Graduate thesis

NTNU
Norwegian University of Science and Technology
Faculty of Architecture and Design
Department of Design

Fridtjof Rode Agnalt

Redesigning future emergency rooms

A human centered service design approach to optimize workflows

Graduate thesis in Industrial Design Engineering
Supervisor: Dr. Ashis Jalote Parmar
Co-supervisor: Dr. Lars Erik Laugsand
May 2023

NTNU
Norwegian University of
Science and Technology

Fridtjof Rode Agnalt

Redesigning future emergency rooms

Using collaborative service design methods to implement changes, creating value for staff and patients

Graduate thesis in Industrial Design Engineering
Supervisor: Dr. Ashis Jalote Parmar
Co-supervisor: Dr. Lars Erik Laugsand
May 2023

Norwegian University of Science and Technology
Faculty of Architecture and Design
Department of Design

NTNU
Norwegian University of
Science and Technology

NTNU
Fakultet for arkitektur og design
Institutt for design

NTNU
Fakultet for arkitektur og design
Institutt for design

Redesign of future emergency rooms
Master thesis for student: Fridtjof Rode Agnalt

Background:

From 2013 to 2021 the number of patient visits in the St. Olav's emergency room rose from 20 thousand to 29 thousand patients. With so many patients the current solution for admitting walk-in patients is proving ineffective. The emergency room at St. Olav's operates with two receptions: One for polyclinical patients, and one for acute patients. This solution is spatially inefficient and creates an artificial divide in the ER that might be confusing to patients. Waiting patients in the acute section also sit in the hallway, something the staff find stressful. The project will address the patient's first meeting with the emergency room by redesigning the physical space and altering the flow of information through digital solutions and service protocols to improve the experience for staff as well as patients.

Research Question:
To investigate role of experience design in designing physical space, digital information systems and service communication protocols to reduce stress and improve organization in emergency rooms for the future.

Expected methodology:
Secondary data collection - Literature study examining design in healthcare.
Primary data collection - Interviews, observations, surveys
Product definition and ideation through co-creation and design methodology.
Prototyping and testing in a realistic environment.

Expected results:
Visualization of the future physical space, prototypes for digital solutions and service communication protocols.

Oppgaven utføres etter «Retningslinjer for masteroppgaver i Industriell design».

Hovedveileder: Ashis Jalote Parmar
Biveileder: Lars Erik Laugsand

Vår dato Vår referanse

Norges teknisk-naturvitenskapelige universitet

Bedriftskontakt: Lars Erik Laugsand

Utleveringsdato: 9. januar 2023 Innleveringsfrist: 29. mai 2023

NTNU, Trondheim, (dato)

(signatur)
Ashis Jalote Parmar
Veileder

(signatur)
Sara Brinch
Instituttleder

Abstract

This thesis examines the role of service design in improving emergency departments (EDs) by addressing the challenges following increased patient volume. The study focuses on a real-world case at St. Olavs hospital in Norway. The goal is to explore how service design can contribute to value creation in the healthcare sector, specifically in the context of EDs. The traditional approach of hiring more staff to meet demand is deemed unsustainable due to cost constraints. To overcome these challenges, the healthcare sector needs to find innovative ways to allocate resources and enhance services while containing costs. Service design, with its focus on continuous improvement and stakeholder value creation, offers a potential solution.

The thesis addresses the patients' initial experience at St. Olavs emergency room by improving information provision and the physical workflow. The research question investigates the role of service design in designing physical space, information systems, and service workflows to reduce stress and improve organisation in EDs for the future.

The study fills a gap in existing research, which has primarily focused on frameworks or prototypes, lacking implementation and grassroots involvement. By conducting primary research using contextual inquiry, including observation and semi-structured interviews, the study identifies existing issues and probes for solutions while considering cultural and physical constraints. Key issues at St. Olavs ED include inadequate wayfinding, insufficient patient information, and unwelcoming waiting areas. Staff members also face challenges related to parallel processing, stress, and noise in the treatment area. Human centred and collaborative service design methods are employed to develop, implement and iterate solutions within a limited timeframe. Stakeholder involvement ensures that needs are met and solutions are grounded in the context.

This thesis contributes a proof of concept for using service design to solve local issues in EDs. It emphasises the need for service design to play a larger role in the healthcare sector, offering a unique mindset and toolset to address the right problems effectively currently unavailable to healthcare staff. By integrating service design across departments, healthcare institutions can build holistic and patient-centred services from the ground up, addressing small problems to reveal the broader pain points in the service.

Overall, this study supports the use of service design as a valuable approach for improving EDs. It highlights the benefits of involving frontline staff in the design process. By leveraging the tools and methodologies of service design, healthcare institutions can create sustainable improvements in EDs, enhancing patient experiences, staff satisfaction, and overall organisational effectiveness.

Sammendrag

Denne masteroppgaven undersøker rollen til tjenestedesign i forbedring av akuttmottak ved å adressere utfordringer knyttet til økt pasientvolum. Studien fokuserer på en reell problemstilling ved St. Olavs hospital i Trondheim. Målet er å utforske hvordan tjenestedesign kan bidra til verdiskaping i helsesektoren, spesifikt i akuttmottak. Den tradisjonelle tilnærmingen med å ansette flere for å møte etterspørselen anses som uholdbar i fremtiden på grunn av kostnadsbegrensninger. For å håndtere disse utfordringene, må helsesektoren finne innovative måter å fordele ressurser på og forbedre tjenestene samtidig som kostnadene holdes nede. Tjenestedesign, med fokus på kontinuerlig forbedring og verdiskaping for brukere, tilbyr en potensiell løsning.

Oppgaven tar for seg pasientenes første møte med St. Olavs akuttmottak ved å forbedre informasjonsformidlingen og arbeidsflyten. Forskningsspørsmålet er å undersøke rollen til tjenestedesign i utformingen av fysisk rom, informasjonssystemer og tjenesteflyter for å redusere stress og forbedre organiseringen av akuttmottak i fremtiden.

Studien fyller et tomrom i eksisterende forskning, som først og fremst har fokusert på rammeverk og prototyping, men mangler implementering og grasrotinvolvering. Ved å utføre primærforskning ved bruk av kontekstuell undersøkelse, inkludert observasjon og semistrukturerte intervjuer, identifiserer studien eksisterende problemstillinger og utforsker løsninger samtidig som kulturelle og fysiske begrensninger vurderes. Sentrale problemstillinger ved St. Olavs akuttmottak inkluderer tilstrekkelig skilting, manglende informasjon til pasientene og ukomfortable venteområder. Personalet møter også utfordringer knyttet til arbeidsflyt, stress og støy i behandlingsområdet. Menneskesentrerte og involverende tjenestedesignmetoder brukes for å utvikle, implementere og iterere løsninger innenfor en begrenset tidsramme. Involvering av interessenter sikrer at behov dekkes og løsninger forankres i konteksten.

Denne oppgaven bidrar med konseptvalidering for bruk av tjenestedesign for å løse lokale problemer i akuttmottak. Den understreker behovet for at tjenestedesign skal spille en større rolle i helsesektoren, og tilbyr et unikt tankesett og verktøyskrin som for øyeblikket ikke er tilgjengelig for helsepersonell for å løse de riktige problemene. Ved å integrere tjenestedesign på tvers av avdelinger, kan helseinstitusjoner bygge helhetlige og pasientsentrerte tjenester fra grunnen av, og adressere små problemer for å avsløre de bredere smertepunktene i tjenesten.

Samlet sett støtter denne studien bruken av tjenestedesign som en verdifull tilnærming for å forbedre akuttmottak. Det fremhever fordelene ved å involvere frontlinjepersonell i designprosessen. Ved å utnytte verktøyene og metodene i tjenestedesign, kan helseinstitusjoner skape bærekraftige forbedringer i akuttmottak, forbedre pasientopplevelser, ansattes tilfredshet og generell organisatorisk effektivitet.

Table of contents

ABSTRACT 4
SAMMENDRAG 5
1. INTRODUCTION 10
1.1 Introduction 12
1.2 Key terms 13
1.3 Background 14
1.3.1 What is an ed? 14
1.3.2 The st. olavs ed 16
1.4 Project and scope 22
1.5 Staff and their roles 23
2. METHODOLOGY 24
2.1 The role of the designer 24
2.2 Human centred design 24
2.3 Contextual inquiry 25
2.4 Service design 25
2.5 Co-design session 26
2.6 Service blueprint 26
2.7 Rapid iterative testing and evaluation 26
2.8 Double diamond 27
3. LITERATURE REVIEW 30
3.1 Patient centred care 31
3.1.1 Patient centred care and service design 32
3.2 Satisfaction 32
3.3 Hospital design and management 33
3.4 Physical Space 33
3.5 Information systems 34
3.6 Wayfinding system 34
3.7 Signage 34
3.8 Service workflow 35
3.9 Design research 35
3.9.1 Speculative design framework 35
3.9.2 Experience based co-design 36
3.10 Summary 36
4. PRIMARY STUDY 38
4.1 Method 38
4.2 Observations and interviews in St. Olavs hospital: 38
4.2.1 Secretary 38
4.2.2 Coordinator and flow nurse 39
4.2.3 Emergency doctors 40
4.2.4 Emergency doctor teams 40
4.2.5 Heart clinic 41
4.2.6 Disaster training 42
4.2.7 Triage 42
4.2.8 Patients 42

4.3 Observations at Haukeland hospital in Bergen: 43
4.4 Patient questionnaire 44
4.5 Selected quotes 45
4.6 Problem areas 46
4.6.1 Wayfinding to reception 46
4.6.2 Waiting for reception 46
4.6.3 Registration 46
4.6.4 Transport to triage 47
4.6.5 Lack of information 47
4.7 Key findings 50
4.8 Co-design 52
4.8.1 Planning 52
4.8.2 Co-design session 54
5. DESIGN AND DEVELOP 60
5.1 Personas 62
5.2 Scenarios with different personas 64
5.3 Design concepts 66
5.3.1 Physical space 66
5.3.2 Information system 68
5.3.3 Wayfinding system 68
5.3.4 Workflow: 68
6. DELIVER: SOLUTIONS, TESTING AND ITERATION 70
6.1 Wayfinding 72
6.1.1 Queuing machine and reception entrance 72
6.1.2 Path from reception to U1 waiting room 74
6.1.3 Doorbell and waiting zone signs 78
6.2 Information system 80
6.2.1 Website 80
6.2.2 Poster 80
6.2.3 Leaflet 82
6.3 Service workflow 84
7. RESULTS 90
7.1 Patient interviews 90
7.2 Patient questionnaire 90
7.3 Staff interviews 90
7.4 Staff evaluation session 91
7.4.1 What is good and bad about the current flow? 91
7.4.2 Are we going the right way? 92
7.4.3 Further improvements 92
7.4.4 Evaluation of the process 93
8. DISCUSSION AND LESSONS 94
8.1 Design elements 96
8.1.1 Design information for stress- People turn blind when in distress 96
8.1.2 Visualisation of multilayered workflows- Visualization of blueprint a good way of communication 96

8.2 Stakeholders 96
8.2.1 Service design is welcome in health 96
8.2.2 Health staff require structure, clarity and calm to perform 97
8.2.3 Patients require human contact to feel safe 97
8.3 Methods 98
8.3.1 Collaborative design leads to better solutions in hospitals 98
8.3.2 Contextual inquiry works very well for complex, fast paced environments 99
8.4 Design lessons in an ED 100
9. FUTURE 102
9.1 The future of the St. Olav's ED 104
9.1.1 Autoskår 104
9.1.2 Automation 104
9.1.3 Communication with GPs 104
9.1.4 What could a future scenario look like? 104
9.2 The future of service design in health 106
10. CONCLUSION 110
10.1 Limitations 110
11. ACKNOWLEDGEMENTS 111
12. REFERENCES 112
13. APPENDIX 116
Patient questionnaire 117
Photos from st. OLav's 119
Questionnaire results 123
Presentation from co-design session 128
Problem descriptions from co-design session 137
Original poster 145
Original leaflet 146
Materials from evaluation 147
Service blueprint from co-design session 149

1. Introduction

1.1 Introduction

The emergency department (ED) is the most fast paced and dynamic department of a hospital, making it a challenging arena to implement change. It is often characterised by high patient volumes, stress and high turnover rates among employees. Emergency departments world wide are experiencing an increase in patient volume causing crowding and boarding which leads to adverse health outcomes and decreased satisfaction among both staff and patients. When staff become despondent due to stress they quit, leading to a vicious circle where resources are spent hiring and training new staff that also quit because not enough is done to create a sustainable working environment.

In February of 2023 the Norwegian health staff commission delivered a report outlining the future of the national health system. It predicts that in the future the amount of patients will continue to increase. In the past this issue has been addressed by hiring more staff to keep up with demand. However, the report also states that this approach will not be feasible in the future as the health sector will soon reach its maximum cost-benefit capacity for society. To cope with this the health sector will have to explore new ways of allocating resources and improving their service to keep staff and patients safe and satisfied without exponentially increasing costs as patient numbers rise. An increased emphasis on service design could be one of the approaches to address these issues. This is because service design possesses the tools for continuous service improvement and stakeholder value creation at a fraction of the cost of traditional management.

The number of patient visits in the St. Olav's emergency room (ER) in Trondheim rose from 20 thousand in 2013 to 29 thousand patients in 2021 putting more pressure on the emergency department. Solutions that used to be adequate have now become disagreeable and are causing stress for patients and staff. This is especially true for patient registration and early handling. The ED reception is located deep within the ER meaning anyone can enter leading to reduced safety. There is no allocated waiting room and so when patient loads are high the hallway, frequented by patients on gurneys in transit, fills up with waiting patients. This chaotic situation leads to frustration among staff and stress for patients. The ED wants to alter the current workflow, but are finding it challenging without additional funding and while ensuring patient safety.

The limited previous research of service design application within emergency departments in hospitals has mainly focused on frameworks or prototypes. A 'top down' approach meant for management and missing implementation. This thesis explores how service design can be used to make and implement rapid service improvements grounded in the needs of the staff "working the floor". To explore this, service design has been applied to a Norwegian emergency department to examine how it contributes to change management within the health sector.

This project will address the patients' first meeting with the St. Olavs emergency room by improving the information and physical workflow to enhance wayfinding and providing additional information for patients by applying a service design process.

Research Question: Is to investigate the role of service design in designing physical space, information systems* and service workflows to reduce stress and improve organisation in emergency rooms for the future.

*Wayfinding and information design

Furthermore, this thesis contributes to the literature on designing in hospitals by presenting a real-world case in a Norwegian emergency room taking a case of St Olavs hospital and sharing how designers can apply their expertise in this context to make lasting impacts and create value for patients and staff.

1.2 Key terms

ER
The physical space where the emergency department operates.

ED
The department in charge of emergency operations in the hospital. Does not operate inpatient beds.

RSHU
Regional centre for healthcare service development main objective is to contribute to health service development and service innovation to create good quality, good patient experiences, good patient flow, good working conditions and optimal resource utilisation in the regional health service.

INPATIENT
Patients that are admitted to the hospital, they have an allocated bed to spend one or more nights.

OUTPATIENT
Patients that are treated at the hospital, but do not have a bed. These patients spend less than a day at the hospital.

TRIAGE
Process to determine the acuity of patient condition.

WALKING PATIENTS
Patients arriving on their own from the GP or the municipal doctor centre. They are usually the ones registering at the ED.

CROWDING
When the ED is over capacity

BOARDING
Patients who have finished treatment in the ED and are waiting for admission.

1.3 Background

1.3.1 WHAT IS AN ED?

The emergency department is the part of the hospital where acute and time sensitive patient conditions are treated. This leads to a wide range of possible conditions from trauma to sepsis to strokes. In general an ED will be staffed by doctors from other departments of the hospital with specialisations. The specialisation of emergency doctors has also started to gain traction. These doctors are trained to spot critically ill patients and treat a wide range of conditions. In some parts of the world anyone can present to the ED, however in Norway you have to be referred from your general practitioner (GP), the emergency number, or the municipal health centre (legevakten) where anyone can present. Emergency medicine presents a number of unique challenges, variability in conditions and the number of patients being the main ones. Unlike other hospital departments the ED does not take elective patients and so how many patients present in a day is outside the control of the ED and also the hospital. In poorly managed EDs or EDs that do not have the required capacity, this variability can lead to crowding. Crowding occurs when the patient demand outweighs the ED's capacity and leads to poor patient satisfaction and health-outcomes. Crowding can also occur because of high boarding times. The time it takes from a patient has finished treatment at the ED and until they are admitted to the hospital. There are several reasons why this might happen ranging from full hospitals to poor communication between departments. The other main problem when it comes to the ED is the variability in patient conditions and the severity of these conditions. In an environment where resources are not sufficient for peak demands, many EDs use a triage system to categorise patients. This is a standardised protocol that asks questions based on admitting symptoms and gives the patient a severity grade. Each grade has a maximum recommended time before the patient should be examined by a doctor. After the triage the patient is seen by a doctor and tests are taken to determine whether the patient has to be admitted to the hospital or not. The EDs job has historically been to get patients out of critical danger and to admit them to the hospital if necessary, however some EDs are transitioning to a role where they operate as a short term treatment centre. In terms of design challenges emergency departments have the same challenges as other medical fields. Patient safety is crucial, large organisations move very slowly, they are averse to change and funding can be hard to come by. On top of this the emergency department presents some unique challenges. Patients are often under distress, either pain or stress due to their condition meaning they are worse at problem solving and information processing. This poses a challenge when designing wayfinding or information systems. Uncertainty is much higher than in other healthcare settings due to the fact that the amount of patients that will show up is unpredictable and that patients are not clarified. Because of this it is very important to process patients fast as some may have critical conditions such as ongoing heart attacks. Emergency departments are also routinely underfunded and overlooked by hospital management.

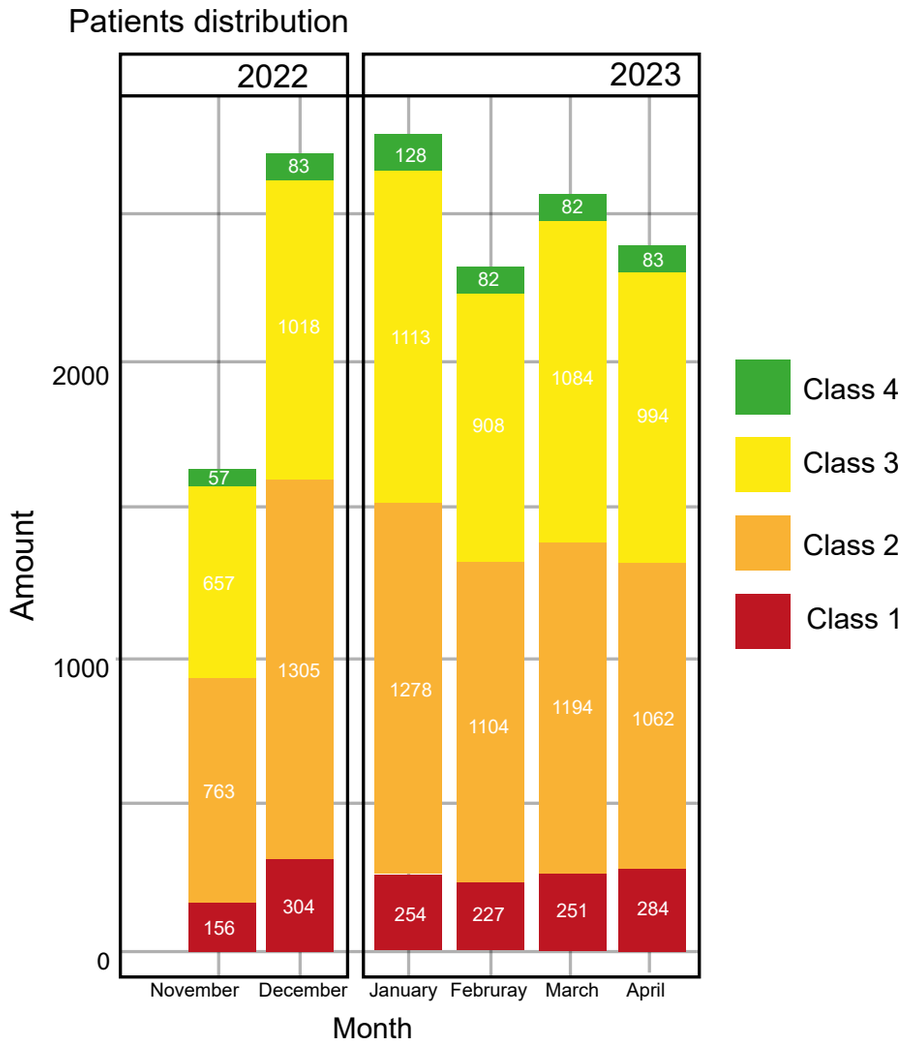


Figure 1: The distribution of different patient groups after triage at St. Olav's ED from 11.22 to 4.23

1.3.2 THE ST. OLAVS ED

St. Olavs hospital is located at Øya in Trondheim and is owned by Helse Midt-Norge RHF, a subsidiary of the national government. St. Olavs hospital has several regional and national tasks for the 725,600 inhabitants of Møre og Romsdal and Trøndelag. Most of the hospital operations are located in Trondheim. St. Olavs is the local hospital for the population of southern Trøndelag. It is also the University Hospital for Mid-Norway and integrated with NTNU (Norwegian University of Science and Technology). Patient treatment, research and education are integrated functions. The University Hospital is built in Øya in central Trondheim. The first clinical centres were completed in 2006 and the entire hospital project was completed in 2015, replacing an older building. It has a total area of 197 500 m2. The different departments have their own building or share them with a few other departments. In 2021 the hospital had just over 62 thousand admissions and staffed just under 11 thousand people. The ED shares their building with the Lung and Heart specialties and are located on the ground floor and basement at the northern part of the building.

The ED treats about 27 000 patients each year. In recent years there has been a significant increase in the number of presentations with a 50% increase from 2012 to 2020. The reason why this is the case is unclear. With such a massive increase in patients the ED established an outpatient clinic. Here patients with standardised patient journeys get an appointment for treatment. This reduces variability for the ED and smoothes the demand curve. This is most used for patients with deep vein thrombosis. The outpatient clinic is also used for follow-up appointments after treatment, reducing the number of admissions and freeing up resources. In the tables below follow some statistics about the ED. The St. Olavs ED has some specific design challenges. The group that works with signage and wayfinding are pulled from other departments and are not readily available. This has led to a wayfinding and information system that is somewhat laissez faire. Walls all over the hospital are plastered with laminated A4 sheets serving as signage and information where necessary leading to information fatigue in many places. The hospital struggles with high occupancy leading to long boarding times. Because of this, resources are spread thinner throughout the day and the ED has to spend a lot of time getting patients admitted and transferred to the right department. Less resources means less time spent working on design improvements as the patient always comes first. The ED also lacks systems for distribution of information to employees outside of email, which some staff never check, and meetings at the beginning of shifts. This makes it difficult for the designer to communicate effectively with large numbers of staff. The ground floor of the ED used to be the municipal doctor centre and is not purpose built to be an ED or interact with the U1 area leading to some awkward logistical solutions. The ED is also right next to the trauma outpatient clinic which also sees many patients each day leading to confusion among patients trying to find their way. Data on the patient body can be found in figures 1-3. Maps of the St. Olav's ED can be found in figures 3-6.

