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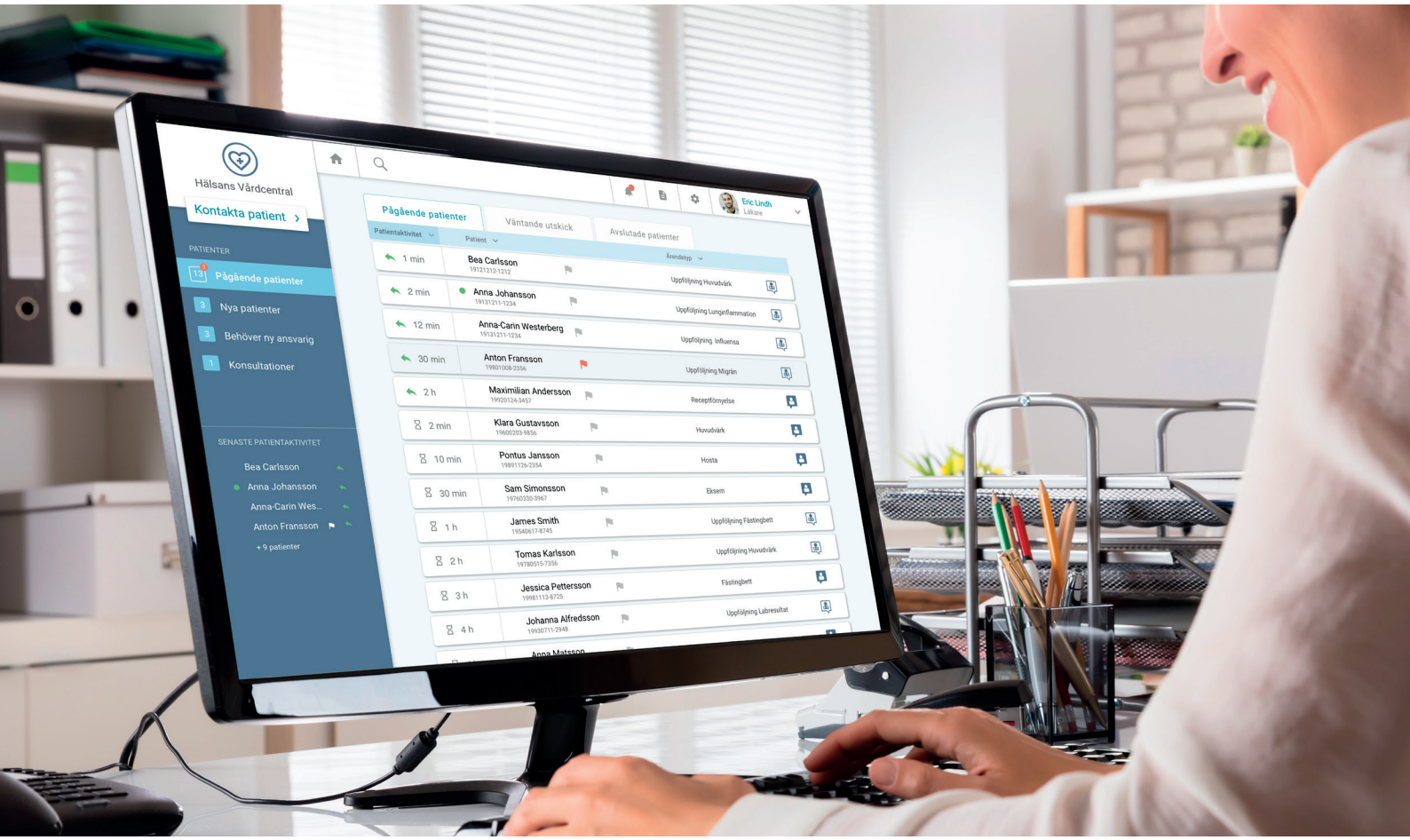

Humanizing digital healthcare

Design of a caring communication tool

Master's thesis in Industrial Design Engineering

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CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2018

Department of Industrial and Materials Science
Division of Design & Human Factors

Master of Science Thesis

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ABSTRACT

Digitalization is currently transforming most industries of today, although the healthcare sector is far behind. The reason being lack of resources but also the difficulty of changing the complex systems that are in use. The Swedish government has put a focus on the issue and has set an aim for Sweden to be world leading using digitalization and the possibilities of e-health to facilitate for a good and equal healthcare (Micko et al. 2016).

With this background the aim has been to investigate and conceptualize how digital tools can enhance the quality and experience of Swedish primary healthcare. The focus has been to look at the healthcare system from a user perspective and with these insights create a caring and humanized digital experience. The project has been done in collaboration with a digital healthcare company and the final result therefore relate to both the company's vision and the findings of the project.

The project has followed a design process consisting of different phases with frequent iterations. These have included user research and analysis, ideation and design, user tests and visualization.

The final result was a concept of a digital communication tool where caregiver can contact patients for a digital follow up in chat format. The procedure when using the tool starts during an appointment when the doctor decides that a follow up is necessary. The doctor can then write the follow up message and schedule it to be sent at a later date. The patient later receives a text message with a link, which through a secure login, leads to the message from the doctor.

With the developed tool the caregivers are able to reach out to their patients in an asynchronous way. This format makes it more convenient for both doctor and patient who can answer when it is suitable for them. By making it easy and efficient to follow up the system will cater for a more secure and effective healthcare. The expected effects for the patients when using the developed tool are to be fewer visits to the healthcare centre and enhanced involvement, in their care.

ACKNOWLEDGEMENTS

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Firstly, the project group would like to give a big thank you to our advisor Lisa Trumstedt at The Company for all your encouragement and support. Without you this project would not have been the same. We would also like to thank everyone at the Company who has participated in our meetings, workshops and user tests. All your ideas and feedback have been of great value for us.

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Gothenburg 19th of June
Elin Gebring & Fanny Wikman

TERMINOLOGY

- *Anamnesis* - The patient's own description of their health status.
- *Doctors invitation* - An invitation sent out to the patient in advance of an appointment showing the time and date, who the patient is seeing and potential preparations.
- *Follow up* - can be done after a visit if the patient's health status needs to be followed up.
- *General practitioner GP* - A doctor who has specialized in general medicine.
- *Medical record* - Where all information about the patient is kept.
- *Medical record system* - The main IT system used at healthcare centres, including all patients' medical record, schedules, prescriptions etc.
- *Prescription* - Is given to patients who needs medicine from the pharmacy.
- *Referral* - Is given to patients when they are ordered continued healthcare at another healthcare instance.
- *Triage* - A process of sorting and prioritising patients were the most urgent patients are being cared for first.

CONTENTS

INTRODUCTION

Digitalization is a phase of transformation that is taking place in most businesses to reach for new value-bringing opportunities by the use of digital technologies. Swedish healthcare have not been in the front end of the digitizing their processes yet it is an organization under constant development and digitalization is emerging in this field. In fact, the Swedish government has set a up an aim that Sweden should be world leading in using digitalization and possibilities of e-health to facilitate for a good and equal healthcare (Micko et al. 2016)

There are several answers to why healthcare has not taken the lead in the digital transformation in society (Jerlvall, Pehrsson 2017). Firstly, primary healthcare in Sweden should be provided equally to all citizens (1177.se). New procedures therefore need to be tested and adapted to the digital experience among the target groups, both patients and caregivers. Also, healthcare is a business handling a lot of sensitive data that calls for high security systems, which adds to the time for development as well as the price tag of the system. This in combination with healthcare being governmentally funded operations that imply restrictions in procurement as well as economical possibilities.

Despite these obstacles there are many promising opportunities that can come with digitizing healthcare (McKinsey, 2016). Good use of digital technology can make workflows more efficient and make healthcare personnel spend less time on administrative tasks and leave more time for the caring of patients. Also people's attitude toward a more digitized healthcare is generally positive if it can be made safe, flexible and coordinated (Vårdanalys, 2017a).

Company X is a healthcare start-up taking part in the journey towards a digitized primary healthcare in Sweden as well as globally. By automating the anamnesis report the company aims to save time for the actual meeting with patient and reduce the time spent on reporting to the medical record. Apart from making processes more efficient the company also claims to enhance medical accuracy and increase patients involvement in their care, something that is reported to be low in Sweden (Vårdanalys, 2014).

