by them. For instance, a girl found a hanger in the room and immediately stated that having hangers in the hospital room is very important.

See Appendix 6 for examples of results from Child's Dream of a Hospital research method.

HOW TO USE THE MODEL SPACE

The aim was the development of simple and efficient methods to utilize the model space. Prior to the midpoint of the project a test run was organized, in which we different methods that could be used in the model space were attempted. The criterion for choosing the methods was that they had to be easily adapted and understood by everyone using the model space.

Based on the feedback received from the demo run it was decided that the final model space would contain mostly real hospital equipment and real hospital beds in order to add to the realism of the space. On the other hand, the space was not intended to constrain the imagination, therefore boxes and other simple objects were utilized to simulate additional equipment. This was intended to encourage the users adventurous side and aid in the development of innovative ideas.

A 1:10 scale model of the space was also constructed. Its utilization helped the users to gain an overview of the entire layout of the room. It was used for planning and sharing ideas, while the real size model (1:1) was used for validating those ideas. The 1:1 and 1:10 models were mostly used by groups of people with different roles in the hospital. The models transformed people's words into the physical form, thus making it easier for people to understand each other's needs.

Modeling space

The real-size model room is used as a tool for designing and achieving the perfect setup and functionality for a high-dependency hospital room. Co-design methods are being used to ensure that every user group is taken into account.

After the preliminary field research, learning about the nurses and patient lives' in the hospital, the next stage was the commencement of the model space; first within the group, followed by the demo run with the nurses. The event began with the construction of all the items and devices necessary for the space. The previously described equipment cards were utilized for this purpose. The first prototype of the model room was constructed from cardboard and other easy to build materials. This preceded the later steps of the acquisition of in real equipment to provide a more realistic environment.

The 1:1 sized model room was tested by different user groups. The main focus of the test run is to determine the best design for the model room, while the secondary focus will be on innovating and ideating about the structure and functionality of the real hospital room itself. The user groups include e.g. doctors, nurses, hospital staff and patients along their family. This co-design method will ensure that every point of view is taken into consideration when designing and planning the real hospital room. Improvements to the model space are also being made after each test run.

1:10 scale model

The 1:10 model is a design tool that is used to complement the real-sized model. When brainstorming the small scale model allows the user to quickly test out new ideas. This is an effective method as any large changes done to the real-sized model would be more time consuming.

The 1:10 model allows the user to brainstorm ideas and quickly test them out whenever and wherever they are. It is not bound to a specific location, which means a visit to the real-size model is not required to test the ideas. This is essential when working with other partners that contribute to the project, but are not a part of the team. The small-scale model allows for the quick testing of new ideas. Any changes made and tests performed with the real-size model space are a time consuming process. With the help of the 1:10 model more ideas can be generated and tested in less time. The small-scale model is also used in the co-design workshops that were arranged in the 1:1 model space. It helps the participants unfamiliar with the model space and project to quickly gain a general idea and grasp of what is to be achieved.

Once you got a person talking about their daily job

Documenting the sessions

For the effective analysis of the test results and to extract the vital information it is critical to have a good documentation technique in place. The more that the process is visual, the better the results. Encouragement of the participants to think out loud is another key to easy and effective for documentation.

A mix of photos, videos, and Post-it notes were utilized. Each test was documented by 2 people; one from the student team who worked in tandem with facilitator; and one person from the hospital staff.

As the test proceeded, the documentation personnel record notes in relation to the actions of the users and place them on the associated objects. To obtain a clear understanding of the need behind each note its important for the designer and architects know the reasons for the testers action. Photographs were taken of all the key points and the design decisions made, along with a video of the entire session.

BUILDING THE MODEL

EARLY PROTOTYPES

After the preliminary field research, finding out about the nurses and patient lives' in hospital, the team began running the model spaces; first within the team and then a demo run with the hospital staff.

At an early stage of the project an early prototype was constructed by the team with readily available materials. This process was described previously.

A similar process was conducted for the development of the 1:10 scale model. The various pieces of equipment were constructed by the team, only this time to scale. The construction of the 1:10 was also used as a brainstorming session. To aid in the generation of ideas each team member was assigned a randomly selected point of view to design the space from, such a for a 3 year old child.

Some possible practical suggestions for the hospital environment were born even within these minor tests. For example, the use of folding furniture/walls, or walls at a height that could provide privacy when sitting, but visibility when standing (privacy and accessibility for a nurse combined). There was as well a lot of thinking "outside the box", producing concepts such as Acoustic Animals, soft and colorful sticker pads for the walls to absorb extra sound.

THE DEMO RUN

*The highlight of autumn was the facilitation of the 1:10 and 1:1 model spaces in a demo session in December .*

In conjunction with the team's HUS partners an ideation session was planned to be run in the first prototype of the model space. An important outcome from the session was the co-design process, which provided the hospital staff with new insight into the tools for the hospital design.

Even though the demo run was aimed to be a only a proof of concept, the HUS modeling team gathered real ideas for the future hospital. For example, oxygen and air masks hanging from the ceiling, wireless monitor system and the flexibility of lights according to the patient. Nurses stations were located on the other side of the high-dependency for immediate control. Those were rather predictable results, and the big achievement for the partners was to finally see them sketched in the process — many restrictions were spotted right away.