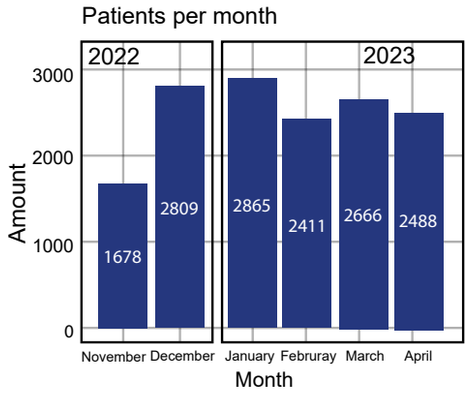


Figure 2: The amount of patients per month at the St. Olav's ED from 11.22 to 4.23

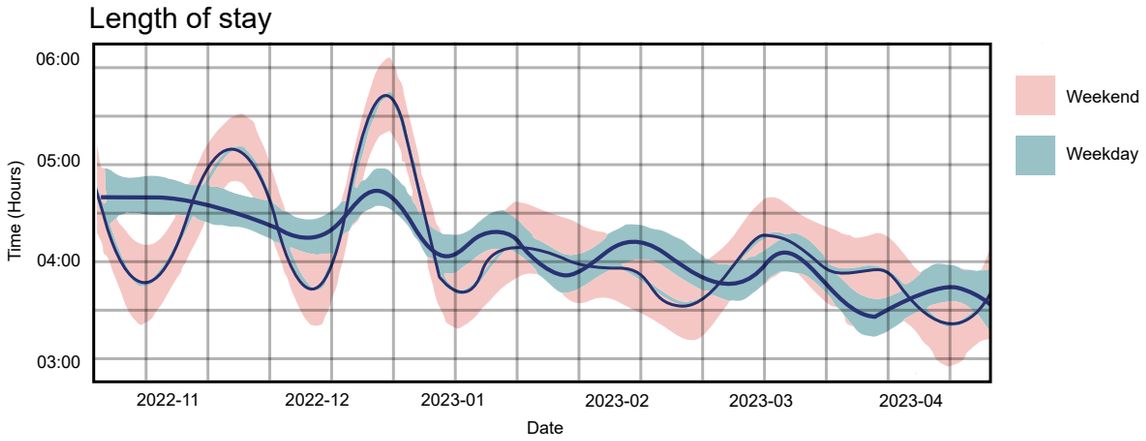


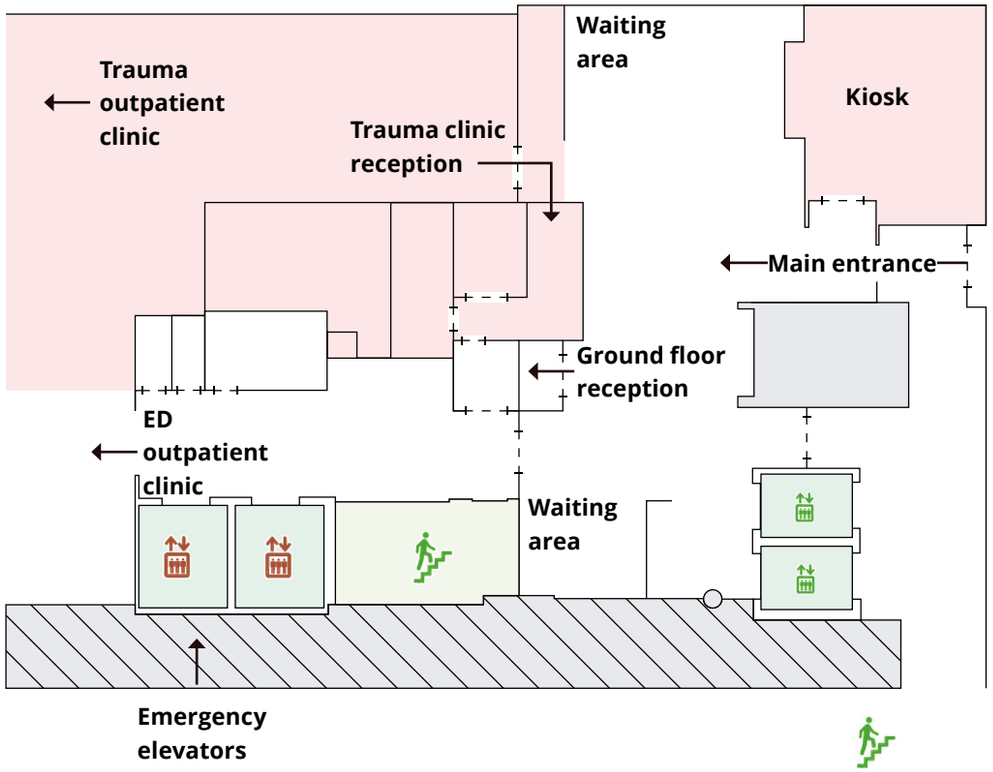
Figure 3: The average length of stay for patients at the St. Olav's ED from 11.22 to 4.23

Map of the St. Olavs ED

PLAN VIEW

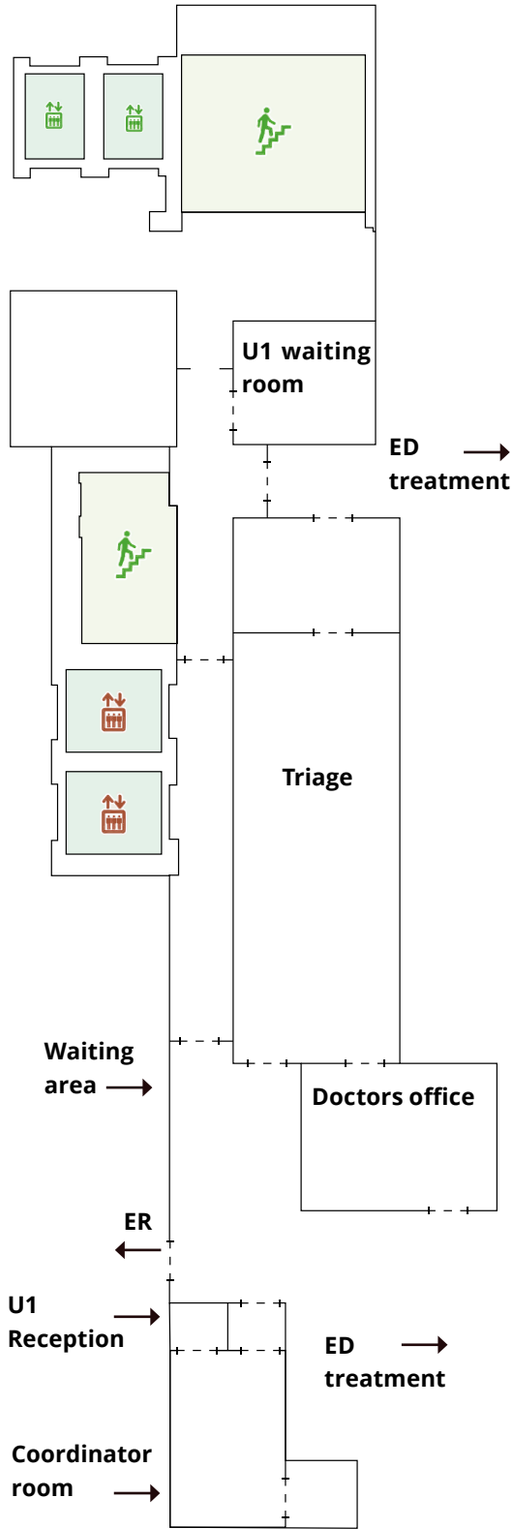
GROUND FLOOR

Figure 4: shows a plan view of the ground floor of the St. Olav's ED.



BASEMENT (U1)

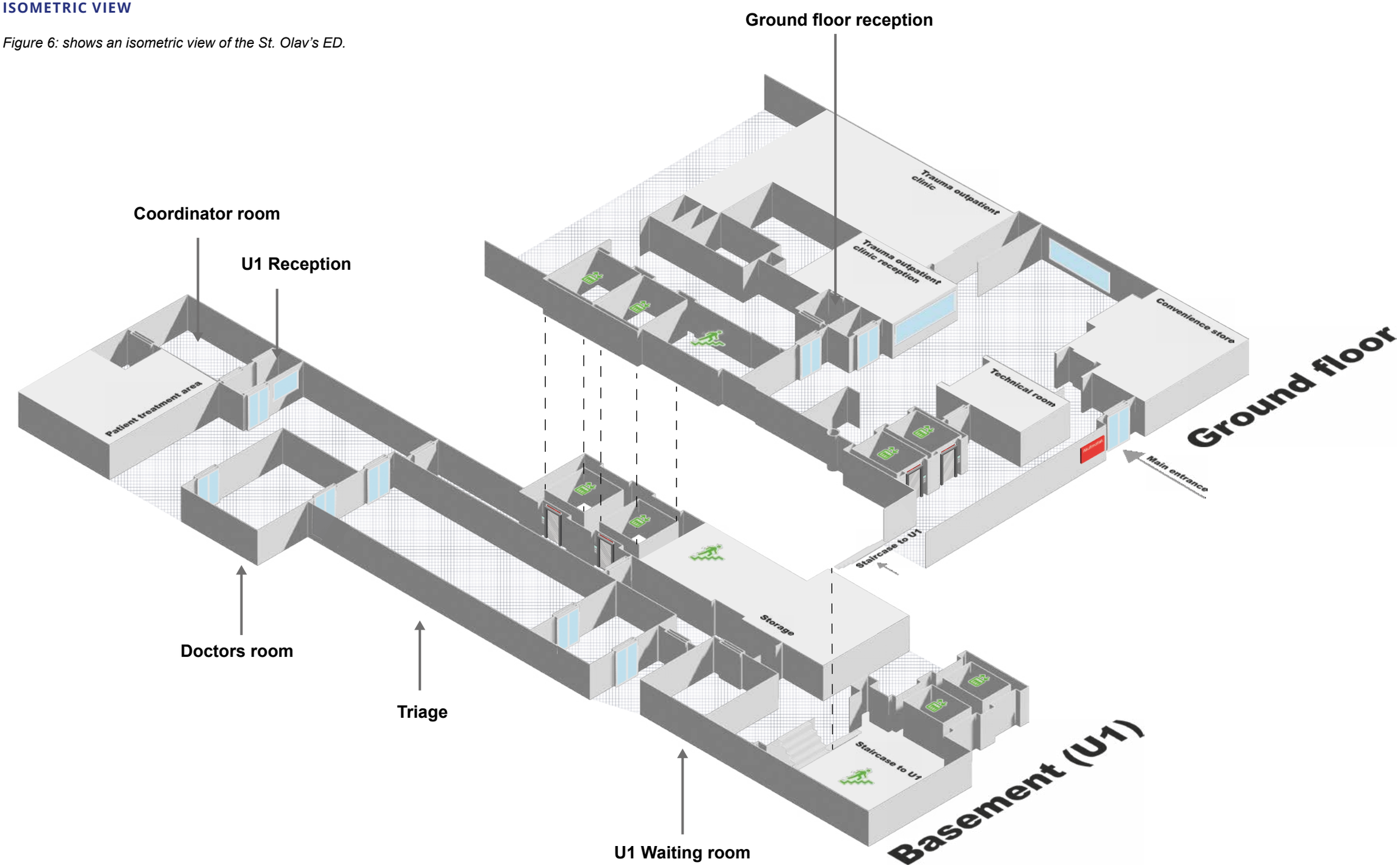
Figure 5: shows a plan view of the basement floor of the St. Olav's ED.



Map of the St. Olavs ED

ISOMETRIC VIEW

Figure 6: shows an isometric view of the St. Olav's ED.



1.4 Project and scope

This project deals with the patient journey from the patients arriving at the ED until triage begins. Specifically it focuses on so-called walking patients. These are patients that have been referred to the ED from a GP or the municipal health service and are able to transport themselves to the ED. As they have been examined by a health professional they are usually outside of immediate danger. It was natural to choose this scope as the ED had already identified the U1 reception as a problem area. The goal was to have some testable prototypes at the end and to create value for the staff and patients. This project does not focus on issues concerning universal design as the goal is merely concept validation. However, this remains an important topic and measures were made to ensure that the prototypes were usable by all, if not perfectly. The project neither deals with crowding and its effects as this issue requires hospital wide policy change to handle.

1.5 Staff and their roles

There are many people involved in running an ER. These are the main roles and their functions.

NURSE
Solve practical tasks related to healthcare such as providing medication and taking tests along with being a general caretaker for the patient. They also perform the triage.

SECRETARY
Solves practical tasks that are non clinical. At St. Olavs, this is mostly paperwork. Registering patients as they arrive, taking payment, talking to next of kin, sending out summons for the outpatient clinic and ensuring proper documentation.

OCCUPANCY COORDINATOR
Makes sure admissions go as smoothly as possible, calling departments, checking capacity and reserving beds for admitted patients.

NURSE MANAGER
Do all the managerial work for the nurses. They are also in charge of improvement projects and are the project owners for this master thesis.

DOCTOR
The doctor is a specialist and only treats patients within their field, for example, medicine, neurology or orthopaedics.

ED DOCTORS
Emergency doctors are specialised within the field of emergency medicine. They focus especially on treating acute conditions and getting patients out of immediate danger.

COORDINATOR
The Coordinator is an experienced nurse. Their job is to take admissions from the ambulance service as well as making sure the patient journey from registration to further processing goes as smoothly as possible. They assign rooms for a large number of patients as well.

FLOW NURSE
The flow nurse is the coordinator’s right hand, as well as being their eyes and ears out in the department.

2. Methodology

As the ED presents a unique set of design challenges it needs a unique design methodology. Solutions have to address both the human needs of patients, staff and next of kin as well as accounting for the physical, cultural and contextual limitations that exist within the ED. Because of this, solutions need to be holistic, dynamic and realistic. To ensure human needs are met while keeping solutions holistic human centred design and service design are the main drivers for design methodology. Along with these methods come a set of tools such as co-design sessions and service blueprints that help triangulate in on viable solutions.

2.1 THE ROLE OF THE DESIGNER

My approach to design is that if the work is not implemented the design is not good as it provides no value to the end user. If this master turned into a report that does not result in change then I would consider it a failure. Because of this grounding the work and building trust have been very important aspects of this project and it might help explain some of the choices that I have made along the way. This is wrapped up well in the famous quote by Peter Drucker “Culture eats strategy for breakfast”. An organisation like a hospital is not geared toward continuous change and so a major role for the designer will be to prime the stakeholders for change to take place and to ease the implementation as it occurs. This is not a context for handoffs and so there has been an emphasis on co-design and on the designer as a facilitator for change and not solely a creator.

2.2 HUMAN CENTRED DESIGN

Human-centred design (HCD) is a problem solving process that begins with understanding the human factors and context surrounding a challenge. (Human Centred Design (HCD), n.d.) To understand the human factors and context it is paramount to work directly with the end-users. This is done by including them throughout the process, not only in research but also concept development. By doing this the designer has a higher chance of creating a viable solution to the right problem. Unicef presents four pillars of HCD:

- Use participatory methods. No expert has more knowledge than a doctor, nurse or secretary about how to solve their biggest challenges. The methodologies that comprise HCD and related approaches acknowledge this by focusing on collaboration and designing with the end users. Problems are defined and solutions are developed locally.

- Be inclusive. We cannot design sustainable solutions if we do not consider the full complex, dynamic and interconnected system. Observing and interviewing all affected users, forces us to re-examine existing assumptions and to include the perspective of others.

- Think critically. Putting people at the centre of the process means that we uncover needs that service providers and programme recipients may not know they have —even though these needs influence actions and decisions. After honing skills of listening and observing we see more than what is visible and hear more than what is said. This allows the unexpected to reveal itself and points us toward new solutions.

- Design to hand-off. From the beginning, solutions are tested in the real world with real stakeholders. Solutions that make it past this “prototype” step lend themselves to local ownership because the health workers have been involved in their development from the beginning. The outcome is action-oriented, implementation-ready prototype—not static reports.

HCD is a fitting approach for the ED as it attends to the very human needs it presents. It also fits into the very chaotic arena that the ED presents, empowering people to rise to the occasion and solve problems when presented with new situations instead of trying to produce “catch-all” solutions.

2.3 CONTEXTUAL INQUIRY

Contextual inquiry is a user centred design research method focused on collecting insights within the users normal context and activities. This is done by observing users in their environment and discussing their actions with them on the spot (Whiteside et al., 1988). It is useful in this project for multiple reasons. Firstly, staff do not have available time to participate in in-depth interviews. Secondly, as the environment is complex users are likely to forget important details about their experiences and are more prone to bias if the research were to take place outside of the ED environment. It also provides an excellent opportunity to build trust among staff by being present during their workday and showing empathy towards their concerns.

2.4 SERVICE DESIGN

Service design is many things each of which is only part of the entire picture. It is a mindset that puts the user first and that relies on observations and testing to arrive at conclusions. It is a process driven by this mindset that goes through iterative cycles of research and development. This process starts with shorts cycles and gradually moves towards longer cycles, with more impact as understanding deepens. Service design is also a toolset to visualise and process the mindset and process that it represents. This toolset includes service blueprints, journey maps, interviews and many more. A toolset provides the basis for another thing service design is, a cross disciplinary language. It has a unique ability to connect people from different silos around a common goal. To sum up it is a human-centred, collaborative, interdisciplinary, iterative approach which uses research, prototyping and a set of easily understood activities and visualisation tools to create and orchestrate experiences that meet the

needs of the business, the user, and other stakeholders. (Stickdorn et al., 2018) For this project service design is what takes HCD from theory to action within the right scope. It also communicates the process and mindset to staff that are unfamiliar with HCD. To use a metaphor: HCD is political theory and service design is the policy used to realise it.

2.5 CO-DESIGN SESSION

A co-design session aims to gather different types of stakeholders to provide different perspectives when working towards a common goal. This can be done in all parts of the design process. Here it was used to gather insights on what a prototype could look like.

2.6 SERVICE BLUEPRINT

Service blueprints aim to connect customer experiences with both frontstage and backstage processes. It also serves to provide a concrete view of the service when discussing with stakeholders or in a co-design session. This project posed some unique challenges for the service blueprint as both patients and staff are considered users although they have very different needs and emotional responses. It was also a challenge to find the right level of detail for such a complex process where it was concise enough to be efficient, but detailed enough to paint a realistic picture of the service.

2.7 RAPID ITERATIVE TESTING AND EVALUATION

Rapid iterative testing and evaluation (RITE) is an iterative usability method. The philosophy behind the RITE method is described as: “1) once you find a problem, solve it as soon as you can, and 2) make the decision makers part of the research team.” In this way it is a bridge between a strict research method and a design method. This method was chosen for critical parts of the design such as wayfinding and flow to ensure patient safety due to its malleability and ability to quickly adapt and solve situations where patient safety might be challenged.

2.8 Double diamond

The double diamond is a design process model that highlights how the process goes through divergence and convergence. It is also applicable for the process used here and is used to highlight where different tools have been used. As seen in figure 7.

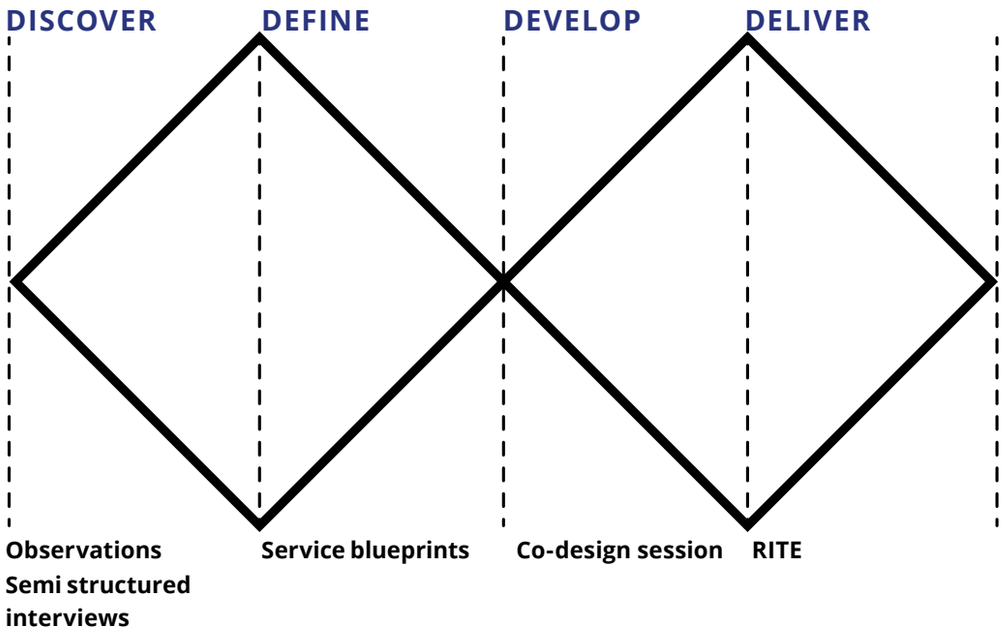


Figure 7: The double diamond and where the different tools have been used.

Research, discovery and definition

3. Literature review

The Emergency Department (ED) is the first meeting with the hospital for many patients. It is where the most urgent medical cases are handled, and where many of the hospital's admissions take place. Staff are expected to, and must, work efficiently and effectively to ensure patient safety and satisfaction. Patients, on the other hand, are entering an unfamiliar environment knowing only that they might be gravely ill and alongside treatment they require communication to feel safe. These needs might seem irreconcilable as communication with patients, other than receiving somatic information, takes up valuable time, reducing efficiency in an environment where time is scarce. However, when somatic and emphatic care are brought together through patient centred care (PCC), it is possible to provide efficient, safe, comfortable and communicative care. PCC is a therapeutic relationship where persons are empowered to be involved in health decisions at whatever level is desired by that individual who is receiving the care (Hearld & Alexander, 2012). Implicit in this definition, and a cornerstone of PCC, is the belief that more effective treatments and better outcomes can be achieved when both physicians and patients are actively engaged in the care process in ways that cultivate open, honest, communication and collaborative decision making and goal setting (Hearld & Alexander, 2012). Empowering patients to participate in their own care requires communication about symptoms, causes, outcomes and risks associated with different treatment possibilities. How this improves efficiency is highlighted by the perhaps surprising finding that when presented with relevant information, patients are often able to choose the path that is safest, involves the fewest procedures, and is least time-consuming (Oppenheim et al., 1994). McCormack and McCance (2006) asserts that for PCC to occur, changes in service delivery are required at both individual and organisational levels, one way to make these changes is through service design (SD). Malmberg et al. (2019) see SD as a transformational driver towards PCC since the two concepts align principally and because SD contains the tools required for organisational transformation that PCC is missing. Some service design methodology has been formalised for healthcare through Experience based Co-design (EBCD) , a participatory research approach that draws upon design tools and ways of thinking in order to bring healthcare staff and patients together to improve the quality of care. McGee (2020) argues that SD is insufficient for providing service futures and argues for a speculative design framework as a way to explore future scenarios. Regardless of the approach, the most important factors in providing efficient and high-quality care through the realisation of PCC in the ED are: a) physical space, and communication through b) information systems, and c) service workflows. This part explores literature on what causes satisfaction for staff and patients, how design can be used to realise change for improved satisfaction and best practices in physical space, information systems and service workflows so they can later be addressed in the final design solutions.

3.1 PATIENT CENTRED CARE

Patient-centred care (PCC) is a type of therapeutic relationship that empowers patients to take part in their own health decisions. PCC is based on the concept of holism, which recognizes the biological, psychological, social, and spiritual aspects of an individual. Individuals should be given choices in their care, showing respect for their worth and encouraging freedom. In order for PCC to be individualised, it is important to understand the person's life situation as well as their ability and desire to make decisions and take control of their own care. Strategies such as providing information, supporting their choices, and effective communication and negotiation allow individuals to feel empowered to be involved in their health care decisions. For PCC to be successful, it should be organised around the patient's needs and preferences instead of institutional standards or routines (McCormack, 2003). When the ED is crowded less time is spent on PCC leading to fewer satisfied patients. (Pham et al., 2011)

Creating a culture of person-centred care (PCC) requires vision, commitment, and shared governance, according to McCormack and McCance (2006). Vision and commitment from organisational leaders are necessary, as is an attitude of respect, empowerment, and choice for patients and staff. Rules and standards must be set and upheld for staff to enact patient-centred care, but these must also be flexible to allow for deviation when necessary. Shared governance gives direct care workers greater input in decision-making processes, and this leads to improved quality of care, increased patient satisfaction, and improved health outcomes. Nursing care has been identified as the strongest predictor of patient satisfaction, as nurses providing person-centred care help to increase their feelings of well-being and improve their functional abilities. Ultimately, creating a person-centred culture has many benefits, and requires a dedication to excellence at both the individual and organisational levels. (Morgan & Yoder, 2012) As patients usually pass quite quickly through the ED , time is a critical factor and many patients are distressed; the ED has limited possibilities for the full realisation of PCC. However, there are still major gains to be made in satisfaction and efficiency by realising it to a bigger extent than today. Involving patients in the decisions regarding time consuming and expensive tests and whether admission is necessary might relive some effects of the current "checking just to be 100% sure" culture that has arisen in Norway.

3.1.1 PATIENT CENTRED CARE AND SERVICE DESIGN

PCC and Service Design (SD) align principally and therefore SD is a way to better PCC care in healthcare institutions. To facilitate this improvement organisational change might be needed. (Malmberg et al., 2019) Specifically, SD is being recognized as a powerful tool for organisational change and transformation (Malmberg, 2017; Yu & Sangiorgi, 2018). It is increasingly used in healthcare contexts to involve patients and their perspectives in the development process (Gammon, Strand, & Eng, 2014). SD and PCC align in five key areas: (1) recognizing the patient as an expert on their own life and experiences; (2) adopting a holistic mindset; (3) shifting power between the involved actors; (4) co-creating value between the parties involved in the service situation; and (5) emphasising needs rather than solutions. SD offers a promising approach to support transformation in healthcare through cooperative and participative approaches that focus on elevating human needs, experiences, and contexts. This shift in focus recognizes that experiences of illness are not always connected to disease, and explanations for illnesses are often found in psychology and social sciences, as well as in the environment in which care is delivered, including an appropriate skill mix, effective staff relationships, supportive and facilitative organisational systems, and the potential for innovation and risk taking. For SD to be effective in providing PCC (Patient-Centred Care), healthcare organisations must incorporate it into their development portfolio and make it a natural part of their organisational structures (Body, 2008; Malmberg & Wetter-Edman, 2016).

3.2 SATISFACTION

Satisfaction is the ultimate measure of the quality of a service as it directly relates to the end user and their expectations. There exists a wide array of research on what makes patients satisfied with their ED visit and how to keep ED staff happy in their workplace. Some of the main hygiene factors for patients are waiting times, comfort, privacy and communication. (Pham et al., 2011) For staff some of the main factors contributing to satisfaction include security, wayfinding, visibility, privacy and efficiency, including effective teamwork. (Zamani, 2019) Other universal factors for staff satisfaction include a good social environment and the possibility for personal and professional development. At the end of the day, both staff and patients have the same goal: safe, efficient and amicable medical outcomes. Communication of waiting times increases patient satisfaction. However, staff are often reluctant to communicate waiting times due to a fear of expectations not being met and disappointing and angering patients. To remedy this it is possible to develop tools that help display waiting times. However, these will have to be developed together with nurses and other key stakeholders in order to be implemented effectively. (Shah et al., 2015) One of the major contributors to patient dissatisfaction is feeling neglected. This feeling of neglect is due to their lack of understanding of the ED system and priorities and occurs when the patient is waiting. (Cohen et al., 2013) Norman (2008) provides some useful guidelines to combat the negative effects of waiting and improve satisfaction.