There are opportunities to take in this field but to reach out to the great majority of the patients it is the physical healthcare centres that need to adapt and renew their workflows (Stavenow et al. 2016). Therefore this project will answer to how the physical primary healthcare can benefit from digital tools and workflows and how these can be designed.

THE COMPANY

The project has been done in collaboration with a company that want to stay anonymous in this report. They will hereafter be called *the Company or Company X*.

The Company is a Swedish start-up founded in 2016. The Company is providing digital services to health care givers to aid them in the process of digitising the patient journey. By using their services the company claim better medical accuracy, a better experience for the patient yet enhanced resource efficiency.

The services as of today is consisting of a complete tool allowing general practitioners to handle patients digitally. The patient fills out an intelligent questionnaire stating their medical issue and expectations for the doctor's appointment. The general practitioner can then asynchronically contact the patient and pose additional questions and suggest medical treatment, prescribe medication or advise the patient. The service has an interface where the general practitioner can see the on-going patients and also patients on the waiting list. If a physical appointment is needed a coordinator will join the conversation and set up an appointment for the patient with the right medical personnel.

By using the services the caregivers can reduce the time spent on taking the patient anamnesis and also improve the accuracy of it, since it is the patient's own words that are being used. The intelligent questionnaire also assures that all relevant questions regarding a symptom is being asked, and with this extensive information it is also easier to direct the patient to the right level of care. According to the Company the effect of this workflow is that the medical staff can spend more time treating the patient rather than collecting information about their health background. Hence, a better use of resources. For the patient this system of healthcare would also increase the level of participation in the caregiving process.

The service comes with the benefit of more efficient medical recording of patient contact since all communication is text based and can be pasted directly into the patient's medical record.

The service is today used in Capio's service Lakarbesokonline.se where a centralised organisation of general practitioners can handle a selected set of medical issues, with the goal that all of the patients will be treated digitally. The goal with the service is however that it will be used on all of healthcare centres the Company holds a partnership with and that the medical personnel at these centres will be able to handle both digital and physical patients in their daily workflow.

AIM

The aim of this thesis is to investigate and conceptualize how digital tools can enhance the quality and experience of Swedish primary healthcare.

OBJECTIVES

As a first part of the process the Swedish primary healthcare system will be investigated to find potential areas of improvement. As a second part of the process a limited area of focus will be chosen from the preliminary research. This area will be evolved in terms of user experience, design and user interaction. The project will be executed in collaboration with a digital healthcare company and the final result should therefore relate to both the company's vision and the findings of the project research. To achieve the objectives and aim for the project the following questions need to be answered.

Research questions

- What procedures in Swedish primary healthcare are possible to improve with digital solutions?
- Which one of these procedures can, in line with the company goals and frames of the project, create most value for the caregivers?
- How can a communication channel between caregivers and patients be improved and designed for a high quality caregiving process and user experience?
- How should an interface optimally be conceptualized in terms of structure, visual design and functionality to meet both patients and caregivers' demands?

DEMARCATIONS

The priorities in this project have been user research and design for usability and user experience. The project has therefore been limited from the development of technical functionality. Only prototypes and a finalized design proposition have been covered.

The focus has been to design a workflow within a limited part of the system. Therefore, pages that are not directly linked to the workflow have not been developed to the same level of detail.

PROJECT STRUCTURE

The project process (see figure 0.1) has been executed with an explorative approach. To guarantee a well-prioritized result the objectives for the project were continuously updated, as results from previous phases were analysed and completed. Each phase of the project represents a new sprint of exploration and is finished with a set of insights to be widened and explored further in the coming phase.

The first phase of the project included literature review of the Swedish healthcare system and user studies of personnel in healthcare. The phase aimed to identify opportunities and pain points when digitizing the healthcare system.

The second phase was initiated with limiting the scope with base in the research from phase one. The chosen area was then further explored and investigated. In parallel, ideation was done to find solutions to the problems identified.

In the third phase the ideas from the previous phase were further evolved and conceptualized into design proposals. The phase included concept development, design and user testing in an iterative process to reach a final solution.

In phase four, the final design and functionality were set and motivated from the joint insight from background study, design iterations and user testing in the project.

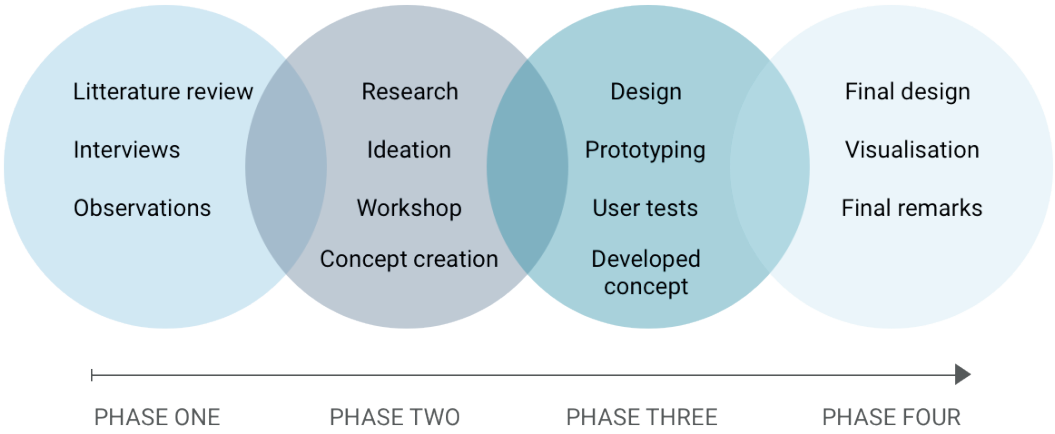


Figure 0.1 The project process

REPORT STRUCTURE

This report is structured into four phases, which follows the structure of the project. The phases in the report are all initiated with an intro to the phase, a chapter describing the methods and execution that were used. This is then followed by a results and analysis chapter and finished by a set of insights that are brought as a starting point into next phase. The report is then finalized with a conclusions and discussion that state the final remarks of the project and its process.

Phase 1: User studies and research
Phase 2: Defining the scope
Phase 3: The design process
Phase 4: A digital communication tool

01.

PHASE ONE

USER STUDIES AND RESEARCH

Phase one includes method, execution and result from a study of the Swedish primary care system from the perspective of medical personnel. The chapter finalizes with a set of nine areas highly relevant to consider when aiming to incorporate digital tools in the daily operations of primary healthcare centres.

METHODS AND PROCESS FOR PHASE ONE

Literature review

To get a good overview at the start of the project a literature review was regarded suitable to immerse in the subject. The review was decided to focus on developing a better understanding of the primary healthcare system in Sweden. It also focused on how primary healthcare relates to other areas of healthcare, what types of systems are in use today and what the user satisfaction is for patients and personnel. The literature review also investigated the level of digitalization happening in healthcare and what the goal are for the near future. The information was mainly collected digitally through reports and studies of the Swedish healthcare system. Different medical web applications were also investigated to get an understanding of the working processes for the healthcare personnel.

Interviews

For deeper insights regarding primary healthcare, interviews with healthcare personnel were regarded as a valuable method. With the hope of getting a better understanding of the everyday routines at a healthcare centre and to find potential pain points. The goal was still to keep the study broad and to get as much information possible in the given time frame. To keep the broad approach and to get a good understanding of the different perspectives it was decided to find interviewees from various professional fields, from nurses and doctors to administrative personnel and managers. The interviews were planned to be semi structured and differ slightly depending on the professional role of the interviewee. The changes of the interview guide were done to get as much useful information as possible from each person. For the general interview guide see appendix I. The guide was slightly adopted during the process when more information appeared, always with the goal to receive as much useful information as possible. The interviews focused on understanding the interviewees' role and experience of working in primary healthcare. The guide also addressed the routines at the different healthcare centres and the different responsibilities that were given for each professional role.