Meanwhile, the team collected a list of improvements regarding the event flow and space itself, that would influence the final model space. One unexpected result was the request to use real equipment, especially wires. The design methodology practiced at the beginning of the project works with plain boxes or so called "non-objects" to allow the imagination roll free. However, for this case situation had to be re-evaluated; many of the processes could only be modeled with the restrictions of real medical equipment. The difficulty in the documentation of ideas emerged from the demo session. In order to manage the massive flow of the ideas and comments, a documentation technique had to be developed that would make sense to all parties and produce generally uniform results for further work.

A general conclusion was made that the concept of the combination of the scale and real-size model proved beneficial. Challenging questions were presented in the environment, where the answers required not only verbal communication but visual communication.
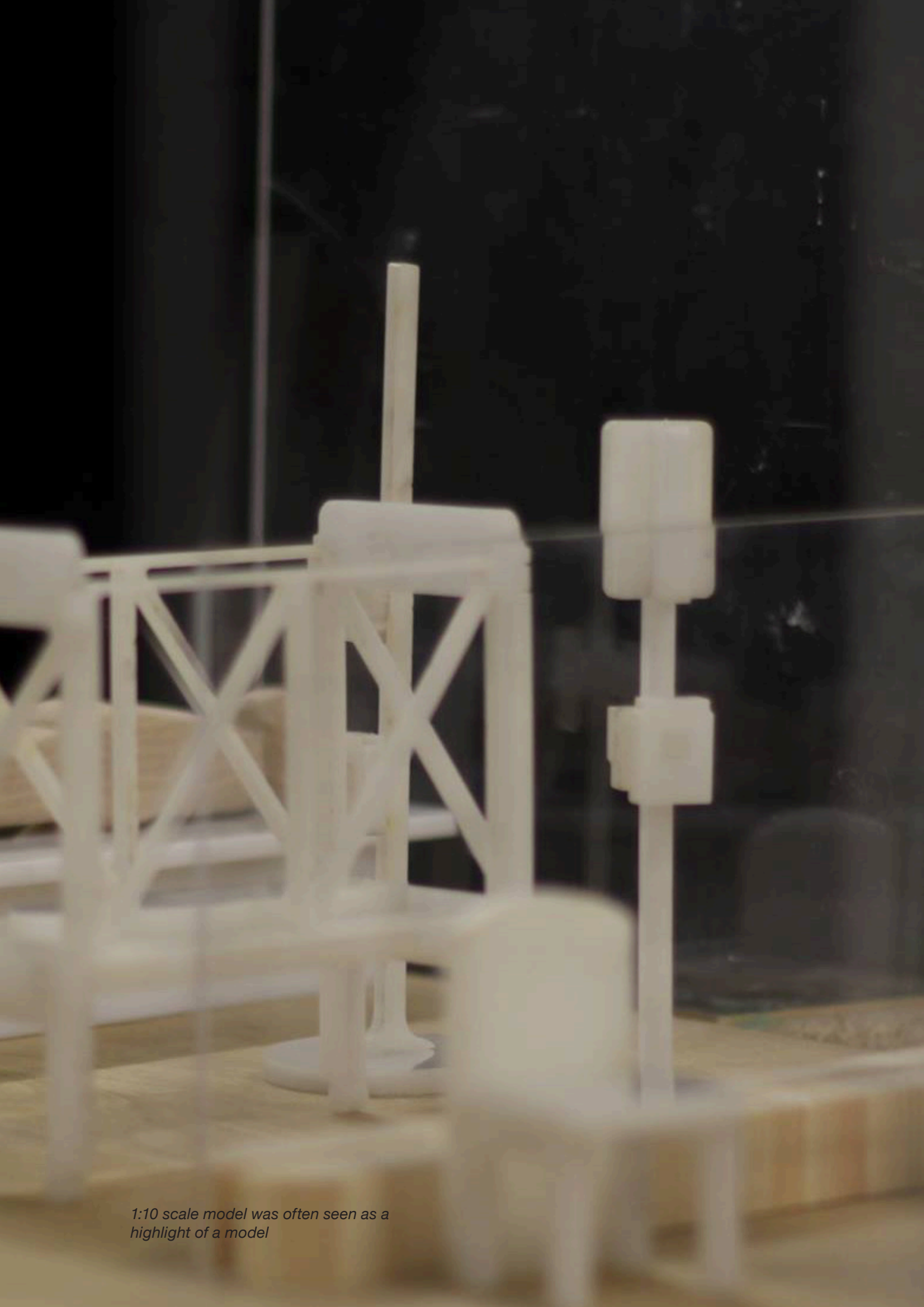
1:10 scale model was often seen as a
highlight of a model

Finding the Way

LOST IN THE WOODS

After the first demo session in the ambulance hall that utilized techniques adapted from the cardboard hospital project, the team was left with a number of ideas of where the project could go next. Proposals were put forth by members of the team on the various directions the project could take. One such example was the testing and improvement of the soundscape of the room. While it is always desirable to have an abundance of ideas, it can pose the negative effect of sowing confusion amongst the group and a lack of clear direction due to the disparity between what the group believed the hospital desired and what was in truth required.