1. Emotions Dominate
2. Eliminate Confusion: Provide a Conceptual Model, Feedback and Explanation
3. The Wait Must Be Appropriate
4. Set Expectations, Then Meet or Exceed Them
5. Keep People Occupied: Filled Time Passes More Quickly ThanUnfilled Time
6. Be Fair
7. End Strong, Start Strong
8. Memory of an Event Is More Important than the Experience

Staff already know that empathising with patients helps alleviate frustration and while they have the tools to do this they lack the time. One intervention could be to have patient coordinators in charge of patient experience. (Cohen et al., 2013) The practice of emergency medicine is characterised by episodic contact with patients and difficulties in establishing continuous care. Because of this the ED usually only gets one opportunity to leave patients with a favourable impression making good design even more important.

3.3 HOSPITAL DESIGN AND MANAGEMENT

Hospitals today are not managed by designers or design thinking. The modest literature that exists suggests that managers' time spent, engagement and work can influence quality and safety clinical outcomes, processes and performance. There are also indications of a need for managers to devote more time to quality and safety. (Parand et al., 2014) By including designers in the management team this might increase the impact as they are used to prioritise users. The best hospitals in the world are managed by doctors as they are trained to think about clinical outcomes first and foremost. Having a boss who is an expert in the core business is associated with high levels of employee job satisfaction. (Goodall et al., 2016) meaning designers should not take the reins completely, but assist existing professionals. End users are being represented in hospital design today. One case study at Erasmus hospital in Rotterdam revealed that end users are represented by various groups and involved in remodelling projects on various levels, with the information provided by end users being relayed to the project through a mediator role (Yalniz, 2020). This mediator role could be filled by a designer to reduce the gap between end users and final production.

3.4 PHYSICAL SPACE

In an ED, the physical space and environment are crucial factors in the interaction between staff and patients. The quality of healthcare in an inpatient setting is influenced by the healthcare climate, which impacts the ability of nurses to provide PCC. In evaluating the ED experience, it is important to consider both the physical space and human interaction, and to use standardised methods to compare results across healthcare facilities and over time (Buffoli et al., 2016). Studies have found that higher levels of security, visibility, privacy, and spatial efficiency enhance staff satisfaction and performance in the ED. Providing private spaces for both staff and patients, and avoiding unnecessary walls, can also improve the physical environment (Zamani, 2019). Flexibility in the physical space can enable efficient information capture (Naccarella et al., 2019).

3.5 INFORMATION SYSTEMS

Providing information about the ED is essential in improving patient satisfaction (Krishel & Baraff, 1993). Understanding the process of communication and information exchange between patients and staff in the ED is necessary to ensure patient satisfaction. In demanding, time pressured and target driven environments such as the ED, communication often has an impact on the patient's mental health and wellbeing, and patients may be reluctant to question staff due to perceived pressures and demands (Blackburn et al., 2019). Positive communication with staff can ensure that patients feel informed about their care pathway, condition and treatment (Blackburn et al., 2019), while interactions with different healthcare professionals can be confusing for patients, particularly when they are being treated by multiple individuals. Additionally, providing detailed information about ED processes and treatment areas can be useful in reducing patient anxieties, as well as informing them about waiting times, procedures and length of stay (Krishel & Baraff, 1993). Some patients may be too ill to read and process written information and staff could do more to inform them about the specifics relating to them (Blackburn et al., 2019). Information systems should be modular to help increase preparedness during a surge or a disaster event or react to other unexpected demands (Woolard et al., 2016). Staff and patients have different views of what information they deem important and so it is important to include all stakeholders when designing information systems.

3.6 WAYFINDING SYSTEM

Wayfinding is the process of finding your way around an area. It is a problem solving process and is affected by many factors. A wayfinding system is the organisation of rules and guides to efficiently create and uphold wayfinding. In a healthcare setting the impact of a poor wayfinding system is stress and frustration for patients and visitors and efficient use of time for staff. To create an efficient wayfinding system one must first create a wayfinding strategy, outlining the key issues and agreeing on key policies. The strategy should also include how to collect and present information used to create the wayfinding system. A wayfinding system should be developed by people from different departments working as a multidisciplinary team. It can also be helpful to include people without a direct connection to the hospital to ensure universality. The system should have guides for use of colour, terminology, sign systems and symbols to ensure these are uniform across the entire site. (NHS Estates, 2005)

3.7 SIGNAGE

Signage includes all signs and physical artefacts relating to the wayfinding system. NHS estates has published a guide for developing effective signage. They recommend a sans serif typeface (or one with very small serifs) with a large x-height and consistent, thick stems. Furthermore they encourage the use of uppercase letters for the first letter and lowercase letters for the rest of the word as this increases readability. The text should be large enough such as to be legible from the intended viewing distance. Accident and Emergency departments should always be emphasised using red with white text. (NHS Estates, 2005) The literature did not present guidelines for presenting information to patients outside of wayfinding. However, the core principles still apply.

3.8 SERVICE WORKFLOW

A service workflow is the systematic organisation of repeatable patterns of activity involved in the operation of a service. It is often depicted as a sequence of operations in a flowchart and aims to visualise the actions performed by staff and patients to highlight where improvement is possible. Emanuele and Koetter (2007) found that workflow technologies has the potential to be a powerful part of healthcare environments, but says that there are major technical, clinical and cultural challenges. Lee et al. (2015) were able to significantly reduce length of stay in one US ED by using modelling to pinpoint inefficiencies in the workflow and develop improvements. The workflow technologies described by Emanuele and Koetter (2007) and Lee et al. (2015) rely on data and mathematical optimization to create workflow which is time consuming and requires data which might be difficult to procure. However, an optimization model does not guarantee an optimal outcome. (Gigerenzer, 2008) Exchanging the mathematical model based on data that has previously been tested with a design method based on heuristics developed together with staff might provide many of the benefits at a fraction of the cost and complexity.

3.9 Design research

3.9.1 SPECULATIVE DESIGN FRAMEWORK

McGee et al, 2020 argues that before solving the ills of today it is important to establish a vision and explore multiple future possibilities of what an ER could look like without immediately placing a value on it. They argue that the traditional service blueprint is too concerned with design outputs and optimisation and advocate for the use of scenarios to paint a future picture to capture the essence of a possible solution rather than getting caught up in details. Such a scenario should be made to show the full contextual richness of a possible future solution. This could be an important tool for managers to "buy into" a vision and be geared towards change. Especially if it is a vision they have helped develop. To present it, it should probably also utilise visual tools to help sell the vision.

3.9.2 EXPERIENCE BASED CO-DESIGN

Experience based Co-design (EBCD) is a participatory research approach that draws upon design tools and ways of thinking in order to bring healthcare staff and patients together to improve the quality of care. The concept of experience based co-design seeks to address needs such as co-creating value, giving recognition to patients as experts in their own lives, and facilitating a shift in power dynamics. The co-design process has numerous potential benefits, including the empowerment of both patients and staff, as well as the democratisation of the relationship between the two. However, this approach presents a number of ethical challenges concerning the patient-staff relationship and the degree to which patients are truly empowered. Furthermore, the results of the co-design process may be perceived as minor by some staff members, highlighting the importance of anchoring to emphasise how small changes can make a huge impact. In this approach, the role of the designer assumes the form of a facilitator rather than a practical designer (Donetto et al., 2015).

3.10 SUMMARY

Changes in the ED should strive to make PCC as easy as possible to improve patient satisfaction. Designers already possess the tools to make this possible through the use of service design. Studies have found that higher levels of security, visibility, privacy, and spatial efficiency enhance staff satisfaction and performance in the ED. Soft qualities such as colour, lighting and decoration should also be considered in the physical space to ensure comfort for staff and patients. Information systems should be modular and developed together with both staff and patients as they emphasise different information. Wayfinding improves satisfaction for both patients and staff. A uniform wayfinding system is important. Signage should be easily legible and unambiguous. Optimisation of staff workflow can increase efficiency. When imagining future design scenarios it might be beneficial to use speculative design. In the present experience based co-design has been finding success. How the concepts discussed here build on each other to create satisfaction is illustrated in figure 8.

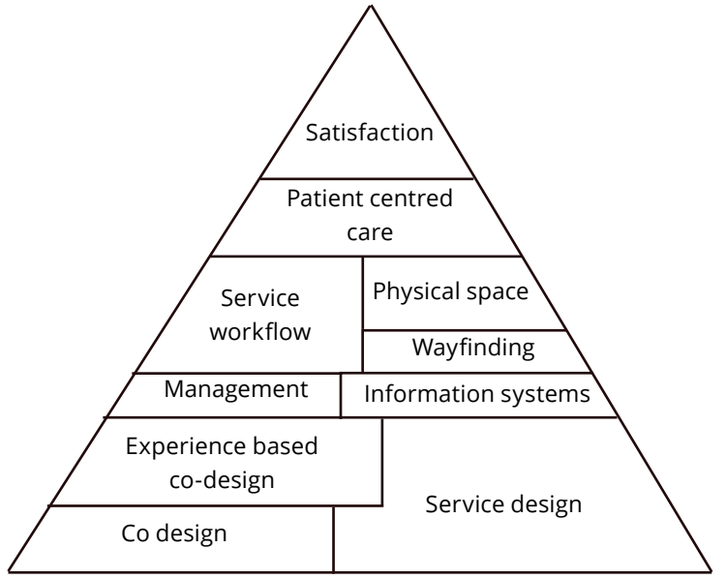


Figure 8: A pyramid of satisfaction. Showcasing how different elements support each other.

4. Primary study

4.1 METHOD

To limit the impact of the primary study on staff who have busy work days a shadowing method was implemented. This entails following a select person or group of persons around and asking them to explain what they are doing. Issues that show up during the observation are noted. I would also enter each observation with some questions in mind that I would scatter throughout the observation. It was important that this felt more like a conversation than an interview to get the most honest answers. Because of the sensitive nature of the health sector no data was collected that could lead back to the person being observed or interviewed. Ten observation sessions with interviews were carried out in February and March. As the ED is a dynamic arena people would get caught up with something and I would have to switch who I was observing. Other members of staff would also often join conversations and contribute to the interviews. Because of the chaotic nature of the environment no exact record exists of how many people were interviewed and observed; however, I estimate it to be around 30 staff and 30 patients. Photos from the observations are included in appendix 2.

4.2 OBSERVATIONS AND INTERVIEWS IN ST. OLAVS HOSPITAL:

4.2.1 SECRETARY:

I followed the secretary through a monday. It is usually the busiest day of the week as people who have gotten sick over the weekend will go to their GP and get referred to the ER. This monday was not overly busy and the ED did not experience crowding or long lines. The secretary's job is to get the patient into the digital journaling system (Helseplattformen (HP) as well as transporting them to triage together with documents, codes for blood tests and an identifying bracelet. GPs are supposed to call the ambulance service (AMK) and report that patients are coming so that AMK can input the patient into the journaling system. However, this norm has not reached all GPs and many patients come in without being in the system. When this happens the secretary has to spend extra time inputting the patient into the system and has to ask the coordinating nurse in the next room to print out the labels for the blood tests. This takes extra time which leads to the buildup of a line if patients come in fast enough. A new discovery was that patients can also be referred from other departments in the hospital if they are in for checks and it is discovered that they might have some acute condition. Because of the way GP offices operate patients often end up presenting in 'waves' sometimes coming as many as 20 people in an hour. These peaks backup the system and leads to lines and waiting. The secretary's job is also to discover possible contagious diseases so that the contagious patient might be isolated. Other than name and personal identification number, no personal information is given in the reception.

Ten key takeaways:

- The reception is empty while the health secretary follows the patients to the triage room.
- Patients do not get any information regarding the process, their diagnosis or waiting times.
- The health secretary can not order blood tests, the nurses have to get involved if the patient is not already in the system or if it is a contamination patient.
- The reception is also for people who are being checked out.
- People have to be entered manually into the system quite often.
- The nurse coordinator and the flow nurse handle the incoming papers and then hand them over to the secretary along with the blood tests etc.
- Most patients that are not infectious go through triage.
- The elevator in the middle of the department is reserved for emergency situations. This makes it difficult to move immobile patients between floors.
- There is no sensitive information shared between the patient and the secretary in the initial meeting.
- The secretary is often interrupted by non-critical phone calls from other departments.
- It does not take a lot of time to register a patient and the time from arrival to triage is usually not long.

4.2.2 COORDINATOR AND FLOW NURSE:

The coordinator and the flow nurse sit behind the U1 reception. The coordinator takes calls from AMK about incoming patients, both ambulance patients and walking patients. The coordinator used to assign a nurse to every patient, however they have now started working in teams and so now they assign them to a team and let them work out the specifics among themselves. It is also their job to make sure that people are flowing evenly through the ED, that people get rooms and get out of the ED in a timely manner. The flow nurse is there to support the coordinator. As the coordinator can not leave their desk the flow nurse handles flow related tasks out in the department. Together they make a good team. They were observed on the same day as the secretary and so there were not too many patients.

Ten key takeaways:

- There is a lot of communication between the secretary and the coordinating nurse. The two main things are:
- Blood tests
- Decision support for contamination and journal entries
- The distance between the secretary and the coordinator was too great during the coronavirus pandemic when the secretary sat by the waiting room so they moved back.
- If there is a lot of traffic at the reception the nurses will exit their space and ask the patients to make contact

if their symptoms get worse. They feel responsibility for the untriaged patients. “If someone falls over you can be sure that they will come to me and ask what has happened”

- There are more patients that are supposed to register for the ED that register at the outpatient clinic reception than actual outpatients. The secretary here will pay attention to the list to make sure that they are registered downstairs.
- It can be hard for the secretary in the outpatient reception to reach the downstairs reception.
- Rooms are used when there is a need. All solutions need to be flexible.
- “We can’t try what we did last time, that did not work”
- It is not possible to visually separate outpatients and emergency patients if they get a shared waiting room.
- There is a need for fast decision making.

4.2.3 EMERGENCY DOCTORS:

The emergency doctor was followed for an afternoon. They were assigned to triage during observation. As it is their task to see all patients as fast as possible they move between the triage area and ambulance patients that are put directly in rooms. A major part of the job is to read up on the patients before visitations and documenting their findings in the journalling system.

Key takeaways:

- The ED doctors are very annoyed with the current reception. It has become a hygiene factor that is causing friction.
- It is very tight down in the ED-doctors office. Space is a very valuable resource.
- Some of the main tasks for the ED-doctors are bulk sorting for the specialists and planning of the patient’s stay in the ED.
- The ED-Doctors are very unhappy about the way that work is distributed between them and the specialists. They do not feel ownership of their workspace when they have to yield for “guests”.
- Unless there is a major rebuild the upstairs triage room only allows for one patient triage at the time.
- The triage room can be very quiet when the patient load is low leading to eavesdropping.
- There is no protocol in the relationship between AK1 and AK2. This depends on the people working so variation is quite high.
- The ED-doctors handle “easy” patients today. They could also handle the more complex, treatable patients, but are facing pushback from the departments that feel ownership over their specialty.
- The ED-doctors would like to only be ED-doctors in the ED.
- The doctors don’t have a coordinator like the nurses do.
- The path to the reception should not overlap with other paths.

4.2.4 EMERGENCY DOCTOR TEAMS:

The emergency doctors are also experimenting with teamwork and I was invited to observe to see how it works. They work multiple doctors together treating one patient at a time. This makes conferring easier and one doctor can document the visit while the other is working on the patient. This day the ED was at full capacity and beds with stable patients had to be moved out into the hallway to make room for more critical patients.

Key takeaways:

- “Working in teams for the doctors is the way to go for the future” -ED doctor
- A lot of the ED-doctors tasks are as coordinators. Clearing rooms and making sure the plan for the patient is clear. They do not enjoy this work.
- The senior physicians get a better overview and more involved with patients when working in teams
- Nurses (and possibly healthcare workers) should all be part of one team for better coordination. (Team leader?)
- There should probably be more observation posts like Acute 5. A lot of patients are OK and waiting for results. Rooms are in high demand. Is it possible to add more flexible capacity?
- There are a lot of machines, noises, people and terms. These could probably be explained, but not by a HCP.
- The ED can be at full capacity without being very hectic.

4.2.5 HEART CLINIC:

RSHU were invited to the heart clinic to see how they solve the problem of non-elective patients, outpatient clinics and receptions.

Key takeaways:

- The effects of a full hospital are being felt on all levels. However, the heart clinic feels that the ED gets a lot of attention from hospital management. Generally they are a bit suspicious of the ED and don’t believe the growth in patient numbers is organic. (GPs?)
- The heart department has their own “Emergency room” for people with heart failure and other critical heart conditions. They estimate that they treat 6-8 patients there each day. These patients have no contact with the ED as AMK calls them into heart directly. about 2/3’s of patients don’t come from the ED.
- They don’t want heart patients in the ER, but are constricted by space to be able to treat more patients “in house”. (Room is gold)
- They have a cardiologist in the ED to feel ownership of the patients down there.
- The ortho clinic has a similar flow of patients and treatment of critical patients.
- The nurses have started a program to let the nurses experience the other department. There is very little understanding across the hospital.
- They do not feel that the changes after 2018 have been positive for them.
- They blame the full hospital on increased patients to the ED as well as the municipality handling of GPs and outflow.
- They don’t know what the outpatient clinic does. In general it would be a good idea to take a look at how the different specialists work together in the ED.
- What they want from the project is less patient pressure and more understanding from the ED.

4.2.6 DISASTER TRAINING:

Disasters are a possibility and the ED must be prepared for them. I was an observer when the department was training for possible disasters to get information about patient flow and demands.

Key takeaways:

- During catastrophes most patients enter through the ambulance entrance.
- A new registration point specifically for catastrophe patients is set up and manned by nurses.
- Coordinators will be busy with catastrophe patients. (Create redundancy)
- Catastrophe patients might come walking through the reception. Then they will have to be sent down in some way.
- Moving the reception could improve disaster preparedness as it would move bulk patients further from the treatment area and allow for easier movement.

4.2.7 TRIAGE:

An afternoon was spent in the triage area talking with nurses and doctors. It was quite a busy day and interviews between observations were short to allow staff to do their work.

Key takeaways:

- It's not an option for the doctors to have a waiting area in triage. It would just move the problem even closer.
- Would be nice to have a 'heart section' staffed by a cardiologist. - Upstairs? Akutt 5?
- One ED doctor was open to moving the doctors out to the workstations. One nurse felt that the doctors would just get in the way if they sat together.
- There has to be clarity in patient transfer.
- Telemetry and triage room could be combined.
- It is not really necessary to have the secretary follow the patient into triage.
- Should have a star in every team. (Already know this, how can I convince?)

4.2.8 PATIENTS:

To get a more personal feel for how patients experienced their first meeting with the ED I conducted some interviews with patients waiting for rooms or test results in the triage area. These patients had not been thoroughly briefed by a doctor on their symptoms and so were good candidates for feelings about information. All patients were stable, not in severe pain and not critically ill.

Key takeaways:

- There is a wish for information about waiting time.
- The patients are understanding that the ED is a dynamic space and that things might change fast.
- Feels like you participate (are empowered) when the doctor is talking with you. The problem is between interactions.
- It's hard to ask questions to the staff because it feels like they are very busy. Also because they don't know what the different staff does.
- Positive to receiving information when you are here. Something to do while waiting.
- A lot of different people to relate to.
- Standardised information (service protocol) - show the patient that they see them and that asking questions is okay.
- "Feels like you are doing something illegal when you walk to the reception" - more welcoming reception
- Patients expect waiting
- Hard to find the reception
- Patients are very happy with staff interactions
- Patients can hear that stuff is happening which they like

4.3 OBSERVATIONS AT HAUKELAND HOSPITAL IN BERGEN:

To avoid tunnel vision I organised a visit to Haukeland hospital in Bergen to see if they had any solutions to the problems that were faced in Trondheim. Haukeland is one of the biggest hospitals in Norway. I was shown around by the department manager and the different solutions and overall philosophy was explained. Pictures from Haukeland are included in figures 9 and 10.

Key takeaways:

- They do not have a "doctors room" , only a working room for nurses and doctors.
- They have a 72 hour treatment unit. 80% of patients are sent home from here.
- They have no queuing system. Patients just walk up to the reception and are taken directly to triage.
- The reception houses only a secretary and the coordinator. No flow nurse.
- All walk-in patients go to triage. Even infectious patients.
- They have flow-roles for both medicine in general and specifically for emergency doctors.
- The emergency doctors run the ship.
- They have 27 health secretaries that perform various tasks. They can do more than just write.
- A separate post for heart conditions staffed by a cardiologist.
- a senior doctor responsible for triage.

Figure 9: The wayfinding system at Haukeland

Figure 10: The open reception at Haukeland

4.4 Patient questionnaire

It was decided to provide some patients with a questionnaire to get a quantitative baseline reading. This would be useful to see if the changes had an effect.

The questionnaire asks questions about previous experience to see if results change based on previous experiences. Questions include how easy it is to find the reception, how happy patients are about the waiting area and so on. It was also important to include a measure of how safe the patients felt as changing the flow could impact this. The questionnaire is included in appendix 1 and results are included in appendix 3.

SATISFACTION WITH WAY TO RECEPTION

4/10

SATISFACTION WITH WAITING AREA

4.86/10

HOW SEEN DO YOU FEEL WHILE WAITING?

5.43/10

HOW SAFE DO YOU FEEL?

8/10

4.5 Selected quotes

“It feels illegal to be down here“
-Patient

“I’m really wondering who all these people are“
-Patient

“It’s good you’re working on systems, we don’t really have one down here“
-Nurse

“It’s among the patients that haven’t been examined where deaths occur“
-Hospital expert

“We can’t try what we did last time because that was chaos“
-Coordinator

“These patients standing around are such a stress factor that I’m reconsidering if this is where I want to work“
-Emergency doctor

“The patient growth that the emergency department has experienced in the last years, it can’t be natural“
-Doctor from another department

“We probably get more people in here [reception] that have gone the wrong way than people that should actually be here“
-Ground floor secretary

4.6 Problem areas

4.6.1 WAYFINDING TO RECEPTION

The wayfinding to the right reception consists of a series of signs as well as some stickers on the floor (remnants of an earlier design project) leading the patient to the reception. In general the walking patients were dissatisfied with the ease of access to the downstairs reception. Many patients also presented at the wrong reception (upstairs). “It feels like you are doing something illegal when walking down here” commented one patient that had been admitted to triage. Referring to the several doors patients have to cross and the fact that you are walking around in the middle of a busy ED.

4.6.2 WAITING FOR RECEPTION

Because the receptionist has some time demanding tasks (printing papers and following the patient to the triage area) a line often forms to get registered at the reception. As there is no waiting area downstairs some chairs have been set up alongside the wall for patients to use. Questionnaires showed some patients were not satisfied with this waiting solution. Since this waiting area is in the ‘heart’ of the ED as one nurse described it, it has become a nuisance for staff, especially the emergency doctors who feel they need to have an overview of the ED. One emergency doctor said: “If this problem does not get sorted out I might look for work somewhere else because it is extremely stressful.” Patients that are admitted from “legevakten” sometimes come on a stretcher and then have to lay in the hallway in front of the waiting walking patients, becoming a spectacle. Because of the physical space it becomes impossible to protect patient anonymity. One professional at “Sykehusbygg” also noted the fact that the hallway might be used as an escape path during a fire or other emergency and that furniture or large masses of people might be dangerous in this regard.

4.6.3 REGISTRATION

To keep track of the queue the reception uses a take-a-number queueing system. Patients are then buzzed into the reception booth. They give their name and date of birth and are checked for contagious disease through a two question screening. The secretary informs the patient that they will register them in the system and gather their papers and that they can go back to the waiting area. The secretary then prints out an identifying bracelet, preliminary blood tests and other documentation connected with the patient. Some patients are not already registered in the journal system and this has to be done manually. When this happens the secretary has to ask the coordinating nurse to print out the blood tests as the secretaries do not have permission to do so. Looking for documents can also take some time. Sometimes the secretary has to confer with the coordinating nurse about the reason for admission (required field in the journal) and about possibility for contagious disease. This takes up time. If the patient has a contagious disease they are put directly in a patient room.

4.6.4 TRANSPORT TO TRIAGE

The secretary then exits the reception booth and leads the patient to their assigned space in the triage room and delivers a very brief report to the nurse in triage. This takes up time and leaves the reception unstaffed.

4.6.5 LACK OF INFORMATION

Patients do not feel welcomed by the space. It is sterile and hard to navigate. Patients are stressed and might be in pain. They are wondering what is happening to orient themselves among new people and systems and so are requesting information.