In total two doctors, three nurses, one medical secretary and four managers were interviewed. Most of the interviews were done in person although some were done through phone or video chat. Two healthcare centres were visited, where it was possible to investigate the physical environment. The two healthcare centres differed, where one was a larger centre with 18000 patient listed and the other was a smaller centre with 7000 listed patient. The difference in size and way of working gave a broad perspective.

In total the interviewees represents personnel from three different healthcare centres. Additionally, two interviews were conducted with primary healthcare managers responsible for larger geographical areas of multiple healthcare centres. After 10 interviews there was a saturation of information. Therefore, it was decided that the study had collected the necessary information it was set out to do.

Structure of data

To summarize and structure the information and data collected from the interviews a KJ analysis (Martin et al., 2012) was regarded suitable to get a better overview and understanding of the content. The KJ technique is an analysis method to organize large sets of data. It gives a good overview and communicates the result in a structured way. At the same time it can also express correlations between individual aspects in the data set. After the interviews valuable information and comments were written down on post it notes. These notes were later analysed and categorized into larger groups. These groups represented different topics for further analysis and evaluation.

Merging information

The goal of the user studies was to find potential pain points but also opportunities for the Company's services when implementing their tools at healthcare centres. To find these opportunities and pain points a merge of the result from the literature review and KJ analysis was necessary. This was done through different methods such as mind mapping, stakeholder analysis and versions of different user journeys. It ended in a reduced KJ analysis where all the collected information had been analysed and potential ideas and important aspects where organized.

RESULTS FOR PHASE ONE

The primary care is the first line of care providers in Sweden. They are set to be a portal to the healthcare system and take care of general medical issues, rehabilitation, preventative care and also diagnose patients and hand them on to the specialized care they are in need of (Vårdanalys, 2017b). For emergency cases the patient should not see the healthcare centre but go to a hospital emergency ward.

The Swedish county councils are responsible for the primary care and as an effect of this there are differences in structure, costs and operations in primary care in different county councils. There are both private and public healthcare centres yet all centres are coordinated by the county council and the county councils may as well require similarities in procedure and operations between the centres, even if run private. Even though varying over the country as a whole, the average amount of healthcare centres is 1-1.5 centres per 10 000 citizens (Vårdanalys, 2017b).

The primary care centres' main competences are general practitioners and nurses but most centres do also have specialized nurses and also physiotherapists, psychologists and dieticians. There are also other centres providing primary care operations in a limited field such as midwife clinics, clinics for elderly or rehabilitation centres. How this division between competences is made and whether or not it is possible to make appointments to specialised primary care directly or if a referral is needed is different in different county councils and sometimes centre individual as well.

Statistics in healthcare

In Sweden every person visits a primary care centre 2.31 times per year (Vårdanalys, 2017b) and every doctor's appointment takes in average 24 minutes. This amount of time per appointment is the longest in a comparison with primary care in other countries (Vårdnanalys, 2015). Yet Swedish doctors experience that they spend too little time with patients. Also, Swedish doctors spend 60% of their daily work on seeing patients and remaining time on administration and other tasks (ibid).

Primary care

From the primary care perspective there is a clear structure of where and when a patient should contact primary care, according to the symptoms and the group belonging. However this system does not always seem as clear to the patients as to the caregivers implying that many patients are struggling finding the right path through the system. Also, for the caregivers there is a constant process of directing patients to the right instance, or they might as well take care of patients that rightfully should have made their appointment elsewhere.

This structure of spread out care centres and branches of it makes the primary care a connection point in the landscape of care. No matter if wanting advice, direction, hospital care or rehabilitation the primary care is the first place to see. Primary care sees all kind of patients and directs them to all other levels of care providers.

The road to an appointment

There are few steps in the process when a patient needs to visit a primary care centre (see figure 1.1). Firstly, the listing information is what should decide, which centre to contact. The patients are free to list themselves at any primary care centre in Sweden, run privately or by county councils. The listing is an

economically important aspect for the primary care centre since every listed patient comes with a allowance from the county councils, in most county councils the listing allowance constitute of over 80% of

Figure 1.1 Patient's road to an appointment

the care centre incomes (Anell et al, 2012).

When wanting to initiate contact the patient needs to find the primary care centre and how to contact it, and can do so by searching the web, seeing brochures or sent out information, having a saved telephone number or physically visit the centre. By searching the web the patients most commonly find the 1177.se page (an information page provide by the Swedish healthcare) for the closest centre, the centre's own home page or a telephone number. None of these options can tell the patient where he / she is listed, in case this would be forgotten. The listing information can only be seen for the patient if logging in to *my pages* at 1177.se.

When having found a centre to contact there are several ways to do so. The majority of patients call the primary care centres, but there are also several web alternatives. There is often a web-booking option on the primary care centre homepage where patients can make their appointments directly to a nurse. There are also web-booking through 1177.se where the patient fill in a short form stating there symptoms and medical issues, they will then be assigned an appointment by a nurse at the centre. Some centres do also provide a drop-in service where patients during certain time slots can visit the centre without an appointment. Patients do also physically visit the centre to make their appointments.

Regardless of how the patient decides to make their appointment they can make different kinds of visits at the centre. There can be appointments with a nurse, a doctor, or other medical staff for treatment or medical advice. Patients do also take tests at the laboratory. Many patients do also contact primary care wanting administrative services, such as insurance certifications or medical reports.

Patient groups

Since primary healthcare is the first line of care the patient group is broad and diverse. The patients can be divided into many different groups depending on health status, age, reason for seeking care etc. With the perspective of the patients' needs and expectations regarding healthcare they can be divided into four main groups (see figure 1.2).

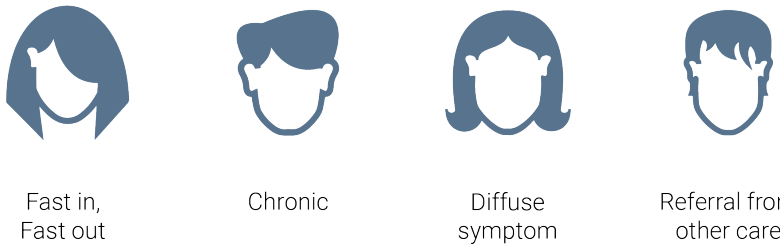


Figure 1.2 Patient groups

Quickly in an out patients are often seeking medical treatment for symptoms or diseases that are easily diagnosed and treated. They often need medical treatment relatively fast but not during a longer time.

These patients are usually healthy, and therefore are not used to how the routines at a healthcare centre works. These patients are expecting fast access to healthcare.

Chronic patients regularly visit the healthcare centre and know the routines and procedures. They often have one doctor that they are always visiting. It is also common for chronic patients to see multiple caregivers for different aspects of their treatment. These patients expect caregivers to know their medical history and to be up to date with their health status.

Diffuse patients, have symptoms that do not make for a clear diagnose. They therefore need multiple visits to the healthcare centre to see various caregivers to be able to figure out the cause. These patients expect that their medical information is transferred between instances and personnel efficiently.

Patients with a referral from other health instances. They have had a previous treatment and when they arrive at the healthcare centre it is often for rehabilitation or follow up of an earlier illness. These patients expect attention and a plan for the next step in their treatment.

Roles of medical personnel

The primary care is a historically hierarchic system, and the hierarchy is still noticeable in the system today. The doctors are an expensive resource, therefore only do the tasks that no one but the doctor can, or have the authority do, should be done by a doctor, such as determining diagnosis or prescribe medication. This structure makes the other personnel at the centres working to limit the workload of the doctors by taking care of everything that does not require a doctor's competence. However, the nurses of today do also have a lot of responsibility. They are usually rotating on different positions such as telephone contact, taking appointments and also handling the drop in service. Nurses do all of their administrative tasks themselves whilst the doctors can have support from a secretary, or handle tasks over to a nurse.

Taking care of the incoming patients

The incoming patients to a primary care centre can be handled differently at different centres. The first thing that needs to be decided when a patient is contacting the healthcare is the level of emergency of the medical issue. This will then determine when the patient will have his/her appointment. With a constant pressure on primary care centres this initial prioritization is essential to be able to help the most acute patients. The patients seeking help for an acute matter can be handled differently, they can get an acute appointment with a doctor, which can be directed to the drop in service or get to see a nurse who can make a preliminary diagnosis and then consult a doctor if needed.