The main focus of discussions would settle on the fundamental nature of the end deliverables. Was the team to deliver a functional model space for exploration of room shapes and configurations; the results from the running of multiple test sessions; or even a new product to recommend for the hospital? It was clear to the team that the focus of the group's future efforts rested on this distinction.

FINDING THE TRAIL

After much discussion the final requirements were determined and agreed upon with the HUS partners. A professional looking space was requested that would allow for the determination of the dimensions, layout, and shape of a two patient high dependency hospital room. A deviation from previous held notions was the desire to utilize as much real equipment as possible.

A number of constraints were agreed upon between the parties that would affect the design of the model space. These constraints were that there would be no ceiling, no curved walls, and that

there would be no requirement to attach equipment to the walls. A high priority was placed on the professional look of the model space.

It should be noted that after the first test sessions a desire was expressed for the ability to attach equipment to the walls. This desire would be fulfilled by the team.

Construction Method: The Lumberjacks

Throughout the duration of the project research was conducted for ready-made, light, self-standing, moveable walls. The search lead through a variety of avenues including interior design, exposition partitions, and office cubicles. In each case, the suitable options were all of a price rendered the product unsuitable to the project's needs.

In the end, it was through contact with theatre groups that yielded the best results. After observing the different options utilized for set walls, it was determined that the option of a simple wooden frame covered in cloth would provide the best results.

The wooden framed cloth walls proved to be self-standing, lightweight, and sturdy enough to provide an adequate feeling of the constraints

present by actual walls. The key focus of the walls was light weight and appearance.

FABRIC WALLS (X11)

The wall frames and legs were The wall frames and legs were constructed of light pine lumber. The fabric utilized was white Lycra. Lycra proved to be an ideal fabric for its elastic properties. This ensured that during installation that no wrinkles or loose fabric would be present, thus providing a professional look.

The constructed walls had a horizontal measurement of 1.5 m and a vertical measurement of 2 m. Simple corner braces were added for support to the frame, while hinged legs were attached to make the walls self-standing. Flat-top, rectangular weights were then constructed to sit atop the legs. These

were added as an insurance measure, as a small weight attached directly to the leg would have been sufficient. The external weight proved to provide a sense of safety to the users.

When the walls are attached in a singular line, hand clamps were utilized to join the walls together.

MAGNETIC WALLS (X4)

To address the late expressed desire to attach equipment directly to the walls, a magnetic wall was developed. As weight was a constant concern, the walls width was reduced to 1 m. A thin piece of sheet metal, 1 m x 1 m, was then attached to the frame, 20 cm from the top of the wall. A piece of lumber was added as a cross brace was added as a backing bar to the sheet metal.

For the magnetic walls, two sets of legs were installed, and heavier weights were constructed.

Magnets were then attached to the desired equipment.

Tales from the Forest Hermit - Construction Lessons Learned

During the construction of the base walls, it was determined that appearance outweighed stability. As such, cross braces were avoided due to the shadow produced on the front of the wall. This could be avoided in the future by utilizing a less transparent fabric. Such a cross brace would improve the stability of the walls, while providing a convenient handle for lifting the walls.

The walls were originally constructed through the use of a nail gun. While this greatly reduced the construction time required, the smooth nails proved problematic during transportation as in some cases the joins came loose or separated completely. Repairs were therefore needed. In the future, a more secure method of attachment should be utilized. It is possible that the addition of cross braces may also aid in elevating this problem.

The Glade - Model Space Setup

Once construction of the walls was complete, the ambulance hall needed to be transformed into a real model space. This began with the separation of the working area from the remainder of the ambulance hall with thick black curtains. Next came the laying of laminate floor atop the ambulance hall's concrete floor. As a final touch, LED pot lights were added to the ceiling to provide additional light.

For the test sessions and the co-design process, the constructed walls were utilized in concert with a combination of real hospital equipment and representational objects. Most of these representational objects were constructed from cardboard or kappa sheet. The main equipment utilized was:
- 1 x Rolling X-ray machine
 - 1 x Rolling desk stations
 - IV-liquid systems attached to walls
 - 1 x Hospital bed from Merivaara
 - 1 x Hospital bed from Hus
 - 1 x Baby bed
 - 2 x Patient table
 - 2 x Cardboard monitors attached to ceiling
 - 1 x Cardboard TV
 - 1 x Fabric separation wall between beds
 - 4 x Cardboard sinks attached to walls
- 3 x Chairs (2 for parents, 1 for nurse station)
- 2 x Stands for respirator/infusion pump

CONCLUSION

GREAT IDEAS THAT DIDN'T MAKE IT

One main idea worthy of future exploration is the soundscape of the hospital room. The idea was proposed at the midway point of the project, due to the observation of comments made by the various hospital staff on the noise produced from not only from the medical equipment, but also the other patients. An interesting project would be the exploration of methods to not only reduce the disturbing sounds, but also to increase privacy and clarity in the rooms.

Another common observance suitable for further exploration is the issue of patient privacy. As the high dependency room normally contains multiple patients, and there is a need for the the nurses to have constant visual contact with the patients, the issue presents the opportunity for unique solutions.