SERVICE BLUEPRINT - Patients arriving at the ED on their own (walking patients)

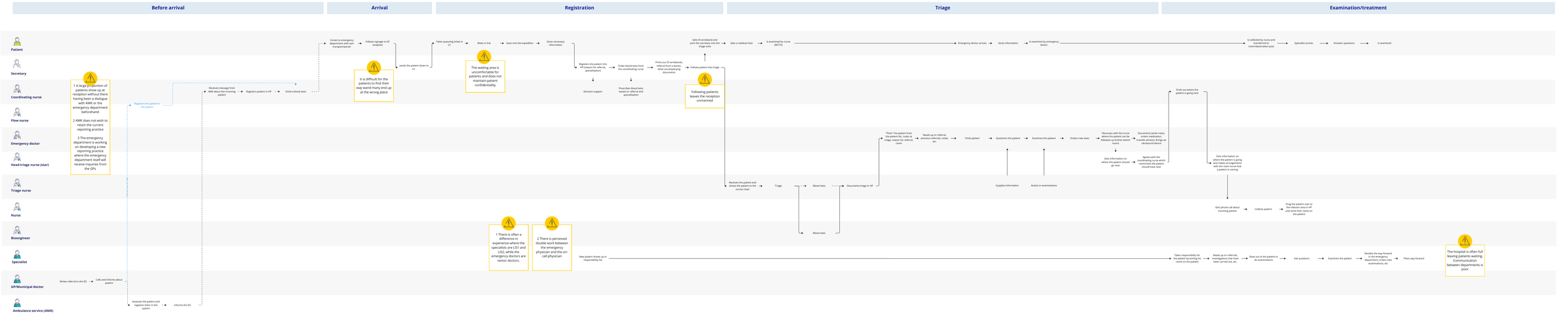


Figure 11: Large service blueprint illustrating the walking patient journey through the St. Olav's ED

4.7 Key findings

WAYFINDING IS AN ISSUE

PATIENTS ARE VERY SATISFIED WITH THE SERVICE FROM STAFF

SOME STAFF DON'T MIND THE PATIENTS IN THE HALLWAY, BUT SOME FIND IT VERY TAXING

THE TRIAGE AREA COULD BE UPSTAIRS

SOMETHING HAS TO BE DONE QUICKLY

THE SECRETARIES NEED SUPPORT

THERE IS A LACK OF INFORMATION FOR PATIENTS LEAVING MANY CONFUSED

THERE IS NO CENTRALISED TRAINING OR COMMUNICATION OTHER THAN EMAIL

PATIENTS BUILD UP BECAUSE THE REGISTRATION PROCESS IS INEFFICIENT

The findings from the research was put into a large service blueprint (figure 11) and problems were highlighted. Figure 12 illustrates the patient journey through initial assessment, trying to highlight the circular nature of staff workload and the different interaction points between them. After this primary research it was decided that the best course of action for workflow would be to move all patient registration to the ground floor. This would allow the doors into the ED to be locked providing increased safety and calm for the staff, many of which really struggled with the current solution. It would also make improvement easier in the future as all patients would pass through the same point. Using this approach it would also be possible to use the U1 waiting room, previously used by next of kin for patients. To ground this solution and work out how it should be solved it was decided to host a co-design session with staff.

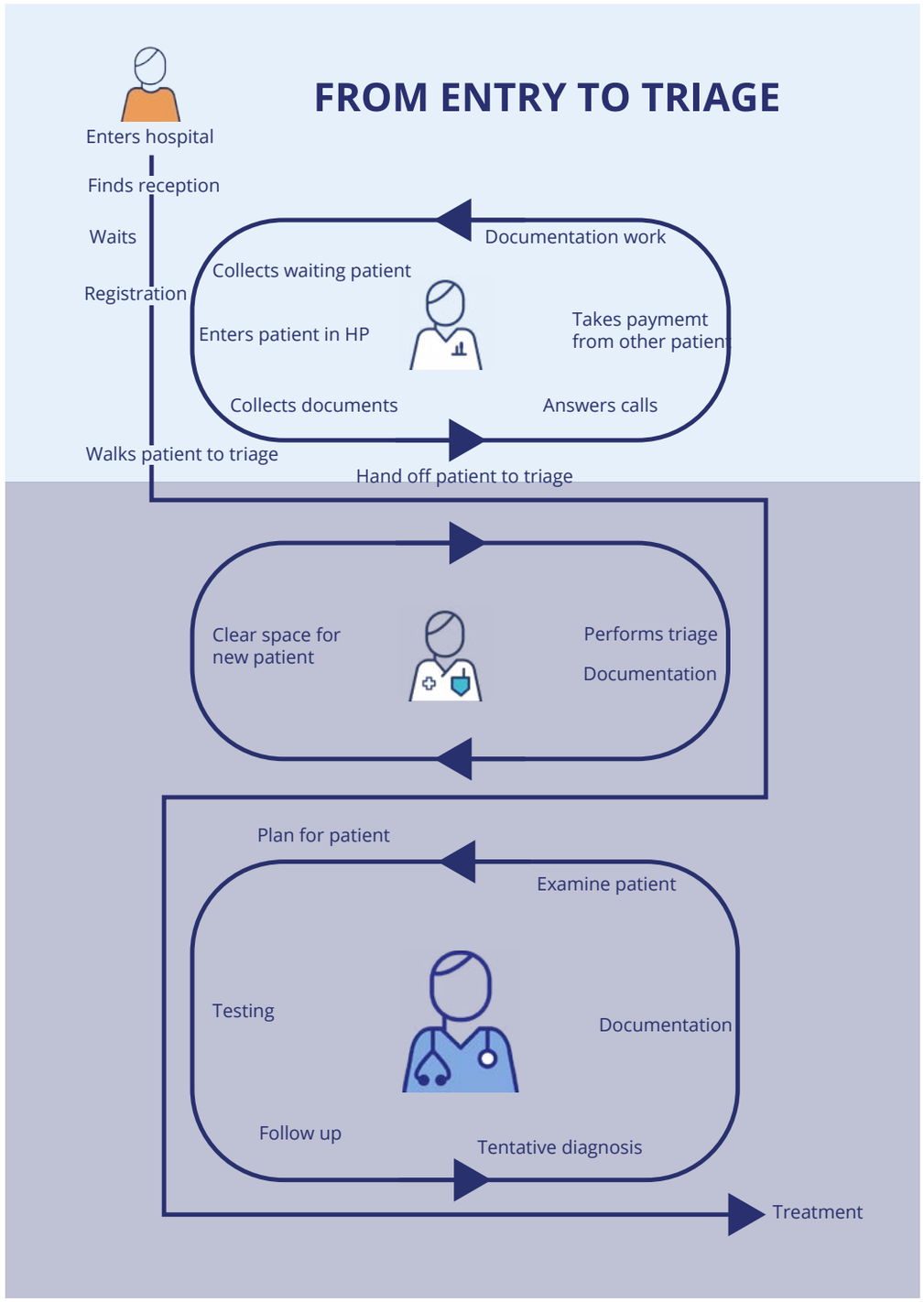


Figure 12: Illustration of initial assessment at the St. Olavs ED

4.8 Co-design

4.8.1 PLANNING

To make the co-design session as efficient as possible a clear goal was set that could easily be communicated to staff. The goal of the session would be to land on a solution that could be tested out in a three week test period. Constricting the future solution in this way reduced pushback from staff as they could lean on the fact that if the solution was poor it would not last forever. To sell them on the concept a presentation was planned that walked through the findings leading to the decision to combine the receptions. This presentation is included in appendix 4. To ensure all participants had the same understanding of the situation a shorter service blueprint (figure 13) was created to be presented. A future service blueprinted was created to highlight the main areas where problems could arise. This can be seen in figure 14. Discussions in large groups can often become unproductive. To counteract this the group would be divided into smaller groups that would each work on a set of problems. To get the groups started a problem description was provided for each problem with a background, goal and possible solutions for inspiration. These problem descriptions are provided in appendix 6. Finally the groups would present their solutions in a plenary session. To make the solution tangible the goal was to fill out an empty service blueprint with staff suggestions. This ensured we ended up with a solution that was shared by all participants.

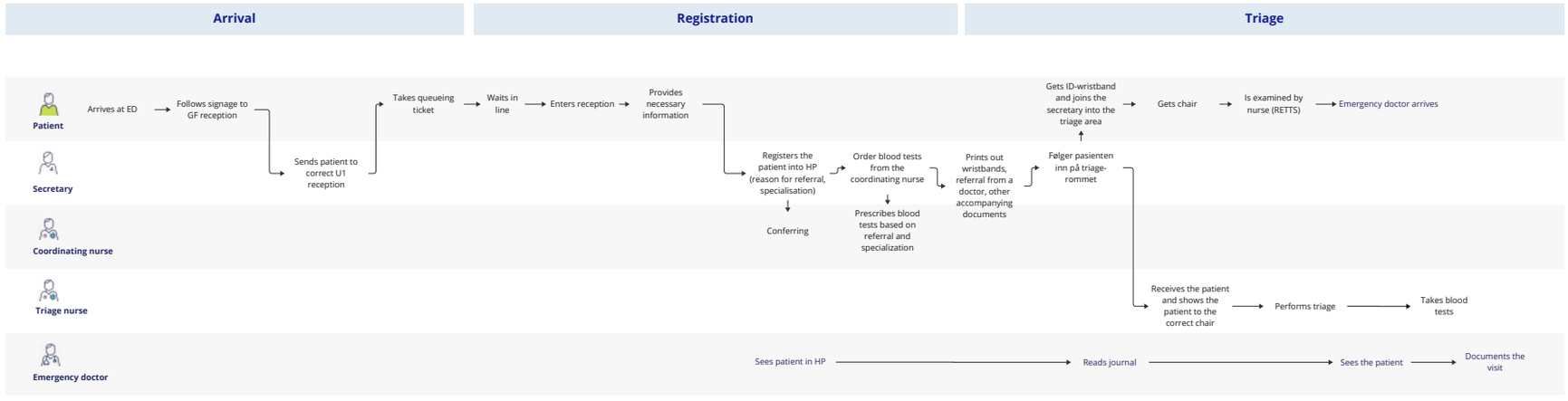


Figure 13: Condensed version of figure 11 for use in co-design session

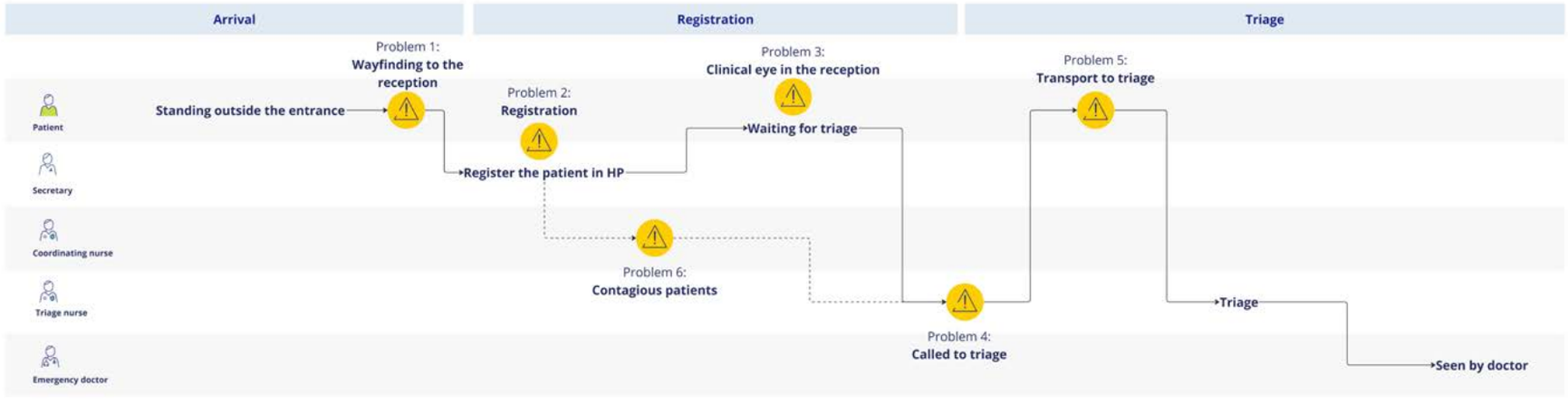


Figure 14: Service blueprint highlighting potential problems when combing receptions

4.8.2 Co-design session

To get the proposition of registering all patients upstairs to a testable solution it was decided, together with the nurse leaders, to host a co-design session with secretaries, coordinators, nurses and emergency doctors to land on a solution workflow everyone was comfortable with. Eight nurses, three secretaries and one emergency doctor participated. As presented in table 1

Type of staff	Amount
Nurse	8
Secretary	3
Emergency doctor	1

Table 1: Co design session participants

The participants were given background information on why it was suggested to relocate the reception and the criteria for a solution. The current flow was presented and comments were taken. Then the future flow with highlighted problem areas was presented. The participants were then divided into five groups and each group was given three problems to solve. Each problem had a specific problem description and suggestions for solutions. The groups were selected to get different roles together to talk about shared responsibilities. The session resulted in a service workflow that was to be tested out over three weeks.

Group 1: 1 nurse, 1 secretary
Problems: Wayfinding to the reception, registration, communication with triage

Group 2: 1 emergency doctor, 2 nurses
Problems: Clinical eye in the reception, Contagious patients, communication with triage

Group 3: 1 secretary, 1 nurse
Problems: Wayfinding to the reception, way to triage, contagious patients

Group 4: 1 secretary, 2 nurses
Problems: communication with triage, clinical eye in the reception, registration

Group 5: 2 nurses
Problems: Way to triage, contagious patients, registration

The nurse in group 3 was given the wrong time and showed up late as a result. The secretary in group 3 joined group 4 and the nurse that showed up late joined group 1. This led to group 3's problems not being solved. However, they were solved by other groups and all participants were present during the discussion.

SOLUTIONS AND DISCUSSION

Problem 1: Wayfinding to the reception
The group suggested lines on the floor connected with signs with different types of signs for day and weekend/night. They also suggested updating the information on the website as this information can be perceived as ambiguous. It is also important that all the other departments at the hospital have the right information as they sometimes refer people to the ED. Last time they tested switching receptions the porters referred people to the downstairs reception.

"People sometimes show up to the reception with a printout of the website"
-Secretary

Problem 2: Registration
The groups suggested that the blood tests and documents would still be printed in downstairs reception. The nurses in triage would then go and collect them while getting the patients. A secretary brought up the fact that there are more secretaries connected to the emergency department, they are just located in another building working on other tasks. If there was more room they could more effectively handle peak loads and also support each other if there were any difficult tasks. The secretary will register the patient in the journalling system and give them the id bracelet. For registration at night this will happen in the downstairs reception. The current waiting room can then be used, however there needs to be installed cameras so the secretary can see into the waiting room and the ticket system needs to be better so it is possible to see if someone is waiting. It is also a possibility that people just ring the bell at the reception. If patients come with friends or family then the phone number of the contact person will be put in the comment section of the journal system. This started a discussion about the importance of the fact that everyone needs to do the same thing. It was decided that a teams channel would be opened during the testing period where directions would be posted and people could come with suggestions.

"If we had more secretaries in the receptions then we could just open more stations if there is a lot of pressure, I mean there are more of us in another building all we need is a place to sit"
-Secretary

Problem 3: Clinical eye in the reception
The groups were very clear that the secretary could not be clinically responsible for unregistered patients. Lack of health professionals nearby was also unappealing to the secretaries. The possibility of a radio system was mentioned but one nurse brought up the importance of face to face contact when identifying ill patients. In the future GP's will have to call the ED directly instead of AMK and a nurse will then be put to man this phone. It was decided that this nurse can sit in the reception in the future to keep an eye on the patients. In the testing period a nurse will be put in the reception to provide support. The need will then be assessed, however it was important for the secretaries that they would not be left alone in the beginning. To improve things as well the coordinator will indicate a tentative triage rating from the information given by the GP so the secretary and nurse in the reception will know who to keep an eye on. The reception also needs to be rebuilt so it is possible for the people sitting there to keep a better eye on waiting patients.

"It's not okay to put that kind of responsibility on someone who's not a health professional"
-Emergency doctor

"That eye contact with the patient is so important"
-Nurse

Problem 4: Communication with triage
The group suggested using the journal system to communicate when a patient was waiting for triage. The patient would then be sent down to the downstairs waiting room after registration and be collected by the triage nurses there. The groups also agreed that after a patient is registered they are the responsibility of triage.

"Let's just use the solutions we have already, I mean the room is there in Helseplattformen, the secretary can just drag them over and then we'll go and get them"
Triage nurse

Problem 5: Transport to triage
Similarly to wayfinding in the reception the way to triage will be marked with lines in the floor. The group decided that it would be best to have the patients waiting downstairs for triage. There was a discussion over what happens if the waiting room is full. This would be resolved by having patients wait upstairs, emptying the waiting room and then collecting the patients waiting upstairs. If patients are too ill to walk down on their own a nurse in triage will be called to lead them down.

"We used to have lines on the floor in the old hospital and that worked really well, but we weren't allowed to have them here. It had something to do with the architects I think"
-Nurse

Problem 6: Contagious patients
To catch contagious patients early the secretary will be given a checklist with what might be contagious symptoms. This list was not made during the co-design session and will have to be made before testing begins. If a possibly contagious patient is discovered the patient will then be given a mask and asked to follow a separate "contagious line" to a spot where they will be picked up by a flow nurse. This spot should be visible from the downstairs reception. The patient will also be reported over the radio to the coordinator so a room can be found and so they know that someone is coming.

"The solution we have today works well, I guess they will just have to walk down here"
Nurse

The key findings and solutions are summed up in table 2 below. The agreed upon service blueprint can be seen in figure 16. The original blueprint from the session is included in appendix 9.

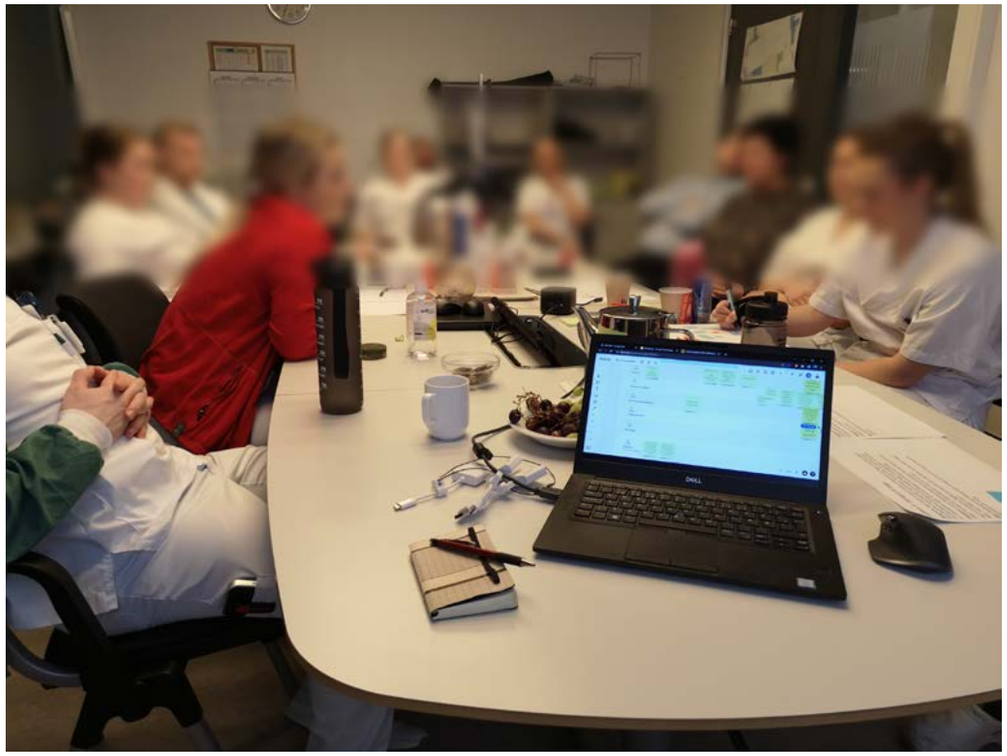


Figure 15: Photo from the co-design session showing the plenary discussion

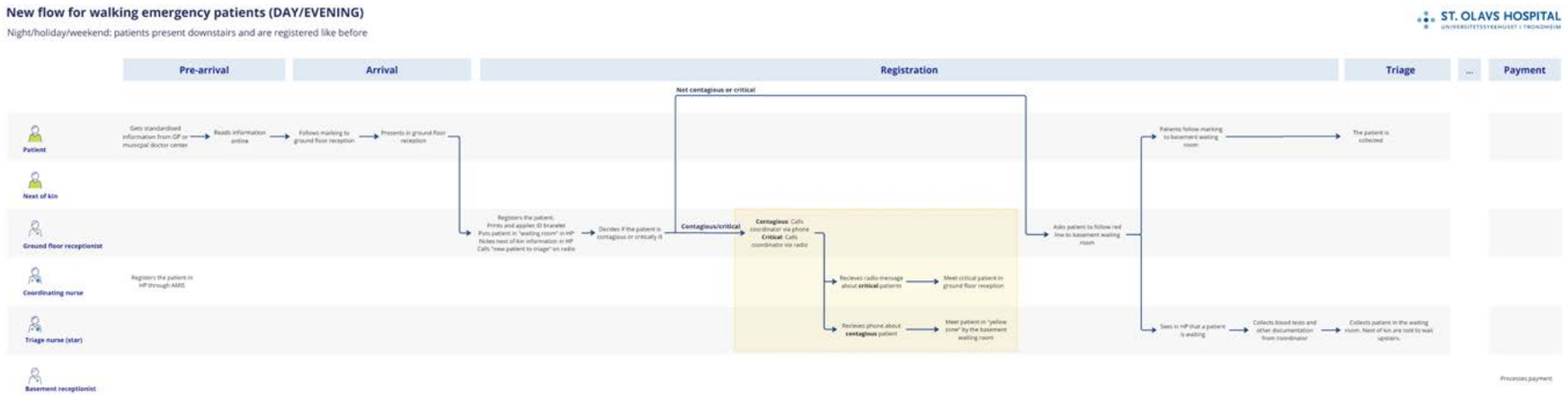


Figure 16: The agreed upon service workflow.

Table 2: Matrix summarising key findings from the co-design session

Problem	Key findings	Solutions	Value	Owner of solutions	Technology
Wayfinding to the reception	Patients get very different information prior to arrival Information on the website and on the signs is ambigous. Last time this was tested other parts of the hospital referred to the wrong reception Different paths on weekdays and night/weekend	Update the website with map and correct information Standardised information to GPs and municipal health services Inform the rest of the hospital before the test starts Update signage, including lines in the floor	Patients and staff have the same expectations. Fewer misunderstandings. Saves time. Patients present in the correct reception. Saves time and frustration.	RSHU	Website Digital lines in the floor for wayfinding (Future) Screens for digital signs (Future)
Registration	Triage is happy with taking on some of the tasks of the secretary like collecting documents and following patients. There are more secratariesavailable in another building.	All documents are printed at the coordinator and collected by nurses in triage. Patients only get an armband for identification at the reception and are registered in HP. Secretary gets radio to inform of patients in unsafe condtition. The reception will be rebuilt in the future to staff more secretaries to handle peak loads.	Time saved for secretary. More flexability for triage. Safety for patients. Reassurance for nurses and secretaries. Flexability and decision making support in the reception.	Coordinator Secretary RSHU (Building)	Radio Rebuild
Clinical eye in the reception	It is not ethical to put this responsibility on the secretaries. Secretaries want clinical support. There will be a nurse handling referrals from GPs in the future that will be available for support. Nurses want to have an overview.	Nurse in the reception in or near the reception in the test period to handle clinical support. Room for referral nurse in future reception. Cameras on path to triage and in U1 waiting room visible for triage and coordinator. (Possibly future depending on installation time)	Safety for patients. Reassurance for secretaries. Safety for patients. Overview and reassurance for nurses.	Nurse leaders RSHU	Rebuild Cameras and monitors
Communication between reception and triage	HP has support for this already. Nurses are more mobile than receptionists.	Secretary drags patient over to U1 waiting room after registration and sends them downstairs. Nurse in triage sees patient in U1 waiting room in HP and collects the patient. Triage is responisible for patients after registration.	No need for personal interaction. Saves time and increases flexability. Clarity of responsibility.	Secretary Triage (star)	HP
Patient transport to triage	Patients have to find their way down today as well. Lines in the floor have worked well in the past.	Updated signage from reception and down to the U1 waiting room.	Patients can usually transport themselves. Saves time for staff.	RSHU	Screens for digital signs (Future)
Contagious patients	Current flow for contagious patients works well. Secretaries need more support to report possibly contagious patients.	Coordinator handles contagious patients. Phone to report the arrival of contagious patients. Separate line in the floor for contagious patients leading to waiting zone where they are picked up by a nurse.	Already an established workflow. Less integration needed. Clarity in communication. Less chance for contaminting other patients or staff.	Coordinator Secretary RSHU	HP Phone

5. Design and develop

5.1 Personas

To make the different types of staff more relatable I have made a persona for each of them together two different patient scenarios.

EMERGENCY DOCTOR

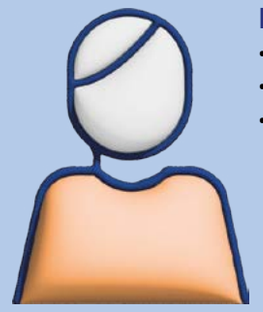
- Needs to have an overview
- Needs space to focus
- Needs decision making support
- Lots of journal writing
- Wants to treat different kinds of patients
- Wants to work with medicine and not logistics
- Feels a great deal of ownership

“I probably spend 60% of my time writing journals and dealing with logistics, I just want to help people”

NURSE

- Wants to provide the best care for patients
- Social
- Wants to work with medicine and not logistics
- Needs decision making support

“What if a patient gets lost? We have a responsibility when they are down here”



PATIENT 1

- Unsure about their condition
- Wants information
- Needs to feel safe

“It’s very stressful you know. One minute you are at the GP for a normal checkup and suddenly you’re on your way to the hospital not knowing what’s going on or if you’ll be admitted”

PATIENT 2

- Chronic condition
- In pain
- First time at the ER

“Sorry I can’t talk right now it hurts really bad”

SECRETARY

- No health background
- Service minded

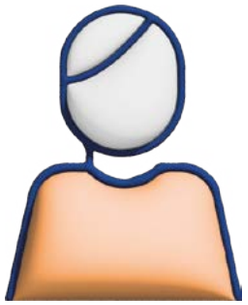
“It can be quite scary if you are suddenly left there with an ill patient”

5.2 Scenarios

WITH DIFFERENT PERSONAS

To make it easier to empathise with patients and understand what a trip to the ER can look and feel like. Two scenarios were created based on real experiences.