There are also physical aspects of the primary care centres that impact the way of taking care of incoming patients. At some centres the doctors can have a doctor and nurse's workspace where they do their administrative tasks, and then there are examination rooms were the nurses and doctors meet the patient. In these rooms the medical personnel do not have access to a computer. The more traditional way of working where doctors have a combined private workspace and examination room is also present in primary care.

The personnel the patient get in contact with during a visit at the primary care centre is different depending on what they are seeking help for, however combined visits are common, implying that the patient can see both a doctor a nurse and lab-staff during a visit.

Nine potential areas for improvement

From analysing the interviews with primary care personnel and combining this with insights from literature reviews nine areas highly relevant to digitalising operations of primary care centres were defined. The areas are chronologically following the workday on a primary care centre and touching upon aspects primarily concerning nurses and doctors.

Listing and payment

The listing information is an important economical aspect for the primary care centres. In the daily work this implies that in all contact with a patient the primary care units needs to assure that the patient is listed at the care centre. If not, the primary care will suggest the patient to change listing to the specific centre or contact the centre where he or she is listed. The listing information is displayed in a separate system provided by the county councils. The triage nurse most often controls the listing when the patient calls the primary care centre. Hence, the care centres do not take care of all the incoming cases but need to spend time on redirecting patients to the right centre. For a healthcare IT system it is important to display listing information. Also, to extend the patient listing at a specific centre, it is important to make changing the listing easy and accessible.

"If the patient is not listed, we'll tell them to change their listing to our centre or to contact the centre where they are currently listed instead."

Payments are at most centres made before the appointment with a doctor, nurse or other healthcare personnel. The price is different in different county councils and do also vary depending on what kind of medical staff the patient are to see. In some cases the patient needs to pay twice during a visit at the primary care centre since the visit needed to be upgraded from a nurse's appointment to a doctor's appointment. The payments are regularly made to a receptionist in the reception area of the centre. This receptionist do also take care of a lot of other matters then payments, such as booking of patients, sending the primary care mails, handling schedules, and taking care of other administrative requests from both patients and medical personnel. Many patients who do not speak Swedish go to the reception of the healthcare centres when contacting primary care.

Planning ahead for primary care, a digital solution for payments in primary care is possible, and could reduce workload of the centres. Digital payments will be needed if aiming to treat patients digitally from care centres. However an important aspect on this matter is that the receptionist cannot be eliminated just by a digital solutions for payments. Receptionists are involved in more assignments important for the daily work at primary care centres. With the Company's aim to digitally treat patients it will also be important to consider what the patients should pay for and not. A phone call to a nurse where the patient gets medical advice is without cost today, if the same kind of treatment was to be made digitally it can be debated weather this should be provided for free or paid for as a physical appointment with a nurse.

Patient inflow

The patient has multiple channels, through which they can contact the primary care centre. The primary care centre is constantly struggling with prioritizing the patients and setting them to the right level of care at the right time and the vast amount of inflows do not facilitate this process, it rather forces personnel to constantly shift focus. At the centres, the nurses are often assigned an area of responsibility, to assure that all of the inflow channels are taken care of daily. The most common way to contact is by calling the centre. There is therefore a developed system for taking care of this inflow. The 1177.se contact form is a growing contact channel, however, it does not seem appreciated by the nurses. The form that 1177.se

ask the patient to fill in does not provide sufficient information for the nurses prioritization. Therefore, they need to reach out to the patient anyway, which takes more of the nurses' time than if the patient just called themselves in the first place.

"All the different inflows are stressful, Mina Vårdkontakter, 1177, phone calls and referrals. The patients have so many ways to reach the health-care centre"

The amount of inflows and the work put in to administer and take care of them is often mentioned as the greatest source of stress for the nurses. The stress does not necessarily come from taking care of a great amount of patients; it can rather be derived from misfit of some channels in the workflow and the pressure caused by constantly checking if any new patients are occurring in any of the channels. As a long term goal the care system should therefore seek to integrate the inflow channels with each other and optimize how they will be taken care of at the healthcare centres. This could make the workflow more efficient and also reduce stress for the nurses.

Triage

"Patient can be calling about test results, reschedule appointments, to know who they should talk to, a lot of patients wants to get in contact with a doctor"

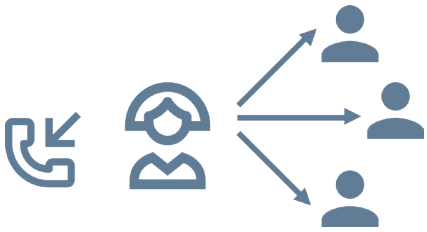
The healthcare personnel do not experience the process of triaging patient as a problem, although it is time consuming. At the larger healthcare centre there where four nurses answering the phone during the whole morning until lunch. During this time they triage patients to decide if they need care and if so at what level. The nurses have five minutes for each call. During this time they need to check if the patient is listed at the healthcare centre, look up the patient's medical history, talk to the patient to understand why he/she is calling, make a triage decision and write it down in the medical record. For new nurses or nurses that can't listen and write at the same time it is difficult to stay within the time limit.

The main thing the nurse have to do during triaging is deciding if the patient needs health care or if it is sufficient with self care advice. If the patient needs healthcare the nurse have to understand if it is urgent or if the patient can get a booked appointment in a few days.

The patients are calling the healthcare centre for all different kinds of things. In many cases a lot of time is spent to explain thing to the patients and ease their worries. One nurse said that if she would have been able to talk with the patient a little longer a lot of the healthcare centre appointments could have been avoided. But now since they only have five minutes for each call they decide to take in some patients, instead of spending time explaining and convincing them that they don't need healthcare.

The patient and healthcare personnel often have different attitudes towards who the patient should meet. The patients usually want to meet with a doctor immediately. While the healthcare staffs often think the patient can see a nurse first. To explain this takes a lot of time. Especially if they are out of schedule appointments with the doctors then the time for each call becomes longer since the nurse have to explain the situation and still wants to make the patient satisfied.

If the process of triage could be made more efficient it would save time for the nurses. Although it is still important to keep in mind that not all patients who call the centre are sick. Some of them just want to talk to someone to ease their worries or ask questions. New systems have to be able to handle those types of task as well.



"To be able to triage you need to know the age, symptoms, for how long they have lasted, general health condition and how worried the patient is"

Routines

The workday at the healthcare centres are very strictly controlled by schedules and routines. Each individual have little to no possibility to make changes. The schedules are also very tight and have no room for tasks taking longer than planned. Still there are multiple tasks that don't have a specific time booked in the schedule instead these task should be taken care of in between other scheduled tasks.

"During my visits with asthma and COPD patients I have more freedom to control the time, if the patient seems worried I can book a longer appointment"

All healthcare centres work differently and have their own routines and way of planning their days. Some centres have drop in receptions for patients that needs urgent care, while others have scheduled time slots that you have to call the healthcare centre to be able to book. Even though the way different healthcare centres work differ it is common that the personnel usually rotate on a few different positions during a day. For nurses this means that they might be in charge of answering the phone in the morning, later they work at the drop in reception and in the afternoon they work with scheduled appointments.

The routines for appointments for different professions also differ. Some nurses and doctors who have their own patients usually have more freedom when scheduling their patients. Although nurses in general feel as if they have little freedom when it comes to planning their day.

"Healthcare is the second most hierarchical organisation after the military"

Everyone working at the healthcare centre had his or her own time book. It works as a schedule where the employee knows what he or she is going to do during the day. Colleagues can book slots in each other's time books if they need to have a consultation or if they have a patient they would like this person to meet. The time book is also often used as a to-do list where the owner of the book can book slots, which works as reminders for tasks that needs to be done.

Stress

Primary healthcare feel that they are a trashcan where they are the ones that have to take care of all patients that other healthcare units don't want to treat. This combined with the amount of patients seeking help creates a stress for the personnel, which feels as if they are never done and that they constantly are not helping enough patients.

The personnel don't want to be acting stressed in front of patients. Since the patients can easily detect if the nurses and doctors are feeling stressed and this can cause a bad impression of the visit.