WHAT CAN BE DONE NEXT?

FURTHER DEVELOPMENT

Experience has shown that the modeling space can be utilized as a tool to collect ideas and to improve the overall design of the space. However, it can bee seen that the design and development of new kinds of rooms with the modeling space methodology is an iterative process in which the space is developed together with different types of user groups. It can also be observed how the room to be developed can be improved from session to session by collecting ideas from different user groups and stakeholders. The speciality in the methodology is that the space to be developed is all the time in a tangible and visible form, which makes it possible for the visitors to tell about their ideas and concerns

without a need to know the terminology and concepts typically utilized within product development projects. Overall, the concrete and simple form of the modeling space are the things that make the method different and practical.

TEST WITH FINAL USERS (PATIENTS, PARENTS)

It is recommended to further test real life situations and scenarios at the space to determine how the room works in action. For example, nurses can be asked to participate in a role play in which real life situations are practiced within the space, such as having a role play in which a person acting the role of patient will get a panic attack - and the nurses are to act in the way the situation requires, or having a role play in which a person acting in the role of the patient will have a headache and the nurses are to react on the situation.

With a similar method, the role plays can be targeted at the patients. For example, the patients can be given tasks such as eating, calling to friends, or playing games at the room. These role plays might bring up different kinds of obstacles in the room that have yet been taken into the consideration when the room setting had been designed.

In addition, at the final stage of the space development project, the room to be developed can be built to represent the final structure and form of the room to be built and furnished at the hospital. By testing the functionality of the model room before building the finalized rooms at the hospital, errors and possible mistakes can be corrected before the final hospital is constructed. By testing the final design solutions with simple to build model space, coupled with real user groups, some of the design mistakes and failures are able to be pointed out during these design sessions. As clear advantage of this

Using sketchy shapes allows you to apply your imagination whle using the model

perspective, it can be summarized that remarkable cost savings are possible to be achieved if the possible failures are found during the design phase, thus minimizing the the design flaws of the final construction.

REFINE THE PHYSICAL ELEMENTS

During the development process of the model space it turned out that there are drawbacks and mistakes in the physical elements of the model space. For example, the research team noticed that the physical elements at the modeling space such as the sinks, tables and the instruments to be attached to the walls are relatively difficult to use during a fast paced developing sessions. From this point of view it can be argued that the physical elements at the space should be developed and improved from their current state, as a means to improve the usability and the overall user experience of the modeling space.

One specific constraint for the room at the moment is that the objects are relatively difficult to be attached to the roof of the modeling space at the moment. Although it was determined at an early stage that this would not be a requirement of the model space, it became clear that it would be a beneficial capability.

Through the attachment devices and cables to the ceiling of the room, the ground space can be better utilized and simultaneously more floor space can be left empty. In order to improve the usability of the modeling space and the functionality of the final hospital rooms, it is strongly recommended that the ceiling of the modeling space should be developed to a version which would make it possible to hang and attach different kinds of items straight to the ceiling. When considering the situation more carefully, it has to be noticed that in developing new kinds of attachment systems for the roof, a special attention has to be paid on the safety issues of the system to be developed. The

attachment systems for the roof has to be extremely secure in order to avoid items from dropping down and to minimize the possible risks related to attaching items to the ceiling.

EXTEND THE METHODOLOGY TO WORK WITH PEOPLE MORE THAN ONCE (PLENTY OF INTERESTED VISITORS)

When the model space has been utilized together with visitors, it has been noticed that people with different kinds of backgrounds are able to bring to light interesting facts and insights about the possible needs and demands related to the space. As an example, nurses were capable to tell the research team about extremely specific and detailed needs related to their work and the equipment utilized at the hospital rooms. At the same time, the doctors

brought up their ideas about the needs at the hospital, where as a patient brought up different kinds of challenges related to patients' point of view about living and staying at a hospital. With this experience about learning new kinds of issues from the people with a variety of backgrounds, it is strongly recommended that when spaces and rooms are designed based on modeling space techniques and methodology, different types of user groups should be asked to test the space as a means to collect different ideas for the room to be developed. However, at the same time, it has to be remembered that the main goal of the development project has to be kept strictly in mind when the rooms are developed as a means to serve the needs of the primary users of the space.

Collecting the ideas and the reasons
behind the insights

Established trust

The experience and try outs at the modeling space have pointed out that with the methodology utilized it is possible to collect important user experience from the real end-users of the space. One of the biggest challenges in collaborative design projects is the communication between the people participating in the co-design project. Modeling space methodology makes it possible for the users to design the space straight away with tangible and touchable objects, which improves the communication in between the participants and makes it relatively simple to build and design new kinds of spaces together with people from a variety of backgrounds.

The methodology holds promise, and concrete benefits for utilizing a modeling space can be seen in the field of collaborative room and space design. The team is pleased to note that HUS, as a client, is ready to continue the utilization of design techniques and modeling space developed throughout the project as a means to improve the space design of the Children's hospital.

appendix

Appendix 1. Session schedule

This is an example schedule for a 1h long ideation session. Each facilitator adopted it according to the specifics of the group that was coming to the space.