Patient 1 is generally a healthy person. Yesterday they were out hiking when they suddenly felt a pain in their chest. They did not think much of it until they went to bed and noticed the pain was still there. They book a doctor's appointment and are shocked when their GP refers them to the ED for the possibility of a heart attack. Patient 1 has never been admitted to a hospital before and has only limited experience with the health services. They google the address of the ED and get on the bus, thoughts of doctors and surgeries rushing through their head. When they arrive at the address they see a barrage of signs all with their own version of "emergency department" on them and all leading in different directions. They pick one at random and are not reassured when it leads them down a flight of stairs through some doors and into a long corridor, it feels like they should not be here. Finally they spot a reception and take a ticket. There are some other patients there all looking either pale or green. Some wincing in pain. People on stretchers are regularly wheeled by. They sit in a chair and wait, the words 'heart attack' racing through their mind. Finally they are called into the reception where they try to explain the situation. The secretary stops them and asks their name and date of birth. Yes, they are in the right place. Just sit outside and wait and I will be there shortly, the secretary says. The minutes pass slowly until Patient 1 is finally led inside a big, brightly lit room filled with other patients and staff. A nurse starts asking questions then they disappear. After a while a doctor appears. She explains that they are going to check for a heart attack although it is quite unlikely, but they are running some tests. The doctor leaves and the nurse comes back a little later to draw some blood. One hour passes, then two. Patient 1 is starting to get hungry and asks a nurse if she can eat. They have to wait for the results to come back first. Finally the doctor comes back and explains that they did not find anything abnormal in the test. Patient 1 is sent home.



Patient 2 has been living with chronic pain for many years now due to a condition that makes kidney stones much more common. They usually pass on their own, but not this time. After visiting their GP patient 2 is immediately sent to the ED. Right before arriving the pain is so bad it feels like they are going to throw up. Patient 2 can see the red signs easily. They enter the ground floor reception and are told they are at the wrong place and give out a big sigh. It's hard navigating around in a long corridor with this much pain. After a wrong turn and some backtracking they finally see the reception and get a queueing ticket, sitting down in the uncomfortable chair in front of the reception. As gurneys move by patient 2 has to shift a little in the uncomfortable chair to make room. It does not help that people are moving past all the time either and they feel like they are being put on display. Finally it is their turn, but the referral from the doctor has not come through and they have to be registered manually. It is taxing to have to explain the symptoms while in pain. The secretary then has to collect documentation leaving patient 2 standing for a while. They move into triage and patient 2 is triaged. Luckily it is not so busy and they are quickly seen by an emergency doctor and sent to a room. After many hours of testing and waiting they are admitted to the hospital.

5.3 Design concepts

I started with three areas that I would look at: Physical space, digital information systems and service communication protocols. These were based on assumptions about the ED. Following the research phase these have been iterated upon to meet the real needs discovered.

5.3.1 PHYSICAL SPACE

There is definitely a need for a redesigned reception. This is being rebuilt in about a year, but the time perspective rules it outside the testability of this master. A reception is being planned by another project group at the hospital. They were contacted and their solution reviewed. Their suggestion was deemed unfit for the needs of an emergency reception and user feedback from this process was included in the next iteration. I also present my own reception rework in figures 17 and 18

In the rework all patients enter on the ground floor. Imaging will take over from the trauma outpatient clinic and so the patient load here will probably be reduced. To capitalise on this and gain some space the waiting areas are combined. The ED reception is enlarged to make space for two secretaries and a GP coordinator. The previous waiting area is turned into storage for wheelchairs and other equipment that is standing around the hallways today. To reduce the need for wayfinding and ensure patient safety the outpatient clinic is converted to a triage area. The new space allows for patients waiting for triage to wait inside keeping them close, but cut off from staff.

Figure 17: A render of what a future reception might look like

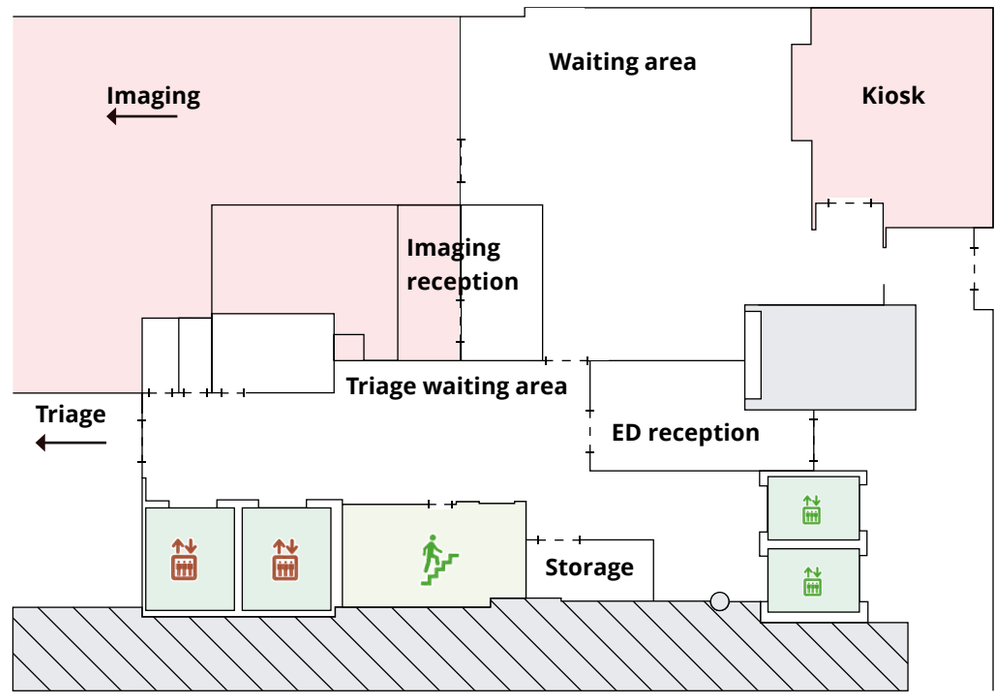


Figure 18: Plan drawing of alternate layout of the St. Olavs reception

Testable stuff

5.3.2 INFORMATION SYSTEM

A digital information would need to be provided through an already existing digital solution such as the “Helsa mi” app or the website. Both have significant limitations on functionality and as there is no internal support for such solutions in the ED. Because of this it was ruled as an unrealistic solution and the focus changed to physical or verbal information. This leads to limitations on functionality however, it has some positive effects for patients that are not comfortable with digital solutions and is much easier to implement and maintain.

5.3.3 WAYFINDING SYSTEM

This part was initially overlooked, but after observing patient issues with wayfinding it was decided to look at improving the wayfinding system in the form of signs and lines throughout the ED.

5.3.4 WORKFLOW:

Service communication protocols were expanded upon to also include staff operations outside of contact with the patients. This comes from the need staff have for improved communication and to optimise the logistics of how they work. This is communication and standards between staff and is presented like a service blueprint.

6. Deliver: Solutions, testing and iteration

The solutions were implemented and tested over three weeks from 17.4.23 to 8.5.23 and iterated in the same time, following the RITE principles.

6.1 Wayfinding

6.1.1 QUEUING MACHINE AND RECEPTION ENTRANCE

The ED reception is behind a door and so patients do not feel comfortable entering without being allowed, furthermore there is only room for one secretary and registration might take some time. There is a queuing machine so patients can sit and wait and so it is clear when they can enter the reception. In the future when the reception is open and the secretaries can have more direct contact with waiting patients the queuing machine should be removed as it is unnecessary complexity. There was a sign here made by a nurse (figure 19). On the first day of testing there was a lot of confusion among the patients about the ticket machine. Some trauma patients would take tickets and some emergency patients would not. Because of poor placement of the number display screen patients would also show up at the trauma reception desk. Poor contrast between the door leading into the reception and the surrounding wall made the reception entry hard to see and patients would miss the door even when redirected from the trauma reception one metre away.

The new sign (figure 20) contains information for both trauma patients and emergency patients. The information for trauma patients is in the blue field while the information for emergency patients is in red, corresponding to the colours of the receptions. The arrow for the trauma clinic points the patients directly toward the reception while the arrow for emergency patients point them toward the ticket button. Hopefully making them stop and think. The font is readable from a distance with small serifs and corresponds to the font used for other signs at the hospital. Ideally the ticket machine should be placed next to the reception entrance, but as the reception is being rebuilt it was not possible to get funding for an electrician to rewire the system. The door for the entrance was marked with red tape (figure 21) to increase the contrast and make the door more visible. A sign was also added next to the door to inform patients coming from other places than the main entrance of the ticket machine. This was an improvement, however people continued to present in the wrong reception and trauma patients still took tickets to a lesser degree. These needs were overlooked during planning, showing the need for RITE when implementing solutions in complex environments.

Figure 19: The old queueing machine sign

Figure 20: The new queueing machine sign

Figure 21: Highlighted reception door

6.1.2 PATH FROM RECEPTION TO U1 WAITING ROOM

With a much longer path for patients from the reception to the waiting room it would no longer be feasible for secretaries to follow patients to the waiting area. Patients felt it was difficult to find their way down into the ED and so an improvement was needed.

The design was inspired by the system used at Haukeland. Consisting of a red line in the floor leading directly from the reception and down to the waiting room. A line has certain benefits over signage because it is unambiguous and because it is universal as it does not rely on language to convey information. It was quite difficult to get permission to use a floor line as it breaks hospital convention and there were some concerns about wear, friction and the universality of the design from the hospital's signage committee. However, after several emails explaining the value of such a line and why it would be useful as an idiosyncrasy of the ED, permission was given for the testing period. However, it had to be minimal and follow along the wall where possible. The prototype line was made out of red tape since it was cheap and durable. For permanent installation a foil is recommended as it is more durable, looks better and has the possibility of tactility for people using white canes.

PROPOSED DESIGN

The proposed design consists of two lines. One yellow for contagious patients and one red for normal patients. It follows the shortest route from the reception, both in the elevator and down the stairs. It was preferable to make people use the stairs as the elevator is used for material transportation. The proposed design is shown in figures 22 and 23. A new sign, showcased in figure 26 was made to complement the line.

IMPLEMENTED

Because of the limitations set by the signage committee the implemented version contains only one red line and reduced marking, meaning the line would not be unbroken.

The marking around the elevator was also reduced, assuming people coming out of the elevator would see the line down the hallway. An arrow was added to this spot to add direction to the arrow, making it more understandable. Implemented solutions are illustrated in figures 23, 24 and 27.

ITERATIONS

People would follow the line to the end and walk to the entrance of the waiting room. Here some people got confused and looked around. To counteract this an arrow was added to the end of the line. This helped, however people were still confused and so a red line was added around the door to increase visibility and to make the door into a landmark. A red line was also added to the sign saying "Waiting room" as this seemed to elude some people. The line was also not visible enough from the elevator which necessitated an extra line.

GROUND FLOOR

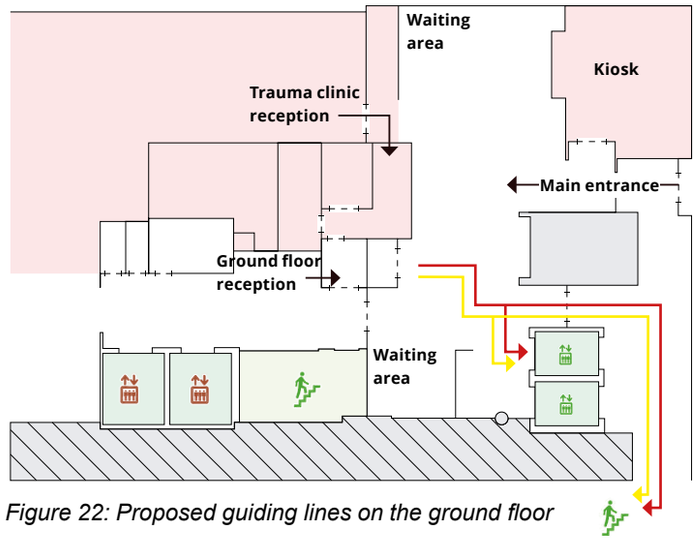


Figure 22: Proposed guiding lines on the ground floor

BASEMENT (U1)

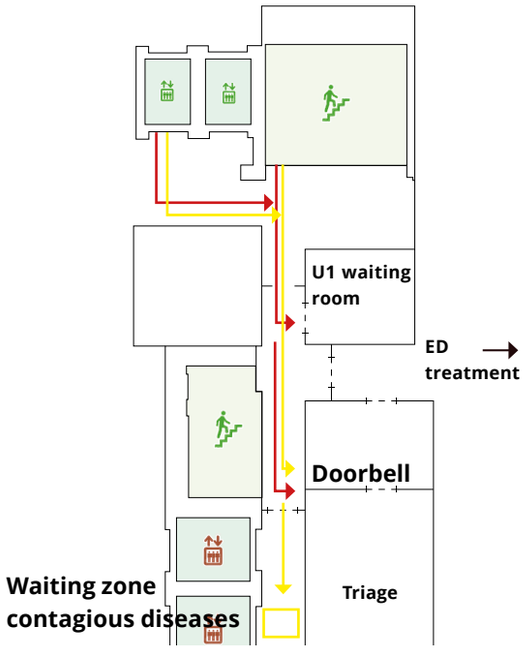


Figure 22: Proposed guiding lines in the basement

GROUND FLOOR

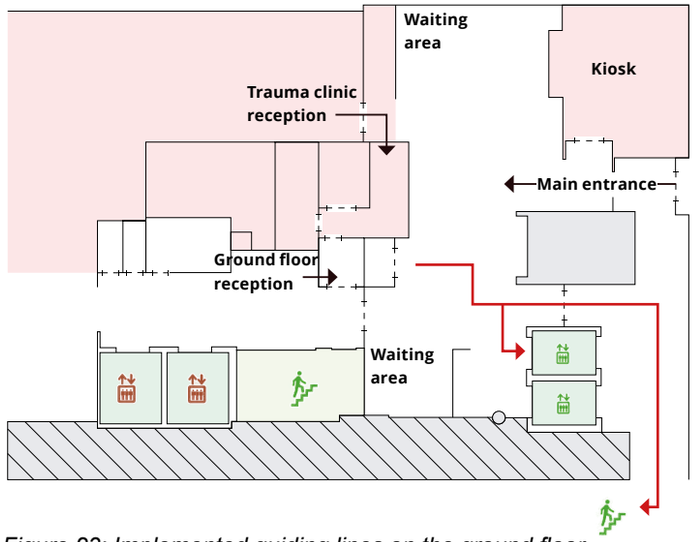


Figure 23: Implemented guiding lines on the ground floor

BASEMENT (U1)

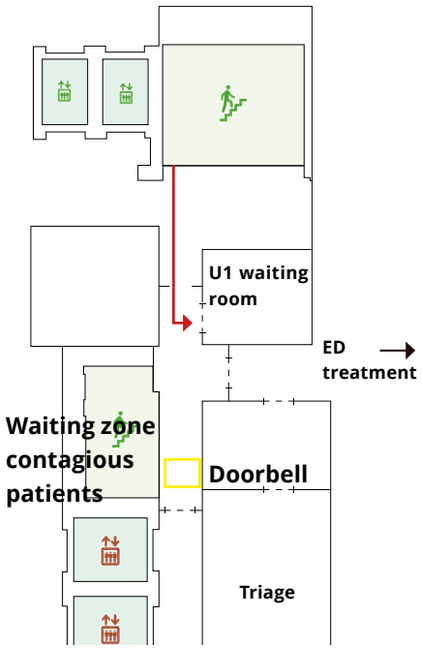


Figure 24: Implemented guiding lines in the basement

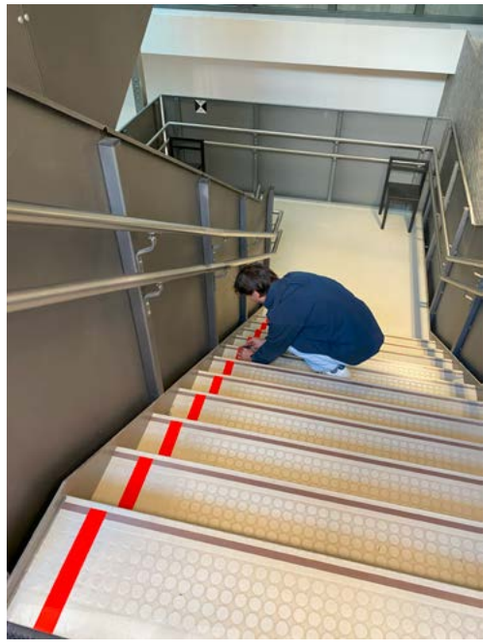


Figure 25: The author taping the stairs.

Figure 26: Old sign (back) with ambigous information and new changeable sign.

Figure 27: Implementing guiding line on the ground floor leading to the stairs.

6.1.3 DOORBELL AND WAITING ZONE SIGNS

Because the door leading to the U1 reception was now locked the doorbell needed to be more visible. There is also a doorbell right next to it leading to another part of the ED and these had to be differentiated. As there was now no wayfinding line to the waiting zone for contagious patients a sign was made for this zone to increase visibility and to make the markings less ambiguous. Contagious patients were also told to wait in the yellow zone by the secretary in the reception. This need was discovered during testing.

The signs were made as simple as possible to avoid clutter. As per design recommendation the contrast between the text and background was over 60%. Red was chosen for the doorbell text so patients would associate it with the ED. Red was chosen for the text instead of the background to make the sign less visually distracting. The sign for the waiting zone has a yellow background to connect to the yellow floor markings. A dark blue text was chosen as it has good contrast and fits in with St. Olav's visual profile. Yellow was chosen for the sign and zone as it is the colour the NHS style guide recommends for safety measures. The signs are presented in figures 28 and 29. The signs were mounted at the recommended height of 1500mm to coincide with the patient's eyeline.

ITERATIONS

The signs were effective however visibility was not great for patients coming down the stairs. To make the signage more visible they were altered and printed on an A3 sheet that was folded so it would protrude from the wall and angle the text down the corridor. The background of the doorbell sign was also changed to a light blue to separate it from the wall. The signs were mounted one over the other to avoid making it visually distracting. This means the one sign is above the recommended mounting height. However since this is connected to the other sign the effect is negligible. This is illustrated in figure 30.

Figure 28: Sign for the ED doorbell

Figure 29: Sign for the contagious patient waiting zone

Figure 30: Bent sign for increased visibility

6.2 Information system

6.2.1 WEBSITE

The website was updated with correct information after the co-design session. RSHU took the lead here and so I was not directly involved.

6.2.2 POSTER

A poster was selected for two reasons. It could stay in one place and would be read by many people and it served as a sign that patients had entered the waiting room. It contains information about the triage process to make people familiar with their situation and the process they are heading into to mitigate stress. The poster can be seen in figure 31. The untranslated poster can be found in Appendix 6.

A light blue background was chosen to make the poster stand out from the wall. Dark blue was chosen for the text to match St. Olav's visual profile. The contrast between the text and the background was consistent with recommendations. For signage the title was made big enough to be able to read outside the room. The information consisted of the different steps in triage connected to an icon of a nurse and an emergency doctor. The icons were selected to make the different roles more memorable. The information also showcased how the role looked to explain the environment better to the patient. As one patient put it: "Who are all these people?" The last step highlights what happens behind the scenes as large amounts of time will often pass with no apparent progress to the patient while staff is conferring or analysing test results.

Lastly information about what to do if symptoms got worse was added in red text to highlight it. The poster printed in A1 size and was first fixed to the wall opposite the entrance of the waiting room.

ITERATIONS

After observing that people would sit in the waiting room and look towards the door (perhaps waiting to be collected) and patient interviews revealing that not many had noticed the poster it was moved to the door. When this also proved ineffective it was moved to the wall to the left of the door. This seemed to improve visibility.

Figure 31: Poster providing information about triage

6.2.3 LEAFLET

Following research that patients are more satisfied with their stay when provided with information concerning the emergency room itself I wanted to test this. A leaflet was chosen to be given out by the secretary when the patients were registered. It was filled with a short description of the hospital and the process that patients would go through. With blue text on a white background it was made to be printed cheaply. An icon was added next to the title to make the leaflet appear a little more professional. The leaflet can be seen in figure 32 and the untranslated version is available in appendix 7.

ITERATIONS

The main issue with the leaflet was that it was not being handed out by the secretaries. To fix this the leaflet was moved to the waiting room and placed on the table. Here it was noticed by some patients however it would easily be buried under magazines and other items placed on the table. Patients who had seen the information reacted positively or neutrally when asked during interviews.

Welcome

Welcome to the emergency department at St. Olav's Hospital. We know that a trip to the emergency department can be stressful, but know that you have come to the right place and that we will try to make your stay here as comfortable and efficient as possible. Approximately 150 excellent nurses, secretaries and doctors work here. It is the nurses and doctors you will see the most. They have extensive experience in the emergency department and a high level of competence in their field.

You will soon come in for an emergency assessment. Here you are prioritized based on your symptoms to see how quickly you need treatment. The doctor will also make a plan for your stay here. The emergency department is the only part of the hospital that does not decide how many patients they take in each day, and in the event of a high demand, things may take a little longer. After the emergency assessment, samples will be taken and you may want to be in for observation. There is a queue for some examinations and other test results take time to analyze. There is a lot going on behind the scenes here and we are working to ensure that you get the best treatment.

After tests and observation, the doctor makes a decision whether you must be admitted to hospital or whether you can return home. In the meantime, we hope you are comfortable. Pleae ask the nurses in white coats if you have any questions.

ST. OLAVS HOSPITAL
UNIVERSITETSSYKEHUSET I TRONDHEIM

Figure 32: Leaflet providing information about the St. Olav's ED

6.3 Service workflow

The workflow had to be redesigned for a GF reception since tasks such as patient registration was moved to the GF secretary.

PROPOSED DESIGN

The design tries to make the process as clear as possible and utilises more parallel processing than before. Processing work is done by the secretary in the GF reception. If the patient is in poor condition the secretary uses the radio to message the coordinator that in turn sends someone to retrieve the patient from the reception. If the patient might be contagious this is called in to the secretary over the phone. The lead triage nurse (star) sees normal patients in HP and retrieves them when they have space. The proposed design can be seen in figure 34.

IMPLEMENTED DESIGN

Some changes were made to the flow at the last minute. It was decided that the U1 secretary would be the one retrieving patients from the waiting room instead of the star. This was done because of concern among the triage staff that the workload would be overwhelming and concern of the U1 secretary that they would have nothing to do. This worked well and distributed the workload more evenly.

ITERATIONS

As the secretary had to walk a lot and was away from their computer they quickly lost track of the patients in HP. Because of this, a radio message was given every time a patient was on their way to the waiting room. Over time this caused some concern among the rest of the staff as radio messages are generally reserved for emergency situations. Because of this it was decided that the GF secretary would instead call the U1 secretary when a new patient was on their way. This workflow is presented in figure 35.

One issue was that the coordinator would often be too busy to pick up the phone or reply to the radio. This would cause the GF secretary to feel unsupported and anxious and a lot of time was spent trying to call various people to get answers to questions. Because of this the responsibility was moved to the flow-nurse that has a much more flexible role. To lessen the time it would take to collect poor-condition patients a wheelchair was placed on the inside of the door and patients were instructed to wait here. The flow-nurse would then go directly up the middle stairway and bring the patient down in the emergency elevator. This workflow is presented in figure 36.

To help the secretaries adapt to the new workflow a cheat sheet was made so they would not have to look up the flow. This is presented in figure 33.

New workflow

- Register the patient
- Give them an ID-bracelet and blood tests
- Ask the patient to follow the red stripe to the waiting room
- Write phone number for next of kin in the journalling comment box
- Call U1 secretary about new patient

Contagious and critical patients

- If contagious or critical mark in journal. Ask contagious patient to follow the yellow line and wait.
- Call out contagious and critical patients on radio. Responsible in U1 should answer.
- Critical patients are collected by flow nurse in GF reception
- Contagious patients are collected by U1 secretary in the waiting zone
- Nurse support: flow nurse- 27007. Call if you have any questions

Signs

- Remeber to change the sign by the stairs at the end and start of the day

Figure 33: An example of a secretary cheat sheet.