"The fact that we can not help enough patients as a healthcare centre is a constant stress"

"1177.se take so much energy, it is ineffective and I often need to call the patient anyway, it would have been better if they had just called in the morning like everybody else."

"The health insurance fund take a lot of energy, there is always a lot of administration, health certifications that need to be written and it takes a lot of time."

Communication

There are time set-asides for nurses and doctors to consult one another about patients and treatments. The length of the time slot differs but the main purpose is to have time to talk to one another without interrupting each other's work. From the interviews it became clear that face-to-face consultation is the most common way to ask for help. Some mentioned that they sometimes write to their colleagues via email or chat applications. Although that only works with colleagues they know will reply soon otherwise it is better for them to go and talk to that person and get the information directly.

"It can be lonely working in primary healthcare."

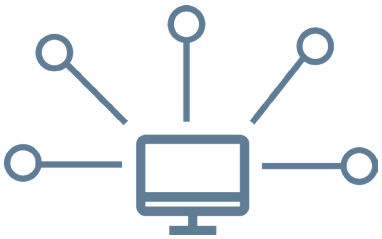
Often tasks need to he handed over to a colleague. it is most common for doctors to hand over task to nurses or medical secretaries, but the task changing can happen between all professions. Although there are no set guidelines or tools to make this transition. Common ways of doing it is to talk to the other person or print out paper notes and hand those over. Sometimes if there is a lot to do it can take some time before the task is completed and handed back for approval. This happens for example when medical secretaries write the transcript in the medical record and then hand it back to the doctor to get it signed. If it has been stressful and the transcript gets back a few days later it can be hard for the doctor to remember what was actually said during the appointment. This can jeopardize the patient safety. Dictation works both as the text that is going to be transcribed in the medical record and as a way of communication from the doctor to the medical secretary.

IT system

Every contact with patient should according to praxis be recorded. The system for recording is different in different county councils and can also differentiate between different caregivers (Jerlvall, 2017). The medical record system is often more or less integrated with other utilities and tools required in the care-

giving process, such as prescription tools, telephone system, schedules and communication tools. The hospitals and primary care does not necessarily use the same system for recording and depending on the particular suppliers it may not be possible for hospitals to read the medical records from the primary care and vice versa. If this will be required the different care units can contact each other and send the medical record by regular mail.

"Oh God, do we have to learn one more IT system! Why can't the systems integrate with each other?!"



The medical record system is the most used system during the healthcare personnel's workday. It includes the patient's medical record, the nurses and doctors schedule and chat functions with colleagues. It also includes the ordering of prescription, patient waiting lists, referral functions and appointment invitation functions.

Other systems are used in combination with the medical record system. These system are only handling more specific topics. For example, at which healthcare centre patients are listed or systems to check the patient's medical record from another healthcare centre, since the different medical record systems do not transfer information between each other.

Many of the IT systems used at healthcare centres or other healthcare units do not communicate with each other. This is causing a lot of frustration and stress for the personnel. They are wishing for IT systems that are integrating with each other, which would erase a lot of extra work regarding copying information and pasting it between different systems.

Most of the IT systems used at healthcare centres are older and often complicated to learn. Still they sometimes lack functionality. The personnel are used to have different tricks and ways of working around problems in these systems.

Since the medical record system is the main IT system used at healthcare centres it will be a potential competitor to a new system. There is a risk that a new smaller system will just be an additional system only used for specific purposes and otherwise forgotten about.

Patient contact

According to the interviewees there are no structures in place for connecting and checking up on patients. It is usually done by calling the patient or sending mail. The difficulty with calling patient is that they do not always pick up. Either they are not available and miss the call or they choose not to answer since it is a anonymous caller id, which many people don't answer to.

Healthcare personnel have a tight schedule and checking patient feedback is not always prioritised when having hectic days. To follow up on patients would, according to caregivers, contribute to enhanced medical quality. However, to follow up with today's methods consumes a lot of time and requires the caregiver to keep a lot of assignments in mind, which is both inconvenient and stressful. Many caregivers therefore assign the responsibility to the patient to get back to the healthcare centre if their health-status is not improve.

"In many cases, the task of following up the patient is ignored when you don't have time"

"You handle over some responsibility to the patients, they have to call back if something does not work"

Often, it seems as if the feedback is more important to the patients than for the healthcare providers. For example, the patient prefers to always get informed about their test results; whichever they were good or bad. Although the caregiver usually only delivers feedback on results that are bad. This makes the patient think that the test result might have been forgotten and they call the healthcare centre to make sure that they have gotten the test results. This results in unnecessary time spent for both the healthcare workers and the patient.

When providing patient feedback it seems as it is more important that there is an information continuity than there is a person continuity. Patient wants their healthcare providers to have a knowledge about their medical history and what has happened to them previously.

Future

When asked about the changes the healthcare providers see in the near future they mentioned a growing group of patients with mental illnesses. These patients often have symptoms that are hard to detect and where the treatment period is long. The personnel feel as if they don't have any working methods or systems to take care of these patients at the moment.

Another trend mentioned, was the increasing number of people are seeking healthcare. Often the patients seek healthcare for symptoms that the healthcare providers don't qualify as severe enough to seek help. This shows a difference in attitude between the patients seeking help and the healthcare personnel. They are treating patients, which they feel are not in need of healthcare. Since these patients have forced themselves into the system and gotten a time slot others more in need of healthcare are left out.

A trend that the healthcare providers could see as beneficial is the self-monitoring. Where patients through different technical devices, for example smart watches and phones, can track and get data of their daily life and routines. This data can later be used by the healthcare providers to work in a proactive way.

The most common change healthcare personnel wanted to make to their work environment was to increase the number of colleagues. This clearly shows that they don't feel that they can handle the workload they are given today. They only believe that the way to fix the situation is hiring more people. This mindset is important to take into account when introducing a new tool that will improve their way of working. Even though the solution might be working as planned, the personnel might feel as their wish for more colleagues are not being heard. Which can cause a negative attitude towards the new tool.

"The whole society is so healthcare seeking! Often you could just do some self-care, everybody does not need to see a doctor"

"Everything is moving so quickly now a days, the patients are less satisfied and have higher demands on the healthcare services"

INSIGHTS TO BRING TO PHASE TWO

The structure of Swedish primary healthcare is complex for patients and the path to make an appointment at the healthcare centre can be both hard to understand and include long waiting. The healthcare system is also exposed to an increasing amount of patients demanding appointments, of which many require a doctor appointment. Digitalization is on the rise in the healthcare sector and many actors claim to make healthcare more efficient, accurate and improve the experience of it by the use of digital systems.

The Company want to explore how their tool as of today can be successfully implemented at a physical healthcare centre and how they need to develop in order to do so. This phase elaborates on nine areas that need to be considered when implementing new tools in primary care. They include both changes that need to be made at the healthcare centre as well adaptations that need to be made in the Company's system. The areas also describe opportunities that could be an advantage if solved in a developed version of the system.

Listing and Payment

Listing is important information for healthcare centres yet unessential for the patient. A future system should display this information to both patients and caregivers.

Patient inflow

The amount of different inflows is stressful to caregivers and complex for patients to distinguish between. Improving the inflow to a healthcare centre would improve the experience of care and caregiving.

Triage

Much time is spent on setting patients to the right level of care, time that does not create value for the patient. Making the triage process more efficient would leave time for caregiving that bring value to patients.

Routines

Primary care is strictly run by routines and tight schedules yet patients and other tasks to be done are diverse and require varying amount of time. Primary care would benefit from having a workflow better adapted to the assignments to fill it.

Stress

Stress is a substantial aspect of daily operations at a healthcare centre. Stress does not seem to emerge from having a lot to do during a day but rather arise from a constant uncertainty of how much that needs to be done.

Communication

Due to tight schedules, stress and to some extent a hierarchical structure the communication among colleagues and patients in healthcare is limited. If there was a planned structure for how to communicate daily operations could be made more efficient and with higher level of patient security.

IT system

Healthcare is a sector that uses a numerous of out-dated IT systems that usually are rather task centred than user centred. Healthcare would make good use of modernizing their systems as well as reducing the amount.