MAIN QUESTION

What would the high dependency room (for 2 patients) of your dreams be like?

SHORT INTRODUCTION (5 MIN)

Who we are and why we built this space.

1:10 MODEL (15 MIN)

Plan and build the room using the 1:10 model. Discuss while building.

1:1 MODEL (30 MIN)

Now build the room that you planned in real size. Use movable walls, hospital beds, equipment and furniture in the model space to create your dream room. If you can't find the item you need replace it by using empty cardboard boxes etc. Use your imagination!

WRAPPING IT UP (10 MIN)

Are you happy with the room you created? What makes this room better than the one you're currently working in? Explain the main reasons behind the solutions.

Appendix 2. Session documentation

Example of testing session documentation

26.03.2014 TESTING SESSION WITH NURSES AND SURGEONS
TEST RUN BY: PILVI ISO-MARKKU, THOMAS WELANDER
LAYOUT & NOTES FROM A SESSION

One of the high dependency rooms has to have a bathroom for (older) patients

Yhteen valvontahuoneeseen yhteinen potilaskylpyhuone (tarvitaan vanhemmille potilaille)

The nursing station is located between two high dependency rooms so it is possible to monitor both of the rooms from there. There are two identical working stations in the nursing station.

Kahdella potilashuoneella yhteinen nursing station, jossa on kaksi samanlaista työpistettä. Nursing stationilta on näkymä kumpaankin huoneeseen.

There is a sliding partition wall between the patient places. It is made of intelligent glass.

Potilaiden välillä on liukuva tilanjakajaseinä, joka on ns. älylasia (voi helposti muuttaa kirkkaasta himmeäksi).

There is a small space for parents on both sides of the door (for sleeping/resting).

Vanhempien tila on omana soppenaan valvontahuoneen oven vieressä (tuulikaapissa), ei suoranaisesti valvontahuoneessa.

Movable side tables in both patient places.

Liikuteltavat apupöydät, molemmille potilaspaikoille oma.

Two mobile nurse stations inside the high dependency room.

Liikuteltavat nurse stationit kumpaakin potilaspaikkaa varten.

Monitors, oxygen etc. on the ceiling.

Liikuteltava kattokeskus.

Sinks need to be situated near the entrance.

Käsienpesupisteet lähellä sisäänkäyntiä.

OTHER NOTES

All sides of the bed need to be accessible.

Pääsy potilaan luo sängyn kaikilta puolilta. Sängyn ympäri pitää päästä liikkumaan

The doorway needs to be big enough for a resuscitation cart

Riittävän iso ovi, ovesta pitää mahtua elvytyskärry.

A partition wall is needed in some occations.

Väliseinää tarvitaan ainakin hetkittäin: tietyt toimenpiteet, yksityisyyttä potilaalle, valaistus, lapsen ja vanhemman kahdenkeskinen aika jne.

Parents shouldn't be in the high dependency room.

Vanhempien paikka ei ole valvontahuoneessa.

No cords.

Ei liikaa johtoja.

Parents shouldn't hear/see private information about the other patient who stays in the same room with their child.

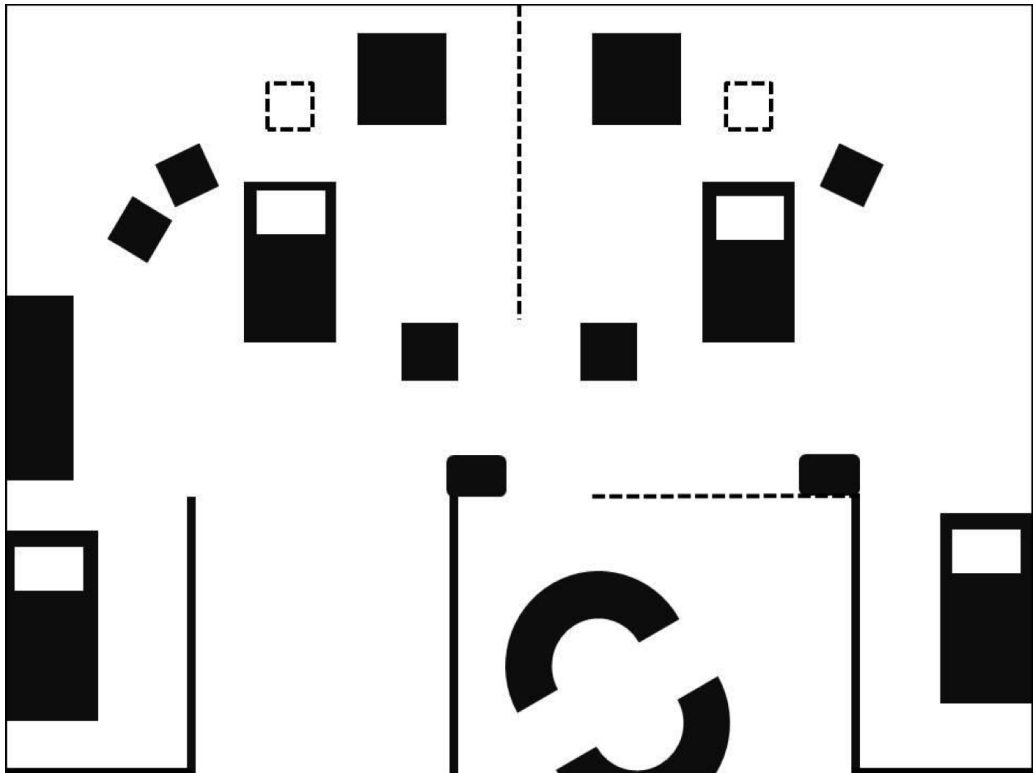Vanhemmat eivät saa kuulla toisten potilaiden tietoja.