1

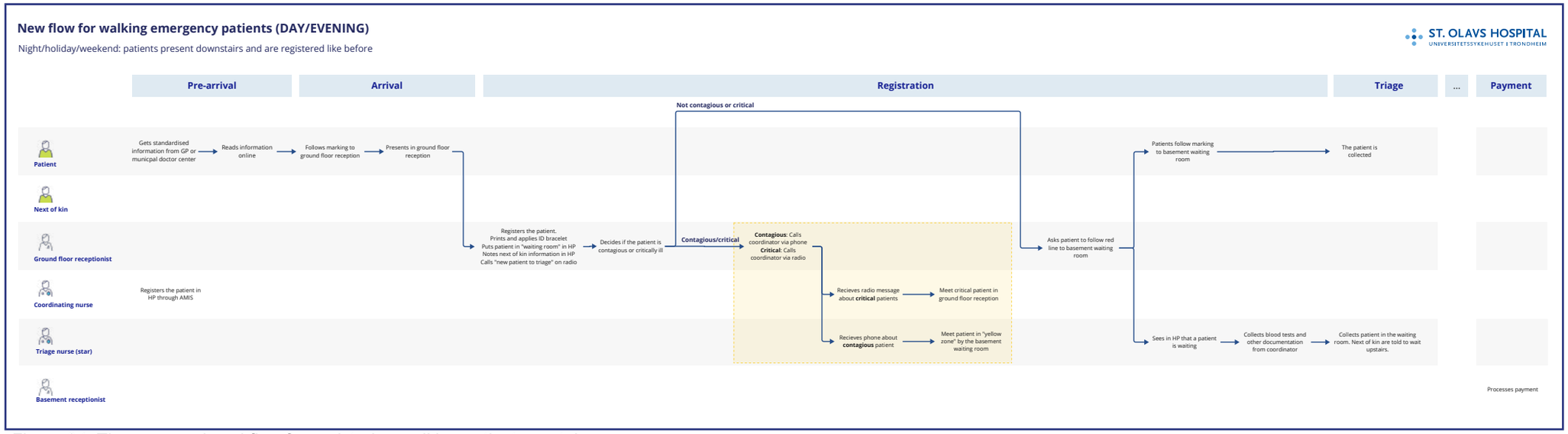


Figure 34: The proposed workflow for registering walking patients upstairs

2

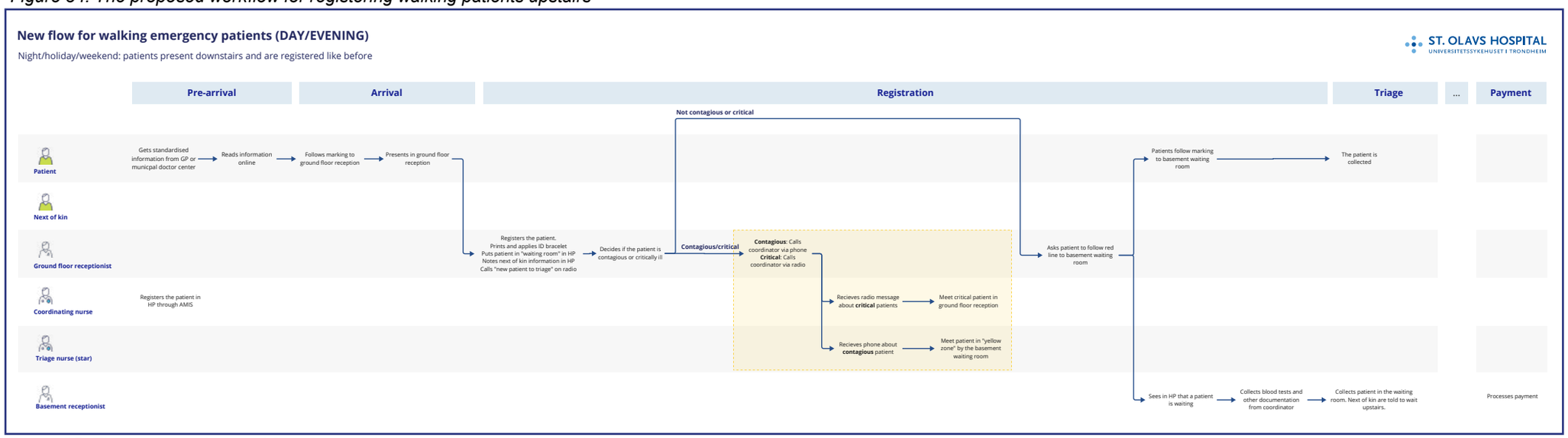


Figure 35: The implemented workflow for registering walking patients upstairs

3

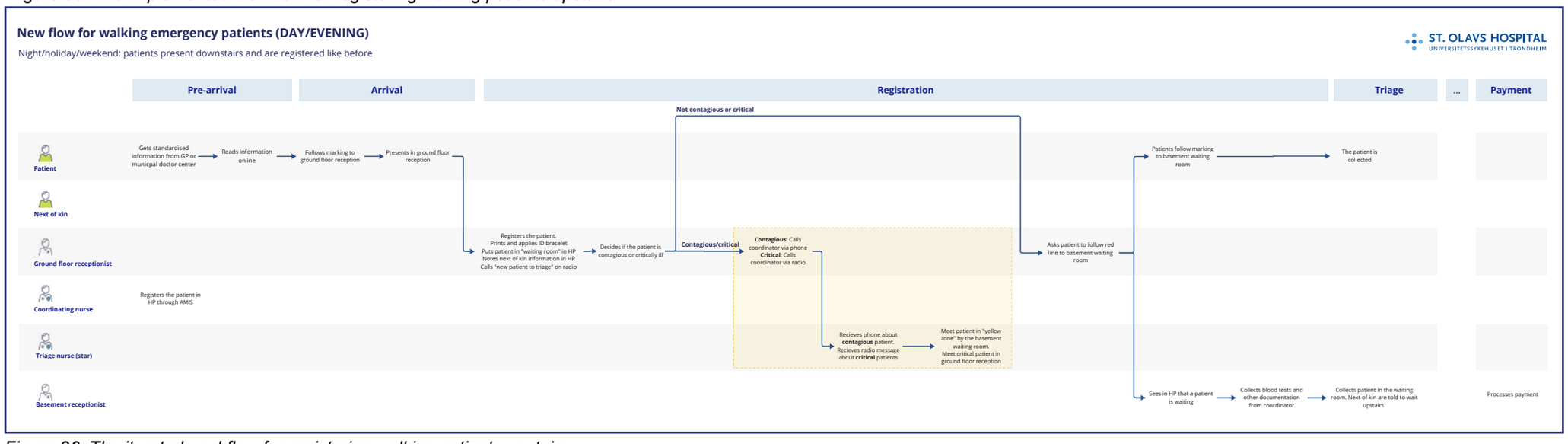


Figure 36: The iterated workflow for registering walking patients upstairs

Results

7. Results

7.1 PATIENT INTERVIEWS

It was difficult to access the patients on the day alloted for patient interviews. However there were some patients willing to express their opinion. Patients were generally more pleased with wayfinding. However, there were more concerns about contact with staff as they were afraid of being overlooked in the waiting room. Feedback about the information was mixed. Some patients expressed that it did not help them feel safer and that it did not contribute to their expectations or understanding of the ED. Others mentioned that it was nice to have at least some expectation of what was coming up, but the general impression is that the current solutions do not adequately solve the problem of information and patient safety even though it might be a step in the right direction. Further investigation would be to make the information more prominent or to change how it is delivered. It would be interesting to see if the flyer was more or less informative if it was provided by the secretary.

7.2 PATIENT QUESTIONNAIRE

Looking at the patient questionnaire, patients are much happier with wayfinding to the reception and with the waiting area. However patients reported lower feelings of safety. The questions about time have stayed approximately the same. Reported knowledge about the process stayed approximately the same. The full results are included in appendix 3

7.3 STAFF INTERVIEWS

Staff were continually interviewed during the testing period. As most of the flow changes focused on the secretaries these were questioned most often. “It’s nice that tasks now come instead of on top of each other” one secretary noted. Staff were happy with the result of the design process noting a better overview and better working conditions due to reduced noise in the hallway.

“It’s nice to have some information about what to expect“

-Patient about the poster

“I wholeheartedly support the project“

-Emergency doctor on process

“It’s really nice that tasks now come instead of on top of each other”“

-U1 Secretary

7.4 Staff evaluation session

Staff that had participated in the co-design session were invited to a shorter evaluation session of 90 minutes. Three nurses, two nurse leaders, two secretaries and one nurse leader participated in the evaluation session. The session was divided into four parts:

7.4.1 WHAT IS GOOD AND BAD ABOUT THE CURRENT FLOW?

Staff were presented with a large printed version of the flow and given five minutes and eight stickers each. Four red and four green. They were instructed to place the green stickers where they felt that things were going well and to place the red stickers where things were going poorly. The findings are presented in figure 37. The full table with comments is included in appendix 8.

Things that were identified as going poorly:
Queueing machine: Patients do not always see the machine.

Notifying contagious and ill patients over the radio and phone: The routines for radio use are not well enough established. “We had a case the other day where the secretary called out: ‘critical patient in the reception’ on the radio and some nurses thought it was an emergency message and came rushing up to help” -Nurse Also it can take time to establish a phone connection between the two secretaries.

On their way to the waiting room: Patients do not always find the waiting room. “We find them whirring around a little all over the place”

Patients in the waiting room: It is hard to keep track of the patients. “When the pressure is high I’m always on alert, but it can be easy to miss someone when it’s quiet and I’m doing other work” -U1 secretary

Patients being collected: It is difficult for the star in triage to get people out so that new people can come in. Sometimes this leads to buildup of patients in the waiting room.

Things that were going well:
Patient registration: It is more efficient to register patients now than earlier as the GF secretary does not have to move around.

Pickup of contagious and ill patients: The system works well. Contagious patients find their way and ill patients are collected quickly.

Patient transport to the waiting room: Patients find their way down easily.
Calling about normal patients: Apart from sometimes taking some time to establish contact this information flow works well.

Documentation pickup: Easier to find than earlier. Natural to pick it up while on the way to the waiting room.

Patients being collected: Not a problem to walk and collect them for the secretaries.

The project itself: Multiple people wanted to highlight that they really liked the project. “I salute the project wholeheartedly” -Emergency doctor.

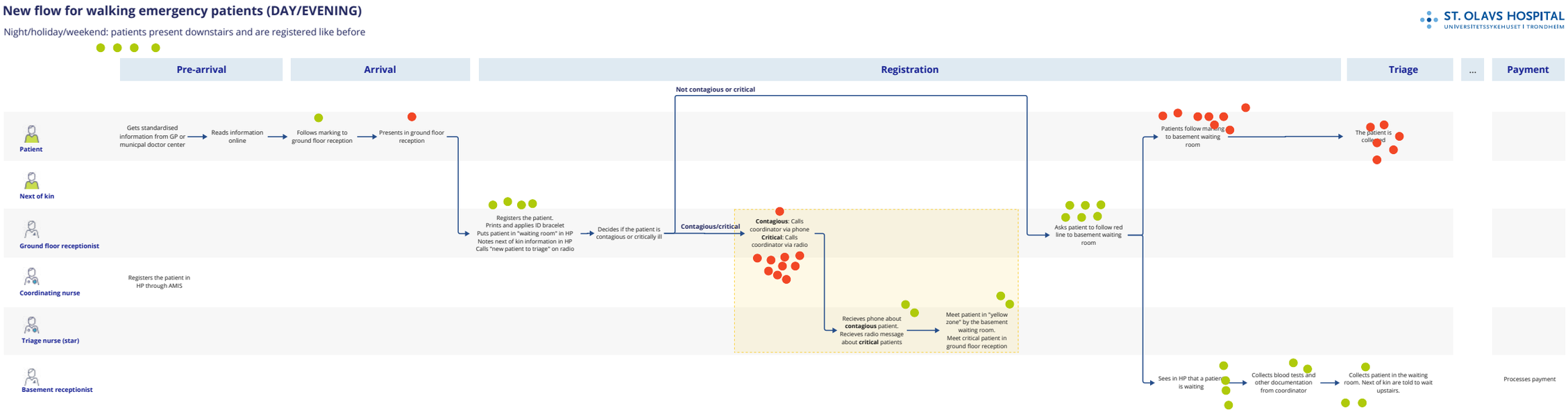


Figure 37: Evaluation of the workflow

7.4.2 ARE WE GOING THE RIGHT WAY?

Staff were asked how they felt about the current solution and if they wanted to go back. The room was opened for discussion. They said that the working environment had become much better during the test period. It was less stressful with fewer patients hanging around and more order within the emergency room. Multiple people also highlighted the fact that it had become more quiet making work less strenuous. Noone wanted to return to the old workflow.

7.4.3 FURTHER IMPROVEMENTS

Issues with wayfinding to the reception and the queueing machine will be resolved when the trauma outpatient clinic moves out.

The U1 secretary did not always have time to reply to the phone either and so time was spent calling. The proposed solution was a private radio channel between the two secretaries.

Secretaries will also receive further training in radio protocol. It was also suggested that secretaries should receive the same cardiopulmonary resuscitation (CPR) training that nurses receive in case of emergency.

To improve overview for the coordinator and U1 secretary it was proposed to get surveillance cameras with easily visible screens for the secretary and coordinator. The original table can be seen in appendix 8.

7.4.4 EVALUATION OF THE PROCESS

To evaluate the process the staff did a simple retrospective. It consisted of filling out a table of “What was good”, “What was bad?”, “What should have been done differently?”, “What should we do moving forward?”. One nurse and the emergency doctor had to leave before this step. The full table can be found below. Especially people liked how inclusive the process was and that all input was taken seriously. They liked the visual tools that were used and felt it provided clarity to the process. The full retrospective is included in appendix 8

“Previously it feels like we’ve gotten these kinds of changes forced on us, but now the process was much better” -Nurse

“It has been very inspiring to work with you two that are so good at implementing change” -Nurse leader

8. Discussion and lessons

8.1 Design elements

8.1.1 DESIGN INFORMATION FOR STRESS- PEOPLE TURN BLIND WHEN IN DISTRESS

Emergency room wayfinding is an interesting design project because people in distress are apparently extremely bad at processing information. Patients would not see the queueing machine, not see the reception, not see the bright red line in the floor and not see the waiting room. This leads to the conclusion that wayfinding in an ED should be as unambiguous as possible. Ideally the only reception on the ground floor should be the ED reception or it should at least be the first thing patients see when entering the door. As the ED is the most time sensitive department it should be what is easiest to navigate to for patients. The triage area should also ideally be located much closer to the reception to avoid wayfinding altogether. One possibility at St. Olavs is to have the outpatient clinic elsewhere and to move the triage area upstairs as is suggested in PHYSICAL SPACE

8.1.2 VISUALISATION OF MULTILAYERED WORKFLOWS- VISUALIZATION OF BLUEPRINT A GOOD WAY OF COMMUNICATION

Workflows are hard to design and hard to communicate especially when multiple stakeholders are involved. It was difficult to find the right amount of complexity that should be included in the visual presentation of the workflows. It was decided that the steps should not be that detailed in unchanged steps and detailed and highlighted where changes had been made. However, the most important part of the workflow was that it was made together with staff and that everyone agreed on what it looked like in practice. Staff said it was helpful to have a visual representation of their workflow. It made communication much easier, both between staff and between the designers and staff. During the testing period staff would ask for updates to the service blueprint showing it was something they used actively in this process. One problem area was that it was hard to get information out to staff, especially the secretaries that work alone. In the future more robust communication channels should be set up to discuss the workflow and to provide information on the different steps. This could for instance be a Slack or Teams channel.

8.2 Stakeholders

8.2.1 SERVICE DESIGN IS WELCOME IN HEALTH

One pleasant finding of this project was how welcome service design and designers were in a hospital setting. Staff would comment on how nice it was to have someone to talk to about the issues they were facing and management said it was inspiring to work alongside designers. This might stem from the fact that the structures for improvement within hospital departments are unsatisfactory. Management is not trained in design thinking or for change implementation. Although they are experts in their field and excellent at managing people they lack the tools to approach change systematically. They recognise this and are very happy when someone can provide the tools for them. However, it is very important for the designer that they approach the situation like they are helping experts. They know what is best even though they might not know what that looks like or how to get there.

8.2.2 HEALTH STAFF REQUIRE STRUCTURE, CLARITY AND CALM TO PERFORM

To provide a quality health service, or any service for that matter, you need quality employees. Quality in people comes from experience and working culture. Ensuring staff satisfaction and workplace sustainability is therefore the primary step to foster quality in a service. As the ED naturally entails some stressful work measures should be made to keep stress at an absolute minimum when not necessary. To do this staff need structure in their workday, clarity in what their responsibilities are and a calm environment when executing their tasks. The main positive feedback from staff was how nice it was without patients hanging around their working area. Staff love being around patients and providing care, but it has to happen within a structured system to avoid becoming overwhelming. Structure is also important for the patients to make them feel safe.

8.2.3 PATIENTS REQUIRE HUMAN CONTACT TO FEEL SAFE

Information was requested by patients during the insight process. However, written, static information is probably not the optimal way of delivering this information. Patients would often miss the information or they would read the information and feel more informed, but not safe. The best solution is probably face to face information with an artefact to remember the information that was relayed. Digital information might also be more effective as it can be more thorough and more interactive. The relationship between information and safety in emergency rooms is something that should be more thoroughly researched in the future. The patient questionnaire was useful in this regard . There are some issues with it. The main one is lack of data, more data should have been collected to provide a more nuanced baseline. This was not done because at this point in the process I was more focused on the qualitative data. I tried to reach out to the nurse leaders to see if staff could provide the questionnaires but this was not possible. Another issue with the data collection was the fact that people were often not waiting long enough after registration to fill out the questionnaire. I wanted to collect the data at this point

because it was important to get the patients input after their first interaction with the ED. Because of this I also chased some people down into the triage area and gave them the questionnaire there. However, they might have received more information at that point, obscuring the data. This might also explain the difference in perceived levels of safety as the patients in triage likely felt very safe surrounded by nurses, doctors and medical equipment. However, I do not think this completely accounts for the drop in perceived safety. Patients seemed unsure when left on their own and expressed fear of being forgotten while in the waiting room. This might point toward the conclusion that human contact and interaction has the biggest impact on feelings of safety. Another issue was the split reception. I chose not to sample a similar amount of patients from each one as there are fewer patients in the outpatient clinic and because the main concern of the staff was the U1 reception. One upside of the new reception solution is that data collection is much simpler. The waiting room provides an easier overview of patients, it also helps to funnel all registered patients through a single point. This might be helpful to improve the process further in the future. Questionnaires proved a helpful tool in comparing the different solutions and more time should have been spent collecting data.

8.3 Methods

8.3.1 COLLABORATIVE DESIGN LEADS TO BETTER SOLUTIONS IN HOSPITALS

Co-design has been an absolutely vital part of this project. Staff were much more willing toward change when included in the process and the solutions they proposed tended to work well as it was built on plenty of real world experience. Patients should also be included in the process. This was not done due to the fleetingness of patients in the ED. There are not many people attending regularly and people are mostly present for half a day at most. This is a major contrast to other departments of the hospital where people with chronic or long term conditions who spend multiple days in the hospital can be asked to participate. A possible solution is to contact patients after discharge and invite them back to participate in a co-designing session, however this was not realised in this project. The relationship between staff and patients is also something to consider if the patients were invited to co-design. These things require further research. RITE is an excellent method for testing in these kinds of complex environments and also functions as a part of collaborative design. As the solution has few constraints it is impossible to envision every single scenario and so issues will be overlooked in the planning stages. Because of this a low fidelity testing period works well to figure out the details. For instance the presented case of the queuing machine. Another example is that it was not discovered until the last week of testing that patients did not have access to a bathroom while in the U1 waiting room. It had slipped the mind of 15 staff while planning and during the two first weeks of testing, showing the importance of testing in a real environment and leaving room for iterations. It is highly encouraged for projects of this type. Another important part of the project was to set the date and duration for a test period early. Right after the key needs were discovered. This contributed to setting a realistic scope for the scale of the project and created a sense of urgency among key decision makers. The test period also lowered hostility among staff as they could be assured that a poor solution would be temporary. A drawback of this approach was that some members of staff had very low buy-in as they were sure the solution would only be temporary. However, when working in the test environment almost all staff were positive and constructive in their contribution. A real life test period also made evaluation much simpler than testing in a lab or among a select group. Staff can be sure the solution works because it works. Issues are also real and must be addressed. A final benefit of real world iterative testing is the amount of ownership the stakeholders get to the solution. Staff were very solution-oriented and happy about seeing their own designs playing out in the real world and this positivity and ownership spread to the others who had not participated in the co-design session.

8.3.2 CONTEXTUAL INQUIRY WORKS VERY WELL FOR COMPLEX, FAST PACED ENVIRONMENTS

The semi structured interviews during observation worked very well to uncover useful insights and also to build trust among staff. However, it was hard to track the amount of people interviewed. While interviewing one person other staff would often chime in and it would turn more into an open discussion than an interview. This provided additional information, but could not be described as scientific. The findings are nonetheless valid in an engineering context. Observations worked well in multiple regards. It was very useful to see what kind of work people were doing and to understand the challenges they faced while doing their job. It also helped to build trust as people knew I had an understanding of their work and I became a familiar face around the ED. An issue with observations was that people I shadowed sometimes had to do work that I could not attend due to patient sensitivity. I would then have to find someone else I could observe. Adaptability is key when working in these kinds of high pressure and dynamic environments.

8.4 Design lessons in an ED

Talk to everyone, listen to their complaining and deliver value early to build trust.

Show staff that you are really listening and prove to them that you can help them in their workday. Management will be easier to convince if staff are asking for you.

Ground all solutions with co-design and include key decision makers throughout the process. Treat staff like the experts they are.

To get anything done you need the people who are doing it on your side. When they have designed the solution they are less sceptical and more keen on iteration and improvement. Having key decision makers involved gives you a lot more freedom. Staff also know more than you, leading to better solutions. Pretend like you are Ronaldo's physiotherapist. He knows how to play football, you just have to keep him from getting injured.

Set the agenda for the discussions and be strict on boundaries.

There are a lot of strong opinions and strong personalities in an ED. There is also a lot of history. In discussions people will often go on tangents about other topics related to this one. Do not let them. It derails the discussion and wastes time. It helps to have a clear agenda you can point to, to reel the discussion back in.

Never waste people's time. It will erode trust.

If it is one thing people in the ED lack it is time. If you do not respect their time, they will stop showing up. Always have a clear agenda in meetings and sessions. If anything can be done to make a session more tangible or efficient, do it. If you set aside too much time for a meeting do not be afraid to end it earlier, staff will appreciate it.

Do the thinking for the patients.

The patients are busy worrying about their health and are not great at information processing or problem solving. Is there a step in their journey where they have to think? Try to remove it. If that is not possible, make it as unambiguous as possible.

Do not design for perfect solutions design implementable solutions and iterate on them to improve.

There is no such thing as a perfect solution. However, there is a solution and it probably helps. In such a complex environment it is impossible to think of all variables. Focus on the main issues, try to cover as much as possible, but always leave room and time for iterations .

Get a good overview of the hospital. Who can help and who might put sticks in your wheels?

A hospital is a little community and that means there are always some politics involved. It is your job to make sure everyone sees the value in your work. If someone has a grudge or is being difficult the issue is probably communication. Also, if you are facing an issue someone else probably is as well. Maybe they already solved it or maybe they can be an extra thinking head.

Implement!

Reports and frameworks do not create any value for patients or staff. Let them see all your excellent thinking in action. Lacking support? Start smaller and ground better.

9. Future

Following the current trend of an ageing population and increased focus on health, the amount of patients presenting to the ED can only be expected to grow in the future. Even if we imagine a far away future where most diseases have a fast and efficient cure, the ED still serves as an important entry to the hospital for acute injury and disease. The new reception lays the groundwork for future expansion. The current ED at St. Olav's does not meet requirements for continued growth of the patient body. Because of this plans for an extension are in their humble beginnings. An important part of this has been the new reception as it solves the key problem of walking patient input and allows for much more freedom when it comes to shaping the downstairs ED.

9.1 The future of the St. Olav's ED

9.1.1 AUTOSKÅR

Autoskår is a project that aims to measure vital parameters contactlessly. In 2020 they were awarded 10 million NOK from Innovasjon Norge. If this technology becomes affordable and reliable it could make the triage process much more efficient. It opens the possibilities for automatic triage of patients while they are being registered or self reporting triage, drastically cutting down the resources required in the patient's first meeting with the ED.

9.1.2 AUTOMATION

The ED suffers from a lack of automation. Other outpatient clinics at the hospital already have the possibility for patient self check in. If outpatients could register themselves this would alleviate the pressure on the reception. The same is true with payment, either from a machine or through a message to the patient's phone, similar to what one might find in a typical GP's office. RSHU is currently working on solutions for both following the insights discovered in this project. However, large organisations move slowly and for the immediate future the reception will still have to take payments.

9.1.3 COMMUNICATION WITH GPS

Insights uncovered that communication between GPs and the ED is one of the major issues the ED faces. Patients that present without being reported by their GP take considerably more time than pre-registered patients. Today this communication, when it happens, goes through the ambulance service. The ambulance service is unhappy with this as it drains resources meant for emergencies. Because of this the ED is going to set up their own contact for GP reporting. They have planned for this to be a nurse. However, while in Bodø, where they have a brand new ED, RSHU discovered that this contact role between GPs and the ED is staffed by an emergency doctor. The Bodø ED argued that this led to decrease in patient inflow as the emergency doctor and the GP could confer, reducing the amount of patients that are sent to the ED "just to be sure". Whether they staff this role with a doctor or nurse the role still provides an important touchpoint to ensure a more holistic service for the patient. It could also solve the issue of GPs providing the wrong information. Patients presenting at the U1 reception during the test period often reported that they did so because their GP said they should go to the basement, ignoring signs along their way.
Better path to area

9.1.4 WHAT COULD A FUTURE SCENARIO LOOK LIKE?

This scenario presents a future for the emergency department with AI generated figures 38-40 to illustrate what a future technology supported reception might look like. These figures are purely for illustration.

Patient X is 55 years old and was sitting at home tending to their bonsai trees when they started feeling dizzy. Hoping it would pass in the night they went to bed early. In the morning they awoke as dizzy as before, but also with a splitting headache. They call up their GP and are given an appointment right away. Patient X remembers that the GP always used to be late to the appointment, funny how things change for the better. However, tests reveal that this might be something dangerous and need hospital admission. Something that is quite rare these days. The GP contacts the ED to confer and they agree that the patient should be checked. Records, test results, and information is automatically transferred to the ED and the emergency doctor that conferred with the doctor is ready to take on the case. When patient X arrives at the hospital they go to the well marked emergency department. Here they are immediately met by a reception desk with a friendly secretary that ensures them that they are safe and registers his arrival. While Patient X is being registered technology in the reception desk measures their vitals triages them. Patient X then proceeds immediately from the reception to the next room where they meet two emergency doctors. They have reviewed the case and explain what the symptoms might be and how they are going to proceed. Tests are taken right away and Patient X is given information about the options while they wait ten minutes for the results. Unfortunately for Patient X the tests reveal cancer in the brain. They are immediately transferred to the hospital and the procedure for treatments starts the very same day. The next day Patient X is cancer free and after recovering in the hospital for a few days they go home. Healthier than ever partly thanks to a rapid admission that left them feeling safe and empowered.