Patient contact

The healthcare centres do not have a modern way of communicating with patients, countless mails are sent each year regarding test results, doctor invitations and follow ups. Modernising the process could save time and improve the quality of care.

Future

Healthcare is facing a lot in future. They are struggling with an increasing amount of patients, especially mental illness. At the same time self-monitoring and digitalization can provide new ways of working that calls for transformation of the system as of today.

These insights worked as a stepping-stone for the coming phase, where one area was chosen for further development. The holistic view of the situation in primary care will allow for the possibility to make valid decisions in the following process.

02.

PHASE TWO

DEFINING THE SCOPE

Phase two includes method, execution and result from the process of limiting the scope from the research to a defined area that would bring value to the caregivers. This area is presented along with different ideas and concepts of various solutions. The phase ends with the result of a workshop session where the different concepts were presented and evaluated.

METHODS AND PROCESS FOR PHASE TWO

This section describes the process and methods used to limit the scope to a defined area that would bring value to the caregivers. Later the defined area worked as a starting point for the development of ideas. In parallel with this process a deeper and more concentrated user study of the defined scope was conducted.

Definition of scope

Based on the project aim, the goal for phase two was to use the results from the previous phase and from there define the most relevant area to develop upon. The decision was based on the area's relevance and added value to the healthcare personnel, its relevance in relation to the Company's plan for development and also the timeframe for the project.

To define the most relevant area to develop for the Company a discussion was held with the CPO of the Company, a UX researcher and a project manager. Topics as the Company's area of expertise, current projects, backlog and customer demands was part of the discussion. By combining these factors and the nine areas presented in the previous phase a direction for the coming project was decided.

User research

When the project was limited to one specific area for further development a complementary user research was conducted. To get a deeper understanding of the area, revisits where done to the previous healthcare centers where additional questions regarding the chosen areas could be asked. For this purpose, two nurses and two medical secretaries at different healthcare centers were interviewed with a semi structured interview guide as base for the conversation. The focus of the interviews was to deepen the knowledge of communication with patients and understand the process in detail. The complementary research was conducted in parallel with idea generation and concept creation.

Ideation

To create and develop different ideas, and to develop a deeper understanding of the problem that were to be solved different methods were used.

Brainstorming

Brainstorming is a technique to extract a broad set of ideas related to a specific topic. In the project it was used for both widening the scope and developing alternatives of a specific function in the ideation process.

User Journey

User journeys is a method to clarify and define all the steps a user goes through to complete a certain task (Martin, Hanington, 2012). The user journey could further be used to keep a holistic perspective of the development process. In the project user journeys were created to gather information of the processes, in which healthcare personnel goes through to do patient follow ups and doctor's invitations.

System mapping

To fully understand a system and assure that the parts of it is thoughtfully prioritized a system map can be used (Martin, Hanington, 2012). By writing down desired functions, gates, and other parameters af-

fecting the system a map can be created and used to get an overview of the difficulties and possibilities of a system. In this project the process was used to clarify the ideation process.

Wireframing in low fidelity

To visually define structures and flows in a system one can use simple, colourless representation of the interface to be developed. The positive aspects of making it simple is that it is fast, easy and cheap if changes have to be made. A non-finalized proposal can also be easier to develop upon. In the project wireframes were used in the early stages of development to visualize ideas but also as material for a workshop.

Workshop

A workshop with stakeholders, users or designers is used to gather the team around a specific problem or idea and extract as much information as possible from different perspectives on the matter (Martin, Hannington, 2012).

In the end of the second phase a workshop was held to present three potential versions of a system to get professional feedback. The concepts were developed to a basic extent to keep the focus on the overall functions, but also to generate new ideas. The workshop was setup with a group of participants from different professional areas. With this set of competence, broad and realistic feedback on the ideas was expected:

Chief Product Officer (CPO)	To represent the Company's interests, current efforts and backlog
UX researcher	To represent the patient perspective and experience
2 Developers	To cast light on technical difficulties and possibilities
2 General Practitioners (GP)	To take the medical perspective, and feedback from a potential user's perspective

The workshop proceeded as follows;

1. Presentation of the workshop and overall procedure, to make sure the participants were on board.
2. Brief of findings derived from user research to introduce participants to the topic.
3. Pause
4. Presentation of each of the three concepts and following discussion in three rounds.
5. Discussion of additional aspects: complexity, automatization and change of workflow.
6. General discussion and finalization.

Sticky notes and pens were spread out on the table and the participants was encouraged to use them to write their comments, thoughts and potential threats and add them on to printed versions of the concepts to be presented. They could also use the sticky notes and paper to note ideas that emerged from the ideas presented or discussion amongst participants. The time spent on the workshop was in total three hours with a break of 30 minutes in the middle.

The result of the workshop was compiled by analysing the collected feedback and ideas. For each of the concepts it was possible to define pros and cons and the discussions also defined areas that needed to be further investigated. The result was then used to create a direction for the further progress of the project, and also to identify difficulties in the project from a technical and business perspective.

Continued concept development

The ideas and thoughts from the workshop were used to continue develop a concept that was a combination between all three concepts. Another round of function listing and system mapping was done to get a better overview and understanding of the necessary functions and the surrounding systems that might be used for integration.

RESULTS FOR PHASE TWO

This section includes the result from the process of choosing a focus area, complementary user research and the development of different concepts and ideas. It ends with the decision of a direction for the continued development of one concept.

What area was picked and why

The nine areas (see figure 2.1) were categorized as potential areas of improvements in phase one included both possibilities and potential pain points for the Company. To be able to choose one area to focus on during the rest of the project different types of evaluations were done.

Figure 2.1 The nine potential areas for development

Some areas could be excluded early on since their level of complexity where not suitable for the time frame of the project or as a conceptualization of a digital tool. These areas where Stress, Routines, IT systems, Inflow, Listing and Payment and Future. Although these areas where still kept in mind during the rest of the project.

Potential areas that remained where Communication, Triage, and Patient contact. All three of them had potential of increasing value for the healthcare personnel and improve their working environment in different ways. The three areas were discussed with members from the Company to understand what they saw as possibilities for further development. To digitally triage patient was something the Company was already working on and was therefore set aside.

Finally, the combined evaluation of what area would provide the most value for the caregivers in combination with the Company's goals and the project's time frame, communication with patients and patient contact was chosen as the focus for the coming phases of the project. The goal with the chosen topics was to create a digital tool through which healthcare centers can initiate contact with their patients.

Complementary user research

To get a better understanding of the process of giving patients feedback and the process of inviting patients to a visit, different system maps were drawn. These maps were a good starting point for investigating the process and generated questions for the user research.

As previously mentioned the conventional way for caregivers to contact their patients is via mail or by calling them, where the latter is often avoided. There are no well-developed or modernized ways of contacting patients yet the procedure is a significant part of daily operations at primary care centers.

Patients are contacted by their primary care centre from a set of different reasons. First is lab results. If the patient has taken a test at the laboratory and there will be no need for an appointment regarding the result the caregiver can send the patient a mail with the result and a comment. However, form research it is clear that there is often a procedure where the caregivers do not inform the patients if the test result is shown to be normal. This cause worried patients to call the care centre asking for their results.

Patients can also be contacted regarding a prior visit. There are cases where the caregiver wants to check the patient's medical status after an appointment to assure the health status is improving or that the medical treatment is proceeding as planned. This type of contact is most often done by phone. Many of the interviewees mentioned that common practice is to call the patient three times during a day and if the patient does not answer any of the calls they will consider their responsibility in the matter finished. The caregivers remind themselves to reach out to the patients by making an appointment in their time book for the day they should make the call. This method sometimes causes the caregivers to forget to call the patients if they cannot find an available time slot the specific day, and it is unlikely that the caregivers will go back to past days in their calendar to look for undone assignments.

Probably the most common way of patients getting contacted by the health care centre is when they receive a doctor's invitation that inform them that they have a scheduled appointment with a doctor or nurse. There are different reasons why the patient will receive an invitation. The patient might suffer from a chronic disease, which imply yearly check-ups with a doctor or nurse. There are often guidelines for how often a patient with a specific chronic disease should see a doctor and nurse respectively. Generally, the healthcare centers have waiting lists for these kind of patients, which is managed by a nurse specialized on the disease in question. This nurse administers the sending and booking of chronically ill patients and make sure they get healthcare regularly.