Teenagers and small patients are usually not in the same room.

Pienet vauvat ja nuoriso pyritään usein sijoittamaan eri huoneisiin.

Electronic cribs.

Sähköiset pinnasängyt.

A nursing table with a warming system (Babytherm) is needed for babies.

Resulting layouts on 1:10 scale model and refined sketch

Lämmitettävä hoitopöytä (Babytherm) tarvitaan pienimmille potilaille.

Movable nursing tables could also include a small bathtub for babies and a shower, a scale and a garbage bin etc.

Liikuteltava hoitopöytä, jossa myös suihku + amme (+roskis +vaaka jne.)

Older patients could use a tablet instead of a tv.

Isommille lapsille tv:n sijaan tabletit, pienille lapsille tv kattoon.

The doctor has his/her own computer.

Lääkärille oma kone.

Lights can be adjusted according to patients' individual needs. In the night the lights can be turned off if the patient's condition is stable.

Valoissa himmennysmahdollisuus: vuorokausirytmi, potilaiden yksilölliset tarpeet

Music and calming sounds make patients relaxed and gives them privacy

Musiikki tai muu rauhoittava äänimaisema.

The patient's family may need several chairs. One of them should be big and comfortable.

Useampia tuoleja potilaan perheelle, yksi iso ja mukava.

Parents need a comfortable chair as well as a bed.

Vanhemmat tarvitsevat sekä lepotuolin että sängyn.

There is a small toilet/shower and a fridge in the small space for parents.

Vanhempien soppeen jääkaappi ja pieni wc/suihku (tarvittaessa wc voi olla käytävällä.)

The cupboards/storage rooms should only have the things that are needed during one day inside them, no extra items.

Kaapissa vain päivän aikana käytettävät tarvikkeet.

Appendix 3. Construction Budget

Item	Amount
Total conctruction costs	2194.84
18.11.13 / Van rent	72.1
18.11.13 / Tools, tape etc for Large scale prototyping	44.43
18.11.13 / Office stuff	9.9
18.11.13 / Office stuff	19.9
27.11.13 / Boxcutters	9.5
21.2.14 / Carpet 70m2 {9€/ m2 (including tax 24%) }	630
21.2.14 / Transportation of carpet	35
24.2.14 / Molton Curtain from Thomann	360.4
25.2.14 / Proto piece of Lycra fabric	25.8
27.2.14 / Wood for wall frames	226.27
27.2.14 / Acrylic sheet for laser cutting	60
3.3.14 / Fabric for walls	356.22
3.3.14 / Construction materials, and misc. stuff	84.25
4.3.14 / Misc stuff for model space (Bauhaus)	41.75
4.3.14 / Misc stuff for model space (Ikea)	22.94
4.3.14 / Misc stuff for model space (Clas Ohlson)	10
4.3.14 / Misc stuff for model space (clas ohlson)	25.95
4.3.14 / Finishing tools	7.9
5.3.14 / Paper knife	4.8
7.4.14 / Plastic bowl to make sink	3.98
8.4.14 / Fabric for model space	62.25
6.5.14 / Two Van rentals for KIK	81.5

Item	Amount
Total Overall Payments:	2953.18
17.10.13 / Daily Allowances for USA members	340.2
13.11.13 / Food for Weekly meeting	15.75
14.11.13 / Basecamp	120
18.11.13 / Van rent	72.1
18.11.13 / Tools, tape etc for Large scale prototyping	44.43
18.11.13 / Office stuff	9.9
18.11.13 / Office stuff	19.9
27.11.13 / Boxcutters	9.5
11.12.13 / Demo day: Food & Drinks	64.91
6.2.14 / Merivaara Visit - Snacks	9.17
21.2.14 / Carpet 70m2 {9€/ m2 (including tax 24%) }	630
21.2.14 / Transportation of carpet	35
24.2.14 / Molton Curtain from Thomann	360.4
25.2.14 / Proto piece of Lycra fabric	25.8
27.2.14 / Wood for wall frames	226.27
27.2.14 / Acrylic sheet for laser cutting	60
27.2.14 / Staples	11.05
3.3.14 / Fabric for walls	356.22
3.3.14 / Construction materials, and misc. stuff	84.25
4.3.14 / Misc stuff for model space (Bauhaus)	41.75
4.3.14 / Misc stuff for model space (Ikea)	22.94
4.3.14 / Misc stuff for model space (Clas Ohlson)	10
4.3.14 / Misc stuff for model space (clas ohlson)	25.95
4.3.14 / Finishing tools	7.9
4.3.14 / Finishing tools for idea board	15.65
5.3.14 / Paper knife	4.8
5.3.14 / Food for model space workshop	12.96
7.4.14 / Plastic bowl to make sink	3.98
8.4.14 / Fabric for model space	62.25
17.4.14 / Daily allowances for cottage trip	168.65
6.5.14 / Two Van rentals for KIK	81.5