Figure 38: AI generated future reception. Courtesy of craiyon.com

Figure 39: AI generated future reception. Courtesy of craiyon.com

Figure 40: AI generated future reception. Courtesy of craiyon.com

9.2 The future of service design in health

As service design is so welcome in an emergency department setting where staff is too busy to manage change this could also be the case in other departments. In the future each department might employ their own designer or team of designers with the role of continual service improvement. This would take a load of health care professionals who could then utilise their problem solving skills for health instead of logistics. It would also allow managers to spend more time ensuring their staff are happy and experiencing professional growth. These designers would become experts within their respective departments and when they encountered problems caused by an unholistic pain point they could reach out to the designer of the department on the other side of the issue to ensure the problem would be holistically solved. With these roles in place a design manager could have an overview role, focusing on strategic design roles. AI was asked to illustrate this in figure 41. And it does not like it will take over the world any time soon.

Figure 41: AI generated illustration of service designs future in hospitals. Courtesy of craiyon.com

The ending

10. Conclusion

The findings in this project point towards the conclusion that service design should have a bigger role in the health care sector because of its unique mindset and toolset that allows for better solutions to the right problems. Service design is not only applicable for big projects over large amounts of time, but also provides serious value when facing smaller issues. Primary research utilised contextual inquiry through observation and semi structured interviews to gain an understanding of the context, issues and limitations. This approach revealed existing issues while simultaneously probing for possible solutions and shedding light on cultural and physical constraints. The issues that existed in the St. Olavs ED were: Unsatisfactory wayfinding, lack of information for patients and unwelcoming and oppressive waiting areas. Staff struggled with a lack of parallel processing and stress due to patients in the treatment area resulting in poor overview, safety and noise. Solutions were designed together with the stakeholders where appropriate to ensure needs were met and that the project was grounded. They were tested and rapidly iterated upon to improve them. Proving that they work in the provided context.

This thesis contributes a proof of concept of using collaborative service design to solve local issues in a hospital ED from the ground up by implementing and iterating solutions in a limited timespan. The future goal of many hospitals and health systems is to have holistic and patient centred services. Presently they try to achieve this with a top down approach. Looking at everything all at once and addressing the visible issues. In the future, with service design being more integrated across all departments, it could be possible to build holistic services from the ground up by addressing small problems within each department that reveal the holistic pain paints of the service.

10.1 LIMITATIONS

There are some limitations to this project. The main ones being lack of funding and lack of connection to upper management. With funding in place, signage could be manufactured and installed. Connections in upper management would have made it possible to explore digital information through existing channels. The transition from trauma outpatient clinic to imaging also limits how much can be accomplished on the ground floor as it will be torn down and rebuilt.

11. Acknowledgements

PEOPLE TO THANK

DR. ASHIS JALOTE PARMAR

Thank you for your unwavering support and excellent suggestions. I am very grateful that you have chosen to share your experience with me.

DR. LARS ERIK LAUGSAND

Thank you for all your help and support and for trusting me enough to give me this project in the first place.

STEIN OVE RAANES
ELI AUNØIEN
KNUT LØVVIK
RAGNHILD STAVÅ

Thank you for all your trust throughout this process. It has been a pleasure working with you these six months. I am thoroughly impressed with your openness, friendliness and skill. You have always made me feel welcome.

HANNE EKRAN

Thank you for being such a good design partner. Teaching me techniques and providing support. Without you this project would have been half as good and half as fun.

JARL REITAN & RSHU

Thank you for being so supportive and for providing me with all the insights and contacts I have needed.

ALL THE STAFF AT THE ST. OLAVS EMERGENCY DEPARTMENT

Thank you for making me seriously consider becoming a health professional. The skill and love you have for your work is awe inspiring. You have all been supremely helpful and friendly and I really appreciate how welcome you have made me feel.

ROBERT NEKKØY

Thank you for taking the time to show me around at Haukeland and answer all my questions. The insights have been extremely important in the process.

HEDVIG KVASSHEIM

Thank you for supporting me throughout and letting me complain. It would have been so much harder without you.

12. References

Need to look through this

SUB-HEADER

Ackermann, S., Heierle, A., Bingisser, M., Hertwig, R., Padiyath, R., Nickel, C. H., Langewitz, W., & Bingisser, R. (2016). Discharge Communication in Patients Presenting to the Emergency Department With Chest Pain: Defining the Ideal Content. Health Communication, 31(5), 557–565. https://doi.org/10.1080/10410236.2014.979115

Blackburn, J., Ousey, K., & Goodwin, E. C. (2019). Information and communication in the emergency department. International Emergency Nursing, 42, 30–35. https://doi.org/10.1016/j.ienj.2018.07.002

Buffoli, M., Bellini, E., Dell'Ovo, M., Gola, M., Nachiero, D., Rebecchi, A., & Capolongo, S. (2016). Humanisation and soft qualities in emergency rooms. Annali Dell'Istituto Superiore Di Sanità, 52(1), 40–47. https://doi.org/10.4415/ann_16_01_09

Cohen, E. L., Wilkin, H. A., Tannebaum, M., Plew, M. S., & Haley, L. L. (2013). When Patients Are Impatient: The Communication Strategies Utilized by Emergency Department Employees to Manage Patients Frustrated by Wait Times. Health Communication, 28(3), 275–285. https://doi.org/10.1080/10410236.2012.680948

Donetto, S., Pierri, P., Tsianakas, V., & Robert, G. (2015). Experience-based Co-design and Healthcare Improvement: Realizing Participatory Design in the Public Sector. Design Journal, 18(2), 227–248. https://doi.org/10.2752/175630615x14212498964312

Emanuele, J., & Koetter, L. (2007). Workflow Opportunities and Challenges in Healthcare. ResearchGate. https://www.researchgate.net/publication/252065707_Workflow_Opportunities_and_Challenges_in_Healthcare

Gammon, D., Strand, M., & Eng, L. S. (2014). Service users' perspectives in the design of an online tool for assisted self-help in mental health: a case study of implications. International Journal of Mental Health Systems, 8(1). https://doi.org/10.1186/1752-4458-8-2

Gigerenzer, G. (2008b). Why Heuristics Work. Perspectives on Psychological Science, 3(1), 20–29. https://doi.org/10.1111/j.1745-6916.2008.00058.x

Goodall, A. H., Stoller, J. K., & Bäker, A. (2016). Why The Best Hospitals Are Managed by Doctors. Harvard Business Review. https://openaccess.city.ac.uk/id/eprint/16148/

Hearld, L. R., & Alexander, J. C. (2012). Patient-Centered Care and Emergency Department Utilization. Medical Care Research and Review, 69(5), 560–580. https://doi.org/10.1177/1077558712453618

Krishel, S., & Baraff, L. J. (1993). Effect of emergency department information on patient satisfaction. Annals of Emergency Medicine, 22(3), 568–572. https://doi.org/10.1016/s0196-0644(05)81943-2

Lee, E. K., Atallah, H. A., Wright, M. E., Post, E. T., Thomas, C., Wu, D., & Haley, L. L. (2015). Transforming Hospital Emergency Department Workflow and Patient Care. Interfaces, 45(1), 58–82. https://doi.org/10.1287/inte.2014.0788

Malmberg, L., & Wetter Edman, K. (2016). Design in Public Sector: Exploring Antecedents of Sustained Design Capability. In 20th DMI: Academic Design Management Conference-Inflection Point: Design Reseach Meets Design Practice, Boston, USA, July 22-29, 2016 (pp. 1286-1307). Design Management Institute.

Malmberg, L. (2017). Building Design Capability in the Public Sector: Expanding the Horizons of Development. https://doi.org/10.3384/diss.diva-134167

Malmberg, L., Rodrigues, V. M., Länneström, L., Wetter-Edman, K., Vink, J., & Holmlid, S. (2019). Service Design as a Transformational Driver Toward Person-Centered Care in Healthcare. Springer International Publishing EBooks, 1–18. https://doi.org/10.1007/978-3-030-00749-2_1

McCormack, B. (2003). A conceptual framework for person-centred practice with older people. International Journal of Nursing Practice, 9(3), 202–209. https://doi.org/10.1046/j.1440-172x.2003.00423.x

McCormack, B., & McCance, T. (2006). Development of a framework for person-centred nursing. Journal of Advanced Nursing, 56(5), 472–479. https://doi.org/10.1111/j.1365-2648.2006.04042.x

McGee, T., Flynn, D., Coxon, S., & Page, R. (2020). The Emergency Department waiting room: towards a speculative service design framework. In Y. Akama, L. Fennessy, S. Harrington, & A. Farago (Eds.), ServDes.2020 Tensions Paradoxes Plurality : Conference Proceedings (pp. 288-302). Linkoping University Electronic Press. https://servdes2020.s3.amazonaws.com/uploads/event/paper/6/79_McGee_Flynn_Coxon_Page_SP.pd

Mentis, H. M., Reddy, M., & Rosson, M. B. (2013). Concealment of Emotion in an Emergency Room: Expanding Design for Emotion Awareness. Computer Supported Cooperative Work, 22(1), 33–63. https://doi.org/10.1007/s10606-012-9174-2

Morgan, S., & Yoder, L. H. (2012). A Concept Analysis of Person-Centered Care. Journal of Holistic Nursing, 30(1), 6–15. https://doi.org/10.1177/0898010111412189

Naccarella, L., Raggatt, M., & Redley, B. (2019). The Influence of Spatial Design on Team Communication in Hospital Emergency Departments. Herd: Health Environments Research & Design Journal, 12(2), 100–115. https://doi.org/10.1177/1937586718800481

Human Centred Design (HCD). (n.d.). UNICEF Office of Innovation. https://www.unicef.org/innovation/hcd

NHS Estates (2005). Wayfinding: Effective Wayfinding and Signing Systems; Guidance for Healthcare Facilities. The Stationery Office.

Norman, D. A., & A, D. (2008). The Psychology of Waiting lines. ResearchGate. https://www.researchgate.net/publication/200085847_The_Psychology_of_waiting_lines

Oppenheim, P. I., Sotiropoulos, G., & Baraff, L. J. (1994). Incorporating patient preferences into practice guidelines: Management of children with fever without source. Annals of Emergency Medicine, 24(5), 836–841. https://doi.org/10.1016/

s0196-0644(94)70201-2

Parand, A., Dopson, S., Renz, A., & Vincent, C. (2014). The role of hospital managers in quality and patient safety: a systematic review. BMJ Open, 4(9), e005055. https://doi.org/10.1136/bmjopen-2014-005055

Pham, J. C., Trueger, N. S., Hilton, J. A., Khare, R. K., Smith, J. C., & Bernstein, S. L. (2011). Interventions to Improve Patient-centered Care During Times of Emergency Department Crowding. Academic Emergency Medicine, 18(12), 1289–1294. https://doi.org/10.1111/j.1553-2712.2011.01224.x

Shah, S., Patel, A., Rumoro, D. P., Hohmann, S. F., & Fullam, F. (2015). Managing patient expectations at emergency department triage. Patient Experience Journal, 2(2), 31–44. https://doi.org/10.35680/2372-0247.109

Stickdorn, M., Hormess, M. E., Lawrence, A., & Schneider, J. (2018). This Is Service Design Doing: Applying Service Design Thinking in the Real World: A Practitioners' Handbook. O'Reilly Media.

Whiteside, J., Bennett, J. M., & Holtzblatt, K. (1988). Usability Engineering: Our Experience and Evolution. In Elsevier eBooks (pp. 791–817). https://doi.org/10.1016/b978-0-444-70536-5.50041-5

Wiler, J. L., Gentle, C., Halfpenny, J. C., Heins, A., Mehrotra, A., Mikhail, M. B., & Fite, D. (2010). Optimizing Emergency Department Front-End Operations. Annals of Emergency Medicine, 55(2), 142-160.e1. https://doi.org/10.1016/j.annemergmed.2009.05.021

Woolard, R., Borron, S. W., & MacKay, J. (2016). Emergency Department Design. Elsevier EBooks, 125–130. https://doi.org/10.1016/b978-0-323-28665-7.00021-2

Yalniz, B. (2020). End-user involvement in hospital building design: A Case Study On Information Management And Design Process: Erasmus MC Rotterdam new building project. http://resolver.tudelft.nl/uuid:1e4403f0-842b-48a0-ae27-3eec3272a096

Yu, E. S., & Sangiorgi, D. (2018). Service Design as an Approach to Implement the Value Cocreation Perspective in New Service Development. Journal of Service Research, 21(1), 40–58. https://doi.org/10.1177/1094670517709356

Zamani, Z. (2019). Effects of Emergency Department Physical Design Elements on Security, Wayfinding, Visibility, Privacy, and Efficiency and Its Implications on Staff Satisfaction and Performance. Herd: Health Environments Research & Design Journal, 12(3), 72–88. https://doi.org/10.1177/1937586718800482

Appendix

OVERVIEW

1.PATIENT QUESTIONNAIRE
2. PHOTOS FROM ST. OLAV'S
3. QUESTIONNAIRE RESULTS
4. PRESENTATION FROM CO-DESIGN SESSION
5. PROBLEM DESCRIPTIONS FROM CO-DESIGN SESSION
6. ORIGINAL POSTER
7. ORIGINAL LEAFLET
8. MATERIALS FROM EVALUATION SESSION WITH STAFF
9. BLUEPRINT FROM CO-DESIGN SESSION

Appendix 1

PATIENT QUESTIONNAIRE

Undersøkelse om resepsjonen i akuttmottaket
Akutten skal bygges om og i den anledning vil vi ha dine innspill for å kunne gjøre tjenesten vår enda bedre. Vennligst ikke oppgi noen personlig informasjon som navn, kjønn eller sykdomsforløp. Da må undersøkelsen forkastes. Takk for din deltagelse!

Hvordan ble du henvist til akutten? (Ring rundt)

Fastlege Legevakt 113

Har du vært i akuttmottaket tidligere? (Ring rundt)

Ja Nei

Hvordan kom du deg hit? (Ring rundt)

Personbil Offentlig transport Hvit Bil Annet:

Hvor lett var det å finne resepsjonen?

Vanskelig Lett
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Hvor fornøyd er du med venteområdet?

Misfornøyd Fornøyd
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Hva liker du og hva liker du ikke?:

_____

_____

_____

Føler du deg sett mens du venter?

I liten grad I stor grad
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Vet du hvor lenge du må vente før du blir registrert?

I liten grad I stor grad
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Hvor mye vet du om symptomene dine?

Ingenting Mye
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Hvor mye vet du om prosessen fremover?

Ingenting Mye
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Hvor mye vet du om hvor lang tid dette kan ta?

Ingenting Mye
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

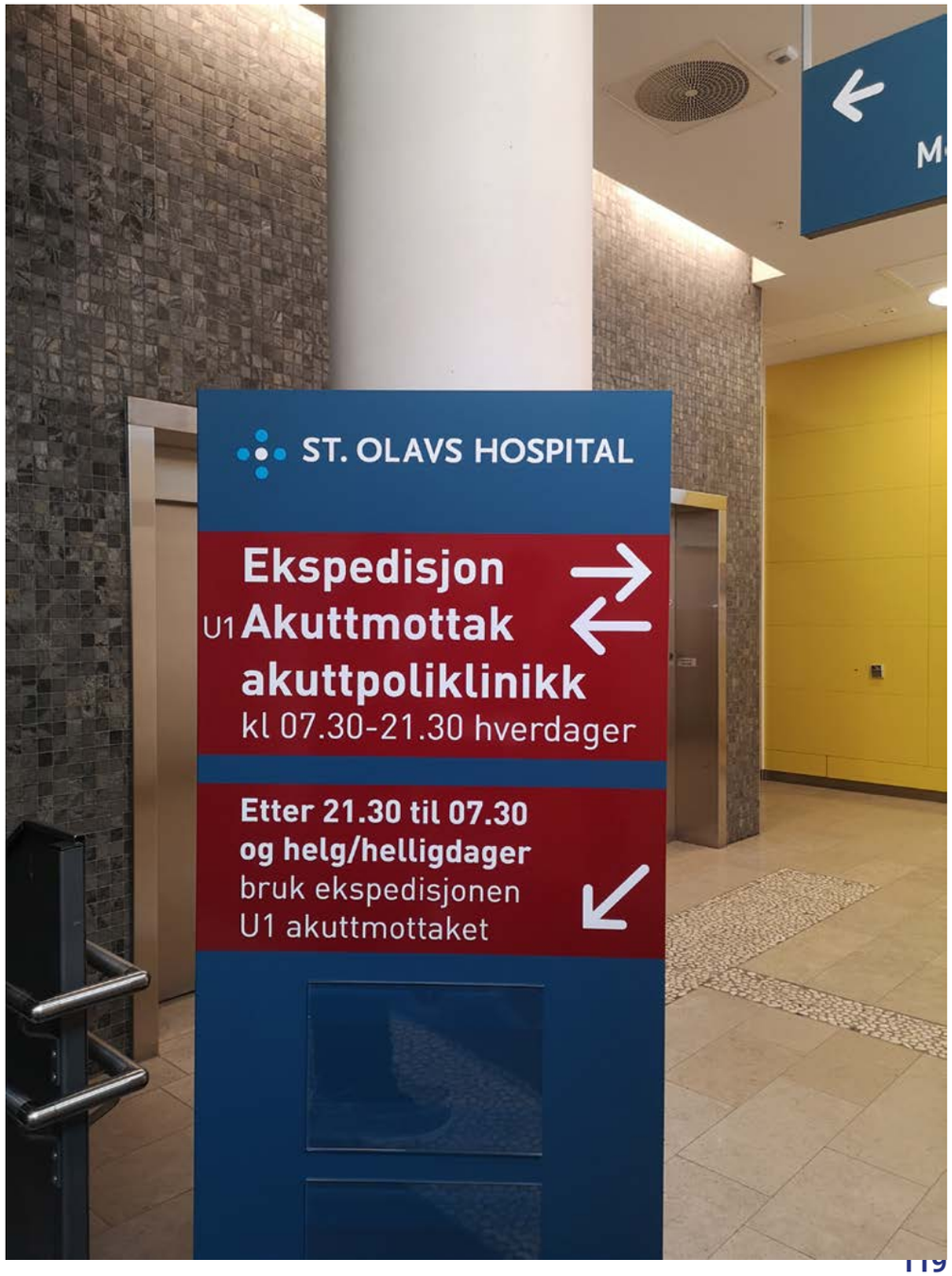
Hvor trygg føler du deg?

Utrygg Helt trygg
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Noe du vil legge til? (Ingen personlig informasjon)

Appendix 2

PHOTOS FROM ST. OLAV'S



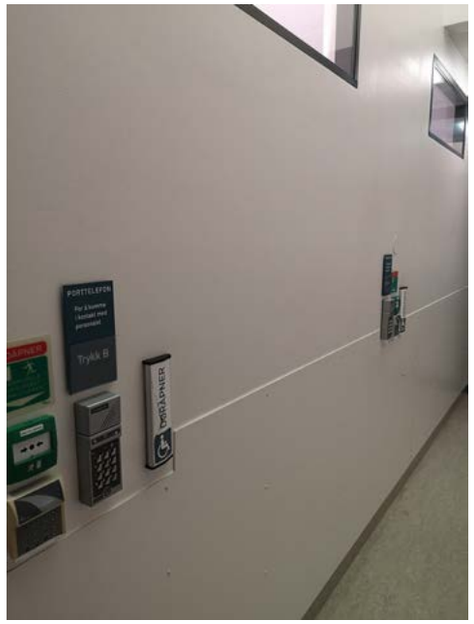

AKUTT POLIKLINIKK
SKADEPOLIKLINIKK
EMERGENCY
SKADEPOLIKLI
EMERGENCY


Utgang
Triage
NODÅPNER
DØRÅPNER


Akuttvurdering


Ekspedisjon
akuttmottak


AKUTTMOTTAK
Ved ankomst henvend deg i ekspedisjonen

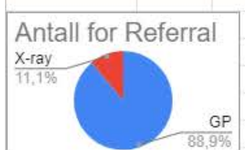


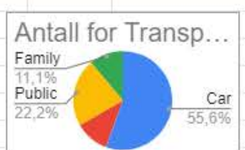
Appendix 3

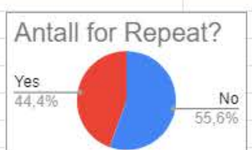
QUESTIONNAIRE RESULTS

BEFORE IMPLEMENTATION

	Referral	Repeat?	Transport	Way to reception	Happy with waiting area	Like and don't like	Do you feel seen while waiting?	How long to registration?	Knowledge of symptoms	Knowledge of process	Knowledge about time use	How safe do you feel	Anything to add?
1	GP	No	Car	10	8	It's alright	6	1	5	1	1	10	
2	GP	Yes	Car	2	3		3	1	4	2	1	3	
3	GP	No	Car	3	2	Sad and cold waiting area. Hard to know where to go.	3	1	4	2	1	7	
4	GP	No	Taxi	4	4		4	3					
5	GP	Yes	Public	5	8	Seems efficient and patients are protected	8	5	7	9	7	10	
6	GP	No	Car	1	1		8	6	10	1	1	10	
7	GP	Yes	Public	3	8	Fast and efficient treatment	6	4	7	7	7	10	
Pol 8	GP	No	Car	8	5	Water	6		2	3	1	10	Coffee machine, good service
Pol 9	X-ray	Yes	Family	10	5	Too much waiting	2				1	4	
Average				5,11	4,89		5,11	3,00	5,57	3,57	2,50	8,00	

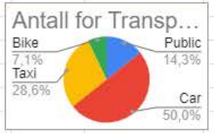


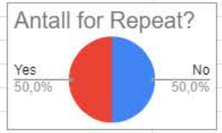




AFTER IMPLEMENTATION

	Referral	Repeat?	Transport	Way to reception	Happy with waiting area	Like and don't like	Do you feel seen while waiting?	How long to registration?	Knowledge of symptoms	Knowledge of process	Knowledge about time use	How safe do you feel
1	GP	No	Public	9	10		10	1	7	7	5	10
2	LV	Yes	Car	6	5		4	3	8	1	1	5
3	LV	Yes	Car	6	6		5	3	2	1	1	3
4	GP	No	Taxi	10	10		10	1	10	6	1	10
5	GP	Yes	Public	2	3	Don't like that it is busy and that they don't seem to see you. You feel small.	1	1	4	1	1	1
6	GP	Yes	Car	1	4	Calm surrondings	5	1	10	1	1	5
7	GP	No	Bike	9	8	Free coffee is good. No natural light	9	3	4	2	1	5
8	GP	Yes	Car	10	10	Easy to find my way	8					
9	GP	No	Taxi	10	9		9	10	10	1	1	10
10	GP	No	Car	10	10			1	10	5	1	5
11	GP	No	Taxi	6	6		5	2	8	1	1	6
12	GP	No	Car	6	5	Signage could be better	4	1	10	6	1	7
13	GP	Yes	Car	8	7	Got help immedeatly and the information was good	6	7	9	8	7	7
14	GP	Yes	Taxi	8	7	I get good help! It's a little gloomy	8	1	8	3	1	10
Average				7,21	7,14		6,46	2,69	7,69	3,31	1,77	6,46





Appendix 4

PRESENTATION FROM CO-DESIGN SESSION

Workshop

Registrering av gående pasienter oppe

Plan

Bakgrunn, mål og rammer - 30 min

Oppgaveløsning - 60 min

Presentasjon og diskusjon - 90 min

Bakgrunn

"Lokalene er utformet på en måte hvor en unngår kryssende pasienttrafikk for å oppnå god pasientflyt, unngå smitte og ivareta taushetsplikt"

Hvorfor flytte registreringen av gående pasienter opp?

- Pasienter misfornøyd med dagens resepsjon og venteområde
- Opphopning av pasienter
- Økt pasienttilstrømning
- Åpent akuttmottak
- Personvern
- Brannsikkerhet

Mål

Lande på en løsning vi kan teste ut ganske snart

Hvordan ser det ut?

Protokoller: Hvem gjør hva og hvordan gjøres det?

F.eks RETTS

Informasjonssystemer: Hvordan får folk informasjon?