Many healthcare centers do also have general waiting lists because they cannot manage the inflow of patients and there are not enough available time slots to provide all a scheduled appointment. Because of this, patients are assigned to a waiting list, which nurses at the healthcare centre go through to prioritize, which patients that are in most need of the available time slots. Doctors can also have personal waiting lists where patients that need to see the specific doctor, often in regard to a prior appointment, are assigned.

To prioritize waiting lists and schedule patients is very time consuming processes. The nurses first need to go through all the patients on the list and read their medical record to prioritize the most acute patients.

To create value for the personnel, it is significant to prioritize time reducing processes. The healthcare personnel will not appreciate a new digital way of contacting patients just for the sake of it being digital. It also needs to take their way of working in to consideration and contribute to a more efficient way of working. For example, adding questionnaires to the contact with patients can increase the value of the communication however the process needs to carefully consider how these answers will be incorporated in the workflow.

User journeys

User journeys (see figure 2.2 and 2.3) were visualized to show all the steps a user is making when sending a doctor's invitation or giving patient feedback. The journeys also included the amount of steps that were made in the medical record system. With the purpose to get a holistic view over the process and to use it as a tool when developing a new system for a similar procedure. The journeys are presented below. The circles with the dots represents steps involving the medical record system.

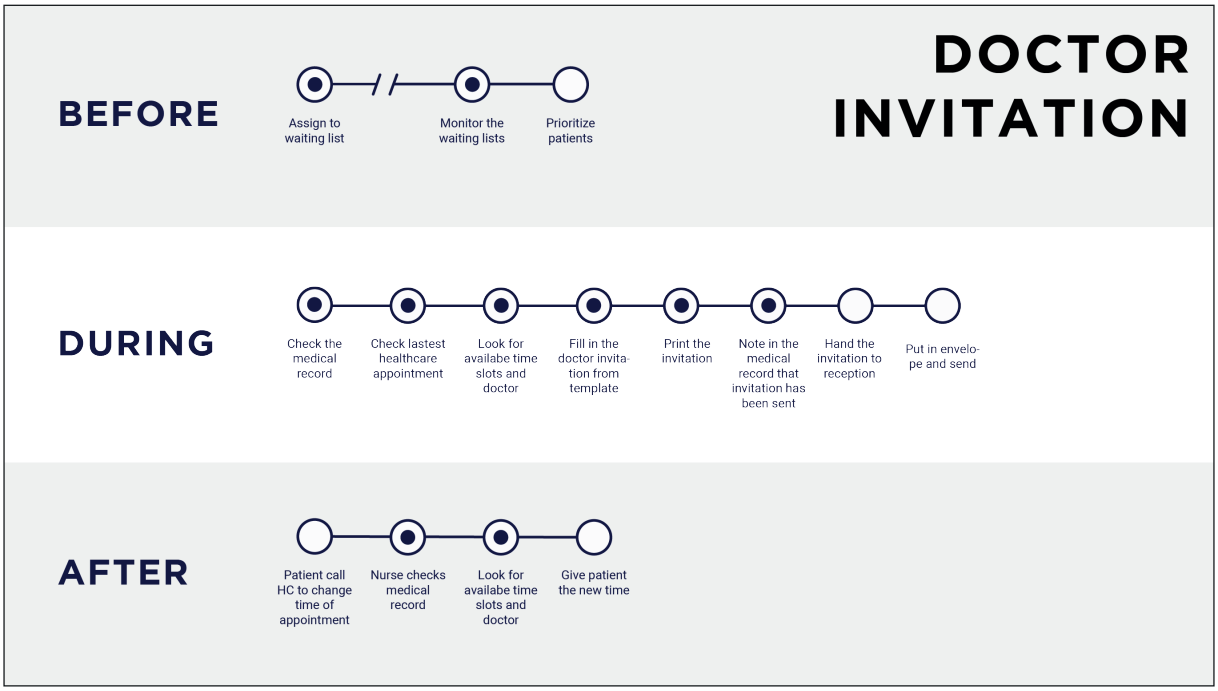


Figure 2.2 User journey for doctor invitation

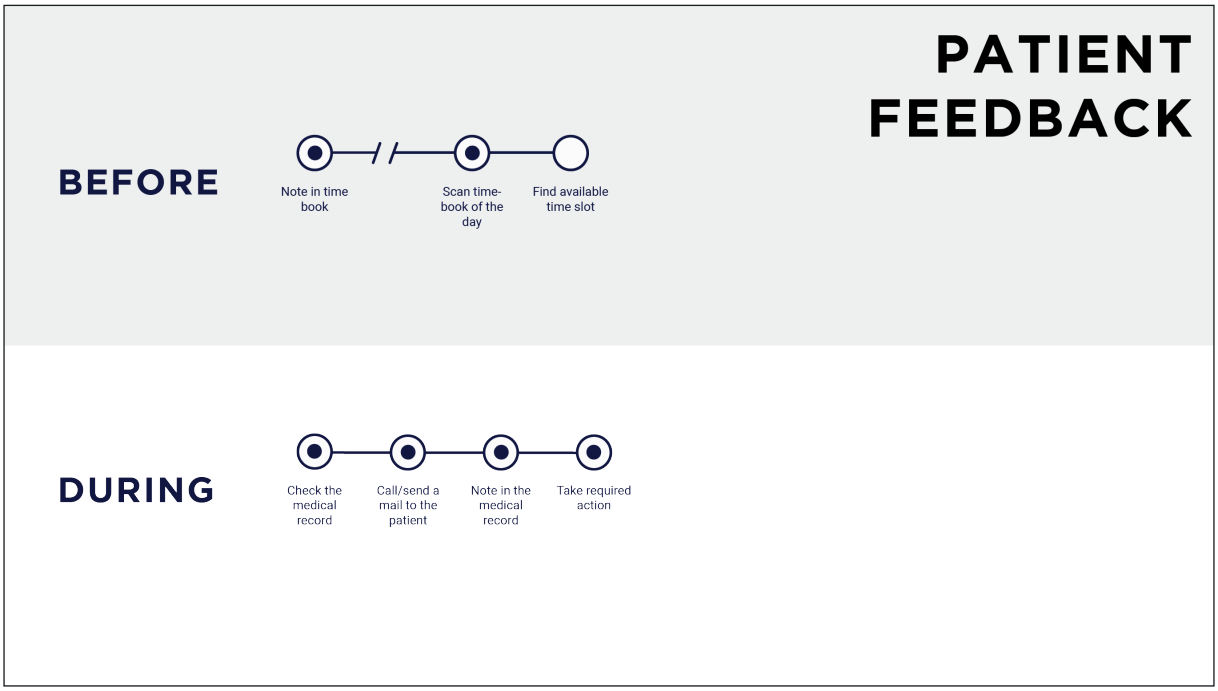


Figure 2.3 User journey for patient feedback

Gates

A map was drawn based on the different gates a new digital communication tool has to go through to function at a healthcare centre (see figure 2.4). These gates included everything from how to collect all patients phone numbers to how much information is needed to be shared with the medical record system.

The mapping of the gates revealed the question of how much functionality this new system should include, since more functionality equalled more gates to go through and solve before launching.