Appendix 4. Contextual inquiry nurse from emergency duty

SUMMARY (THINGS THAT SHOULD BE PAID ATTENTION TO)

Furniture and devices need to be light, adjustable and flexible

More space is needed

Parents and their personal belongings

Privacy

Small activities for the patients

PROCEDURES

Common reasons why a patient is taken into a high dependency room: need for additional oxygen, need for continuous monitoring, badly broken bones

Common procedures in a high dependency room: measuring blood pressure or pulse, giving additional oxygen or medicine that can be breathed in, suction

Children often want to sit on their parents lap while being examined or treated by the nurse

Writing down data about the patient

Patients are expected to stay in their beds (They don't usually even have the energy get up.)

The time spent in the high dependency room varies a lot but it's usually less than 4 hours

DEVICES

Monitoring: All monitors need to be visible and clear even from a distance or then a central monitor can be used

Monitors that are currently being used cannot be moved and adjusted very easily, they should be more flexible

ROOM SETUP

More space is needed

It would be good to have empty space on all four sides of the bed, but having empty space on 3 sides of the bed is the minimum

In the current high dependency room there is a window between the high dependency room and nurses' office but you can't really monitor the patients through the window

There are two types of curtains in the room: movable screens and "shower curtains". Curtains are dislikable and they don't give the patients enough privacy. (A boy may need to pee while being at the same room with 3 other patients and their parents and the nurse.) The curtains/partitions between the patients should be stronger and thicker - they could even be walls. The problem with walls, however, is that they make the space around the bed feel even smaller (bunker feeling).

Risks in the space: a child might pull cords and tubes, there are some baskets and boxes above the patient's head that might fall off, a child might accidentally swallow some disinfectant. Children like to touch and chew things, so most things should be kept out of their reach (high enough, for example).

Parents want to sit on the 'head side' of the bed. This is also where the monitors etc. are and sometimes parents (and the chair they sit on) are blocking the nurses' way to the monitors.

It would be good if the nurse could reach all equipment while standing on one side of the bed. Currently the nurses need to move a lot around the bed and go here and there to get the things they need. (This can be a good thing, too, though.)

Having a TV and a possibility for other small activities in the room is important.

(The current TV is too small and it can't be moved and adjusted very easily. At the moment there's just one TV in each room although different patients like different programs (a 14 year-old may not want to watch Bob the Builder).)

AN IDEAL HIGH DEPENDENCY ROOM

Ideal furniture: light, movable, flexible (like the monitor table in the new emergency room)

The lighting of the room should be adjusted according to each

patient's needs (In the same room a patient might be suffering from a migraine and he/she might want to sleep to sleep, while another patient might be being examined by the doctor in bright light)

Cupboards with glass doors would probably be the best option for storing things. Open shelves are not very practical because they collect dust

Having iPads instead of books or a TV– more hygienic, individual needs

Interesting things to see and small activities to do

Bright joyful atmosphere, colours

A table and a chair for the patient's parent/relative etc.

PATIENT AND FAMILY

Patients are almost constantly accompanied by their parents. Just one parent is allowed to stay in the high dependency room with the patient. At the moment it isn't possible for the parents to stay overnight in the high dependency room

Parents don't have any place/space for their personal belongings, not even a table for a coffee cup. Perhaps a small movable coffee table with a shelf under it would be needed. However it shouldn't take up too much space and it shouldn't be on the nurses' way.

SMALL THINGS:

Bed

 - The beds that are currently in use are either for babies and toddlers or for adults, so the beds are either too small or too big for young people. Smaller beds would save up space.

- Cords and tubes and other things are often on the way when adjusting the bed.

- It is important to have side rails that prevent the patient from falling out of bed, especially if the patient is very young.

- There is a stand for a dropper attached to most beds but it's not very practical. It tilts if you adjust the bed in a more upright position and the dropper hangs just above the patient's face. For this reason most nurses prefer to use a movable dropper

that has wheels.

Each patient should have their own nurse call button

Water

- There's just one sink in the room. Some people might avoid using the sink because they don't want to disturb the patient staying nearest to the sink.

- Having a separate place for drinking water would be nice. At the moment people go to the lavatory to get water for drinking as well as to wash their baby's butt.

- There are currently no showers. Showers might be needed in some situations (washing a patient's hair that is stained with blood, a baby needs to be washed, cleaning scalds, a relative needs to take a shower etc.)

Most utensils (plasters, diapers etc.) can be situated in just one place (cupboard etc.)vomit) in racks. This would be a good place to have disposable aprons as well. If the room is big, more than just one place for disposable gloves is needed.

Medicine is usually kept in the main office. Only the medicine needed in emergencies is kept in the rooms (at least in the emergency room).

Garbage bins and a laundry basket are needed in a high dependency room.