F.eks Skilt, nettsiden til st. Olavs

Foreslåtte rammer for løsning

Prøveperiode på tre uker

Så lite ombygging som mulig

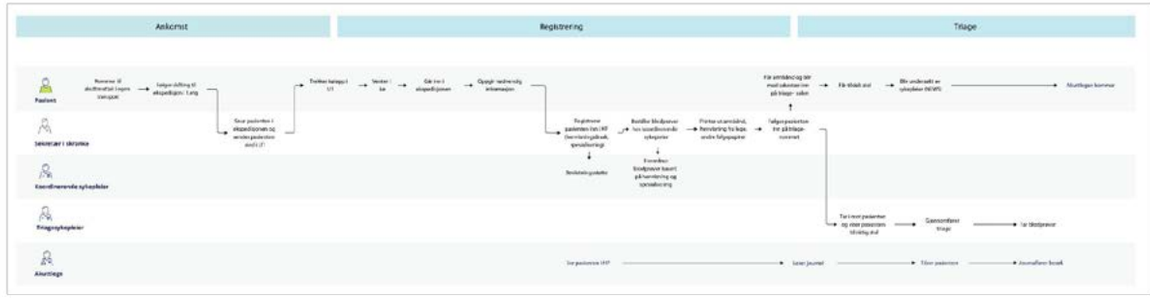
Én sekretær oppe

Arbeidsfordeling mellom etasjene

Oppe: Registrering av gående pasienter, polikliniske pasienter og pårørende

Nede: Pasienter fra legevakt og resten av sykehuset, betaling

Dagens brukerreise



Pasientens første møte med akutten

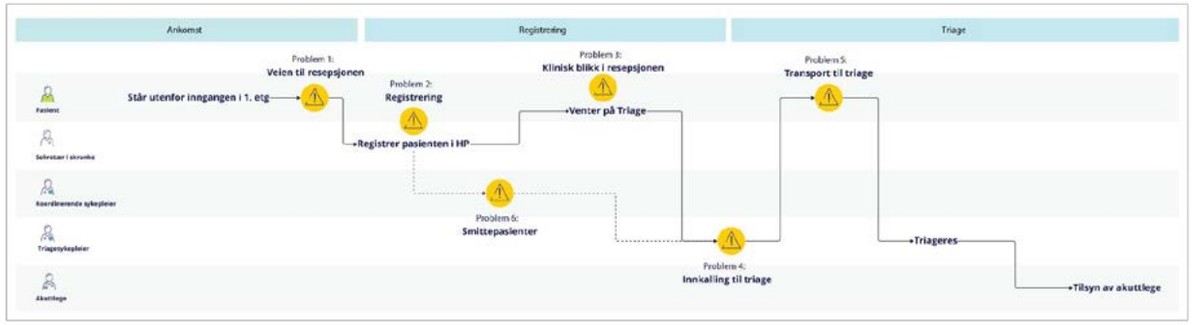
Fra de står utenfor døra til de er tilsett av en akuttlege

Tjeneste blueprint - visuell fremstilling av prosesser

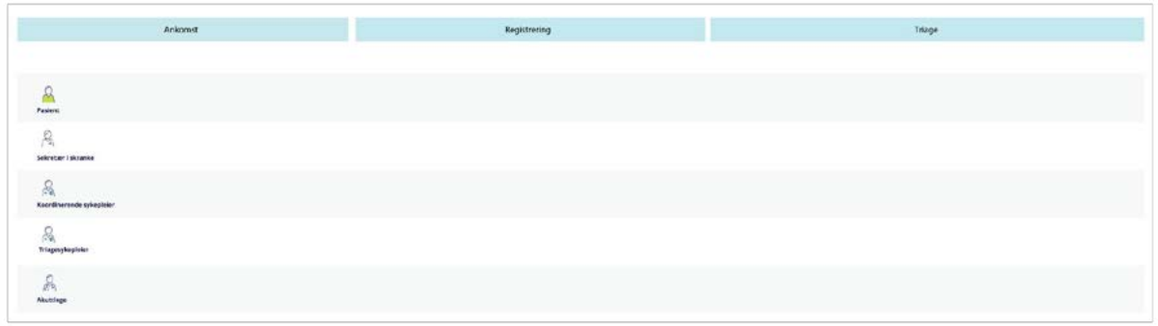
Hvordan ser reisen egentlig ut for en pasient?

Hvordan ser reisen ut når gående pasienter skal inn oppe?

Gående pasienter registreres oppe



Dagens mål



Foreslåtte rammer for løsning

Prøveperiode på tre uker

Så lite ombygging som mulig

Én sekretær oppe

Arbeidsfordeling mellom etasjene

Oppe: Registrering av gående pasienter, polikliniske pasienter og pårørende

Nede: Pasienter fra legevakt og resten av sykehuset, betaling

Vær visuelle! Tegn, klipp og teip der det lar seg gjøre

Oppgaveløsning - 60 min

Seks ulike problemer

Fem grupper

Vær visuelle! Tegn, klipp og teip der det lar seg gjøre

Sier ifra når 20 minutter er gått

Disponer tiden slik dere ønsker

Presentasjon og diskusjon - 90 min

Presenterer løsninger for hvert problem

Grønn hatt: Tenk løsning!

Husk: Vi er på det samme laget

Problem 1 - Veien til registrering

Bakgrunn: Pasientene sliter i dag med å finne frem til den riktige resepsjonen. Ved å samle resepsjonene for de som kommer selv løser man noe av problemet, men hvordan finner pasienten frem hit? Husk at folk har ulikt funksjonsnivå og at det er mange veier inn i akutten.

Oppgave: Gi forslag til hvordan et informasjonssystem kunne sett ut og hvor det bør være.

Mål: Alle gående pasienter skal gå rett til resepsjonen og registrere seg.

Problem 2 - Registrering

Bakgrunn: Når registreringen flyttes opp vil det ikke være mulig for sekretæren å konferere jevnlig med koordinator. Hvordan kan man rokkere om på arbeidsoppgavene så denne konfereringen ikke er nødvendig?

Oppgave: Lag en protokoll for pasientregistrering som ikke krever nærvær mellom sykepleier og sekretær.

Mål: Registreringen skal være så effektiv at det ikke blir (langvarig) kø foran resepsjonen.

Problem 3 - Klinisk blikk i resepsjonen

Bakgrunn: Så lenge pasienten er inne på sykehuset er de sykehusets ansvar. De aller fleste som kommer gående til akutten er ikke kritisk syke, men hvordan oppdager man de som kan være det?

Oppgave: Lag en protokoll/arbeidsflyt for hvordan sekretæren kan oppdage de som er kritisk syke.

Mål: De som er kritisk syke og ikke kan vente skal oppdages så tidlig som mulig.

Problem 4 - Kommunikasjon mellom triage og resepsjon

Bakgrunn: I dag følger sekretæren pasientene inn på triage, men med større avstand vil dette ikke være mulig. Hvordan kan triage kommunisere til pasienten at de er klare for dem? Hvordan kan sekretæren kommunisere trykket i resepsjonen til triage?

Oppgave: Lag et informasjonssystem og/eller en kommunikasjonsprotokoll for samhandling mellom resepsjonen og triage.

Mål: Sekretær og triage skal være klare over hverandres situasjon samtidig som pasienten får beskjed om når de skal bevege seg til triage.

Problem 5 - Transport til triage

Bakgrunn: Med større avstand mellom resepsjonen og triage er det nødvendig at flere pasienter klarer å gå selv ned til triage. Hvordan finner de veien best mulig? Hvordan skal man ta seg av de som trenger følge? Ta utgangspunkt i at pasienten er i resepsjonen oppe når de får beskjed om å bevege seg til triage.

Oppgave: Lag et informasjonssystem så pasientene ikke går seg bort på vei til triage. Hvordan ser informasjonen ut og hvor er den?

Lag en protokoll for følging av pasienter som har behov for det. Hvem trenger følge, hvem følger dem?

Mål: Pasientene skal transporteres til triage så fort som mulig og med så lav ressursbruk som mulig.

Problem 6 - Smittepasienter

Bakgrunn: Det er ikke ønskelig å få smittepasienter inn på triagesalen. Hvordan kan man fange opp disse pasientene tidlig og legge opp et godt løp for dem.

Oppgave: Lag en protokoll for smittepasienter. Hvor skal de oppdages? Hvordan ser deres løp ut? Hvem er ansvarlig for oppfølging?

Mål: Smittepasienter skal behandles effektivt uten at de står i fare for å smitte andre.

Appendix 5

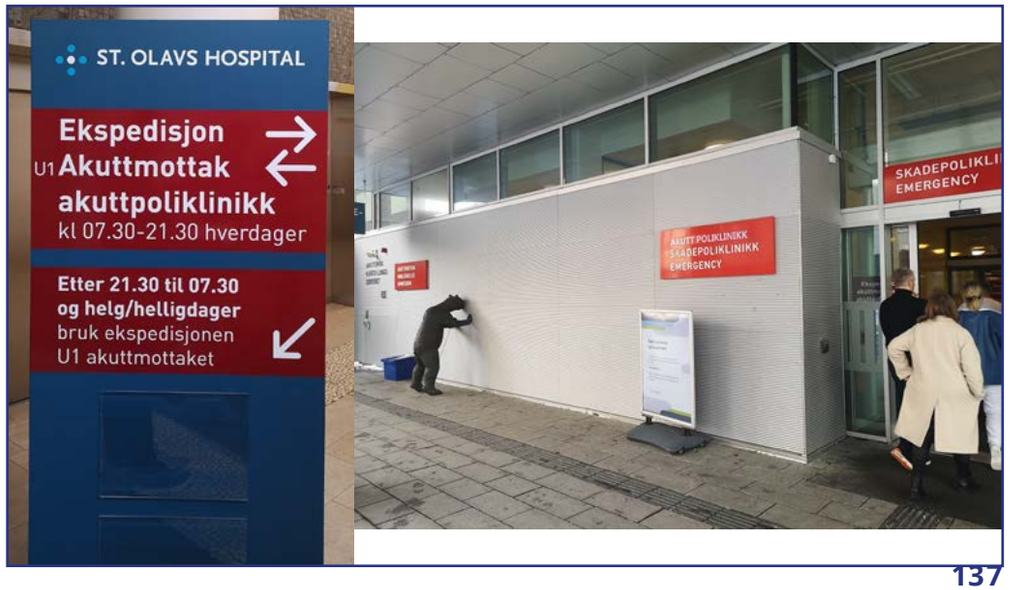
PROBLEM DESCRIPTIONS FROM CO-DESIGN SESSION

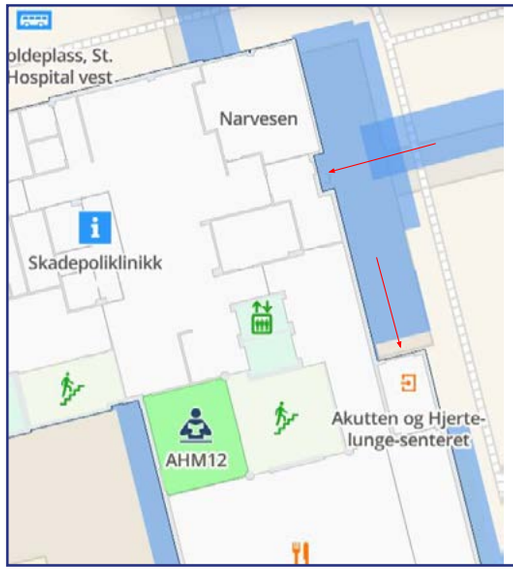
Problem 1 - Veien til resepsjonen

Bakgrunn: Pasientene sliter i dag med å finne frem til den riktige resepsjonen. Ved å samle resepsjonene for de som kommer selv løser man noe av problemet, men hvordan finner pasienten frem hit? Husk at folk har ulikt funksjonsnivå og at det er mange veier inn i akutten.

Oppgave: Gi forslag til hvordan et informasjonssystem kunne sett ut og hvor det bør være.

Mål: Alle gående pasienter skal gå rett til resepsjonen og registrere seg.





Inspirasjon til løsning

Akuttmottaket på Haukeland

Digitale skilter for å skille mellom natt og dag.

Problem 2 - Registrering

Bakgrunn: Når registreringen flyttes opp vil det ikke være mulig for sekretæren å konferere jevnlig med koordinator. Hvordan kan man rokkere om på arbeidsoppgavene så denne konfereringen ikke er nødvendig?

Oppgave: Lag en protokoll for pasientregistrering som ikke krever nærvær mellom sykepleier og sekretær.

Mål: Registreringen skal være så effektiv at det ikke blir (langvarig) kø foran resepsjonen.

Inspirasjon til løsning

Blodprøver og følgedokumenter skrives ut på triagesal

Ingen kølapper

Resepsjonen på Haukeland:

Problem 3 - Klinisk blikk på venterommet

Bakgrunn: Så lenge pasienten er inne på sykehuset er de sykehusets ansvar. De aller fleste som kommer gående til akutten er ikke kritisk syke, men hvordan oppdager man de som kan være det?

Oppgave: Lag en protokoll/arbeidsflyt for hvordan sekretæren kan oppdage de som er kritisk syke.

Mål: De som er kritisk syke og ikke kan vente skal oppdages så tidlig som mulig.

Inspirasjon til løsning

Resepsjonen på Haukeland:

Problem 4 - Innkalling til triage

Bakgrunn: I dag følger sekretæren pasientene inn på triage, men med større avstand vil dette ikke være mulig. Hvordan kan triage kommunisere til pasienten at de er klare for dem? Hvordan kan sekretæren kommunisere trykket i resepsjonen til triage?

Oppgave: Lag et informasjonssystem og/eller en kommunikasjonsprotokoll for samhandling mellom resepsjonen og triage.

Mål: Sekretær og triage skal være klare over hverandres situasjon samtidig som pasienten får beskjed om at de skal bevege seg til triage.

Inspirasjon til løsning

Kølapp: Pasienten får en kølapp til triage i resepsjonen og blir “pepet inn” av stjerne når triage er klare for dem.

Problem 5 - transport til triage

Bakgrunn: Med større avstand mellom resepsjonen og triage er det nødvendig at flere pasienter klarer å gå selv ned til triage. Hvordan finner de veien best mulig? Hvordan skal man ta seg av de som trenger følge? Ta utgangspunkt i at pasienten er i resepsjonen oppe når de får beskjed om å bevege seg til triage.

Oppgave: Lag et informasjonssystem så pasientene ikke går seg bort på vei til triage. Hvordan ser informasjonen ut og hvor er den?

Lag en protokoll for følging av pasienter som har behov for det. Hvem trenger følge, hvem følger dem?

Mål: Pasientene skal transporteres til triage så fort som mulig og med så lav ressursbruk som mulig.

Kart oppe og nede - tegn inn

Inspirasjon til løsning

Akuttmottaket på Haukeland

Digitale skilter for å skille mellom natt og dag.

Problem 6 - Smittepasienter

Bakgrunn: Det er ikke ønskelig å få smittepasienter inn på triagesalen. Hvordan kan man fange opp disse pasientene tidlig og legge opp et godt løp for dem.

Oppgave: Lag en protokoll for smittepasienter. Hvor skal de oppdages? Hvordan ser deres løp ut? Hvem er ansvarlig for oppfølging?

Mål: Smittepasienter skal behandles effektivt uten at de står i fare for å smitte andre.

Forslag til løsning

Standardiserte spørsmål sekretæren stiller til pasienten for å avdekke mulig smitte.

Appendix 6

ORIGINAL POSTER

Appendix 7

ORIGINAL LEAFLET

Velkommen til oss

Velkommen til akuttmottaket på St. Olavs Hospital. Vi vet at en tur på akuttmottaket kan være stressende, men vet at du er kommet til rett sted og at vi skal prøve å gjøre oppholdet ditt her så behagelig og effektivt som mulig. Her jobber ca. 150 flinke sykepleiere, sekretærer og leger. Det er sykepleierne og legene du kommer til å se mest til. De har lang erfaring i akuttmottaket og høy kompetanse på sitt fagfelt.

Du vil snart komme inn til en akuttvurdering. Her prioriteres du ut fra symptomene dine for å se hvor fort du trenger behandling. Legen vil også legge en plan for oppholdet ditt her. Akutten er den eneste delen av sykehuset som ikke bestemmer hvor mange pasienter de tar inn hver dag og ved høy pågang kan det hende at ting tar noe lengre tid. Etter akuttvurderingen vil det bli tatt prøver og du vil kanskje være inne til observasjon. Det er kø for noen undersøkelser og andre prøveresultater tar tid å analysere. Det er mye som skjer bak kulissene her og vi jobber på for at du skal få den beste behandlingen.

Etter tester og observasjon tar legen en beslutning om du må legges inn på sykehuset eller om du kan reise hjem igjen. I mellomtiden håper vi du har det behagelig. Du må bare spørre sykepleierne i hvit kjortel om du lurer på noe.

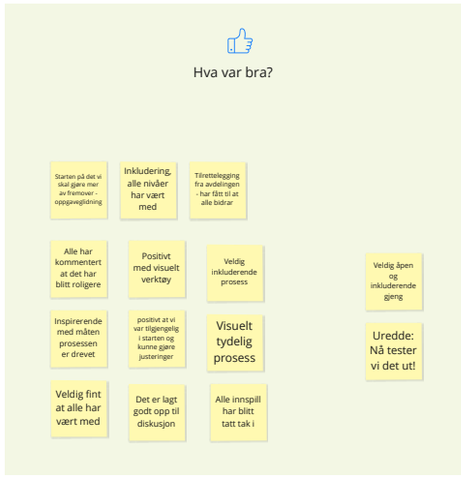
ST. OLAVS HOSPITAL
UNIVERSITETSSYKEHUSET I TRONDHEIM

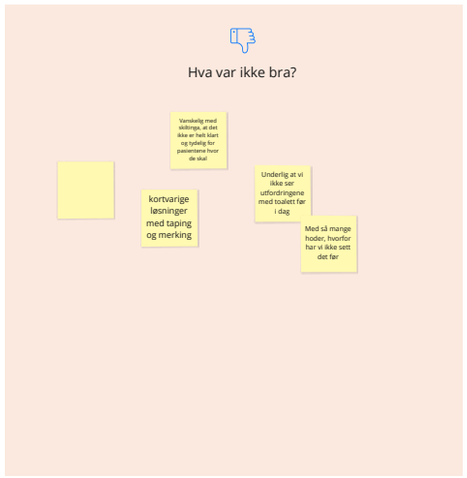
Appendix 8

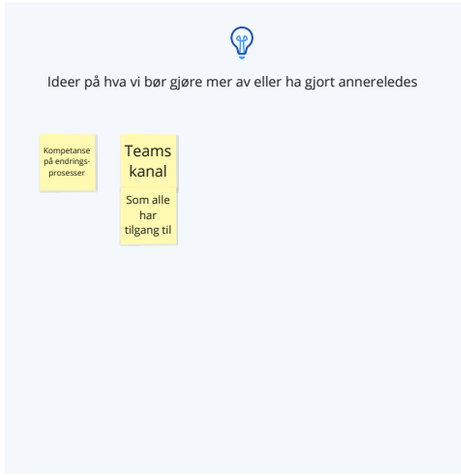
MATERIALS FROM EVALUATION

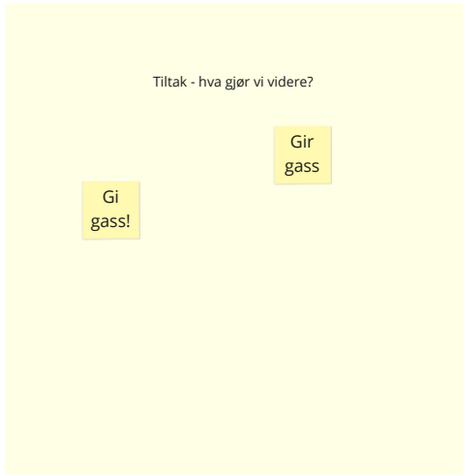
RETROSPECTIVE

Refleksjoner rundt prosessen





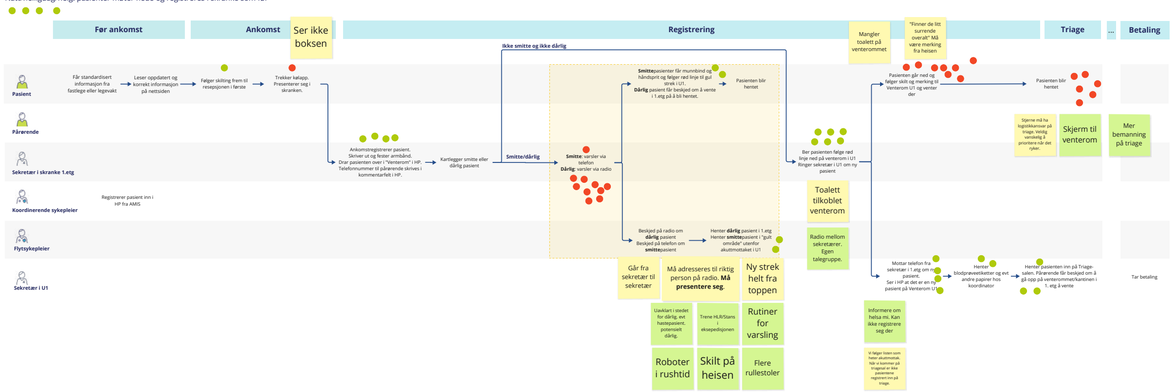




Ny flyt for mottak av gående akuttpasienter (DAG/AFTEN)

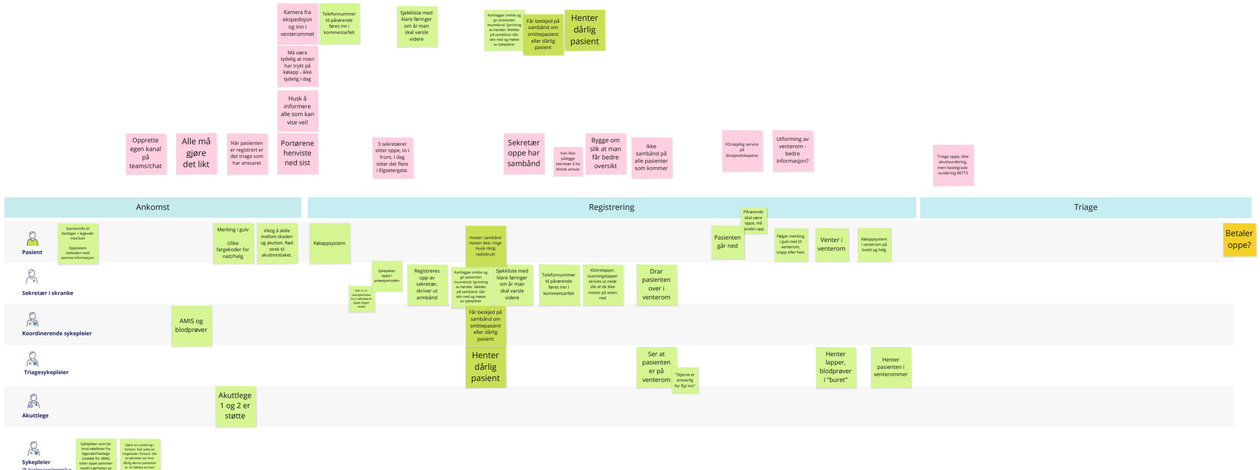
Natt/helligdag/helg: pasienter møter nede og registreres i skranke som før

ST. OLAVS HOSPITAL
UNIVERSITETSSYKEHUSET I TRONDHEIM



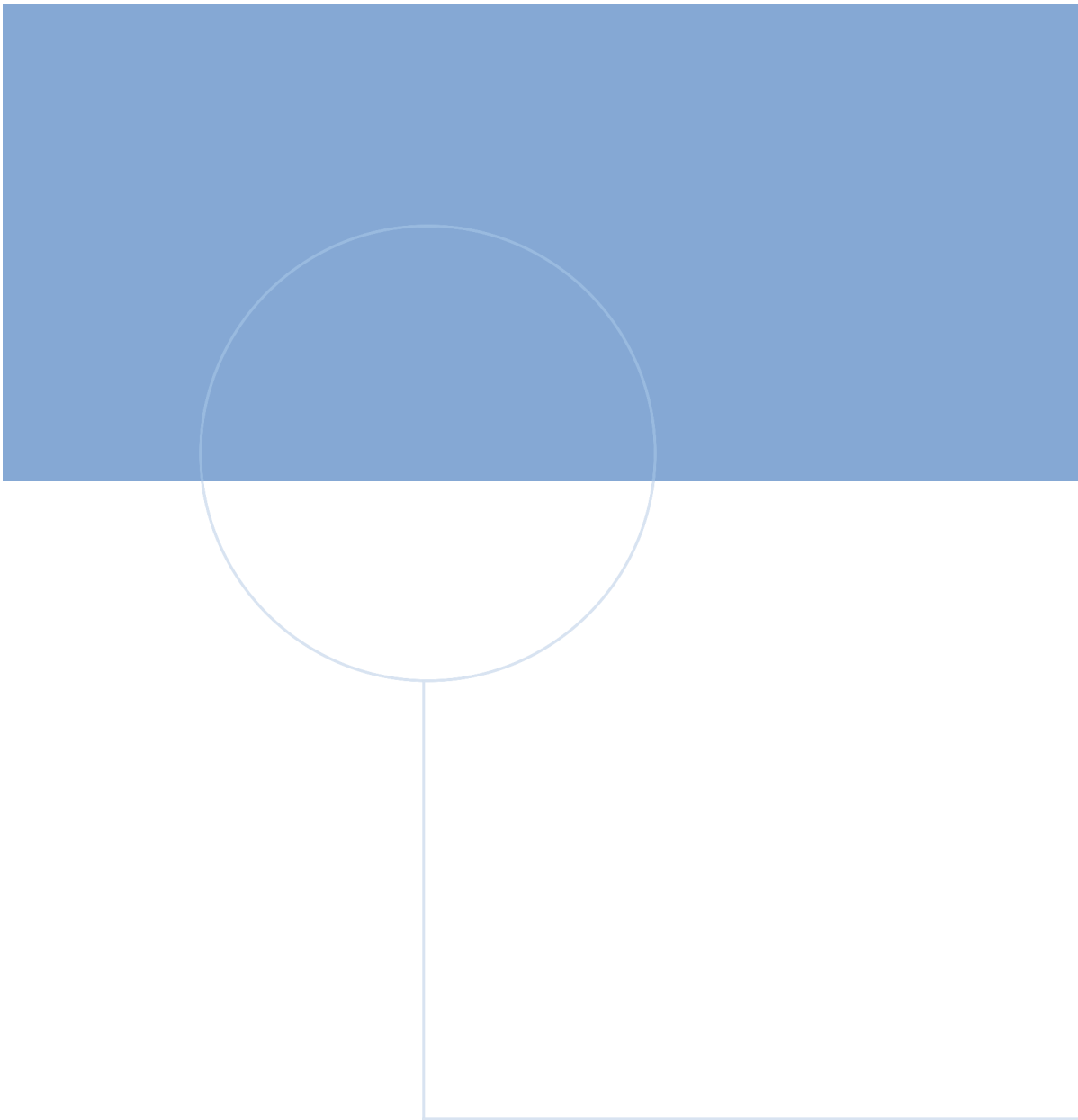
Appendix 9

SERVICE BLUEPRINT FROM CO-DESIGN SESSION



Header

SUB-HEADER



NTNU

Norwegian University of
Science and Technology