It's better to have various small garbage cans around the room than just one big one. (Cleaning staff might disagree, though.) The garbage cans should probably have lids on them.

At the moment the colours in the rooms are awful and there are random pictures here and there

How should the door to the high dependency room be like? Nurses go in and out of the room all the time and they should have easy access to the room, yet the door should also give the patients enough privacy.

A mirror is something the patient's visitors may need

A wall clock showing seconds would be useful

Having natural light in the room would

Appendix 5. List of design methods considered and used in various stages of the process

1:10 SCALE MODEL

It is easy and fast to try out different layouts for a room using a small scale model. The space can be viewed from a new perspective through it, which makes it easier to see the challenges and problems in the space. The small scale model is used as a tool of communication and planning in our project.

MOCKUP

Mockup is a light structured model of an object or a space with real proportions. It is used for testing the usability of a product. We used mockups to simulate some items, such as sinks and cupboards, in our project.

CO-DESIGN

Co-design is a way of involving the user of a product in design process. Users often have more expertise and knowledge in their field than designers and co-design gives them the opportunity to share their information. Workshops and games are often used to help users express their thoughts.

ACTING OUT

Acting out is a method used for testing a design by trying out a procedure step by step. It helps in pinpointing the problem areas in the design. Mockups and prototypes can be used as props when acting out a procedure.

CONTEXTUAL INQUIRY

Contextual inquiry means interviewing a person while she/he is doing his/her normal activities. In our project this method was used when interviewing nurses at the hospital.

INTERVIEWING

Interviewing is a research method in which a researcher, called as interviewer, will ask questions from the people as a means to collect opinions and thoughts from the people. Interviews are typically based on discussion as a result of which an interviewer is able to collect subjective and experience based information. Interviewing can be seen as a valuable and effective way to collect subjective insights, thoughts and opinions from the people that can be seen to be difficult with objective research methods or by observing people. Interviews are also a good way to collect qualitative information from the people relatively fast. A big challenge in interviewing as a research method is that the information callected as a result of a discussion might be affected by the values and attitudes of the persons, which has to be taken into the consideration when considering the reliability of the information. At the same time, a remarkable amount of effort has to be paid on the questions to be uses as a means to collect right kind of information

Appendix 6. Examples of the ideas that the children came up with during Child's Dream of a Hospital Session

different aged children should have different rooms, for example 16 year old do not want to have teddy-bear pictures on their wall

- a candy shop
- peeking holes through which you could see other patients without having to be afraid of the diseases spreading
- more colors
- tablets/pads for playing games etc.
- large TV's and TV programmes for children, the TV should be easy to use
- hoplop (to which 1. patient said "if blood levels would be good, you could go")
- crowns which you could keep when you had them long enough
- beautiful clothes
- pictures on the wall - rain drops and flowers
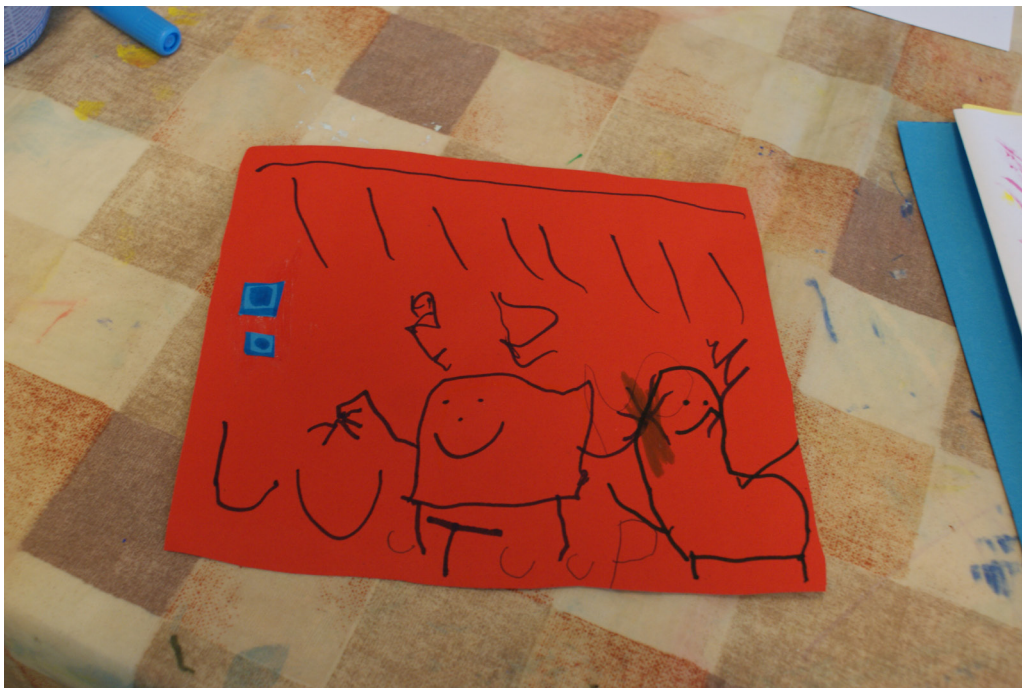
Watching Sponge Bob on Ipad

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