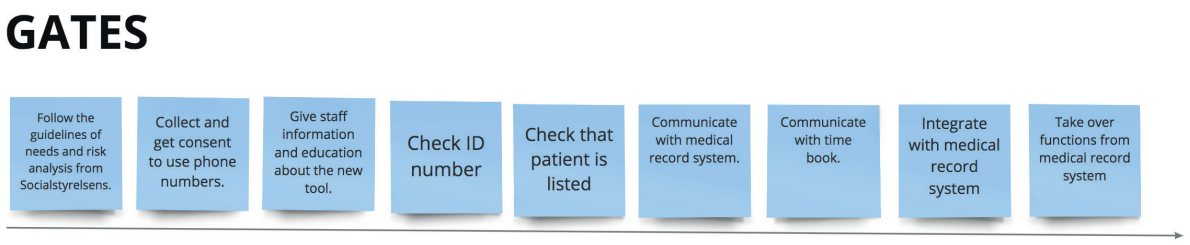


Figure 2.4 Gates for systems to be developed

Ideation

In parallel with the complementary user research ideation was conducted to find new solutions of contacting and following up on patients. Brainstorming was used to come up with different ideas and concepts. Different areas were used to spur the creativity. Some examples were the complexity of the system, the level of automatization and the change of work procedure. To make sure that the problem was looked at from all directions, the perspectives of different professionals' roles were taken into account. It was helpful for generating new ideas and to evaluate and develop already existing ideas. To showcase more clearly the ideas generated different low fidelity wireframes were made. These were first done by sketching them out on paper. Later the sketches were made digitally to keep a similar look and feel.

User devices

From the user research it became clear that it is most common for healthcare personnel to use their current digital systems and medical records at a desktop computer. It was therefore decided to develop concept for desktop. Although, for the patient interface it was decided for it to be developed with a mobile first approach. This since the users of the Company's current system are mobile based. Both interfaces were decided to be kept web based since that is what the Company is using today.

Concepts

From the ideation three different concept were developed further. They had slightly different perspectives and handle various aspects of communication and contact with patients.

Small system

Development of *the small system* (see figure 2.5) had its starting point in the Company's system as of today. The small system had a sidebar menu that included digital patients, patient feedback, doctor's invitation and lab result. The three latter ones were functions where the caregiver initiates the contact with the patient, for different purposes. The idea was that the caregiver decides what task to proceed with from the menu and then get the possibility to fill in the needed information on a new page. The system was thought to be built with an integration to the medical record system. The caregiver would then be able to search for the patient on the patient's identity number, and not have to fill in any additional information.

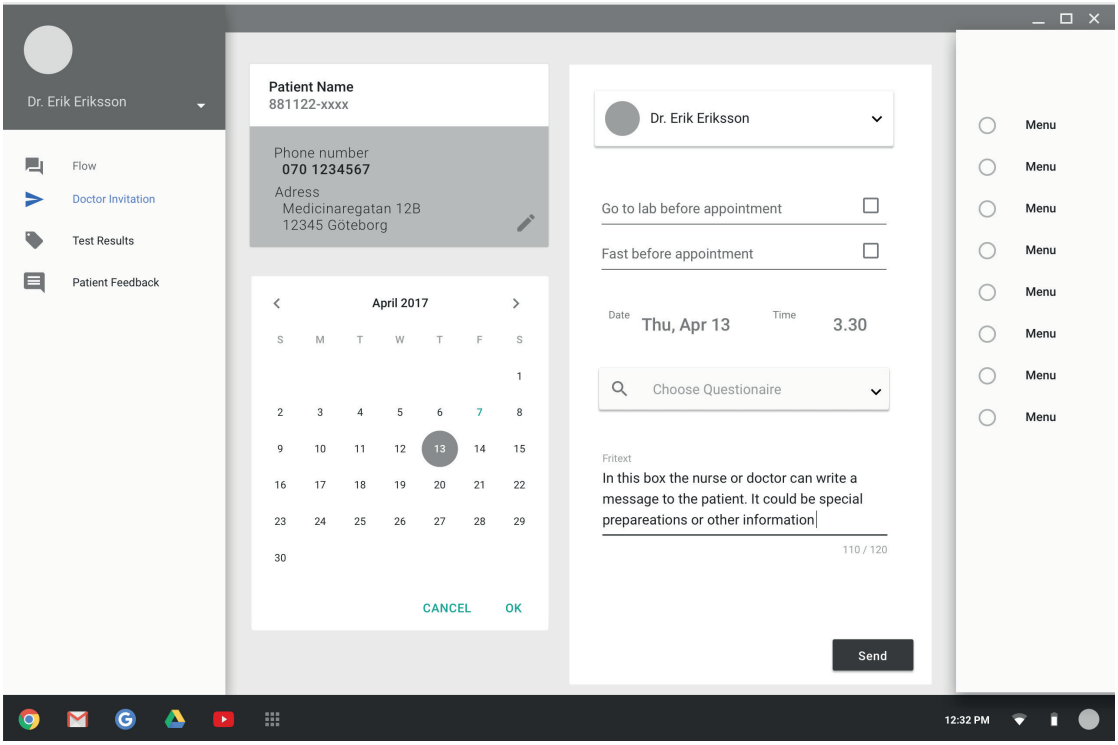


Figure 2.5 The small system

Larger system

The large system (see figure 2.6) was set to expand the Company's current digital caregiving platform into a medical record system. The system had a more extensive sidebar menu with all possible options a medical record system would need. The start page was a card based interface where the main idea was that the caregiver would get a good overview of their tasks of today, no matter digital or physical. The cards would be clickable and therefore bring easy access to the most important pages of the interface.

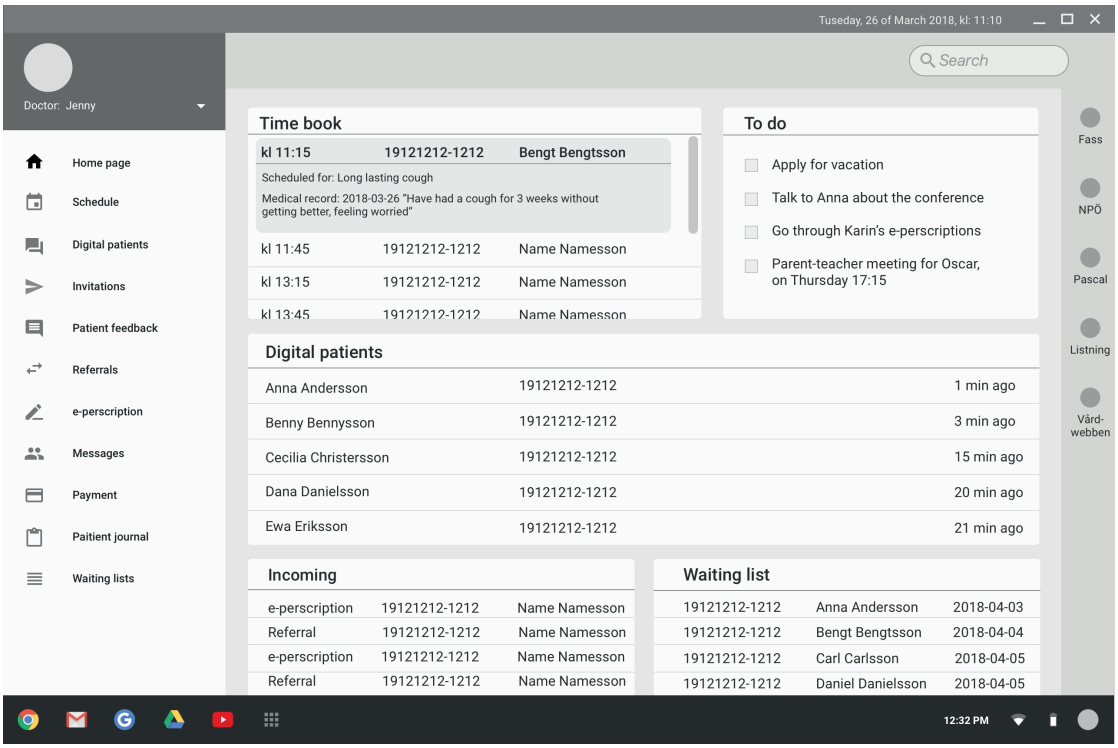


Figure 2.6 The large system

Involve the patient

In the *involve the patient* (see figure 2.7) concept the idea was concentrated around doctor's invitations. The system would hand over part of the task to the patient to book a timeslot for their appointment. The patient would get a "pre invitation" from the caregiver, stating that it is time to make an appointment and a link to a booking system. In the booking system the patient would get to choose time slots from a doctor that are set by the caregiver. The concept would imply that the caregivers do not have to spend time finding available time slots for each specific patient, yet someone needs to make time slots available for the patients to book. Also, caregivers will still need to prepare and sent the pre-invitations to the patient.

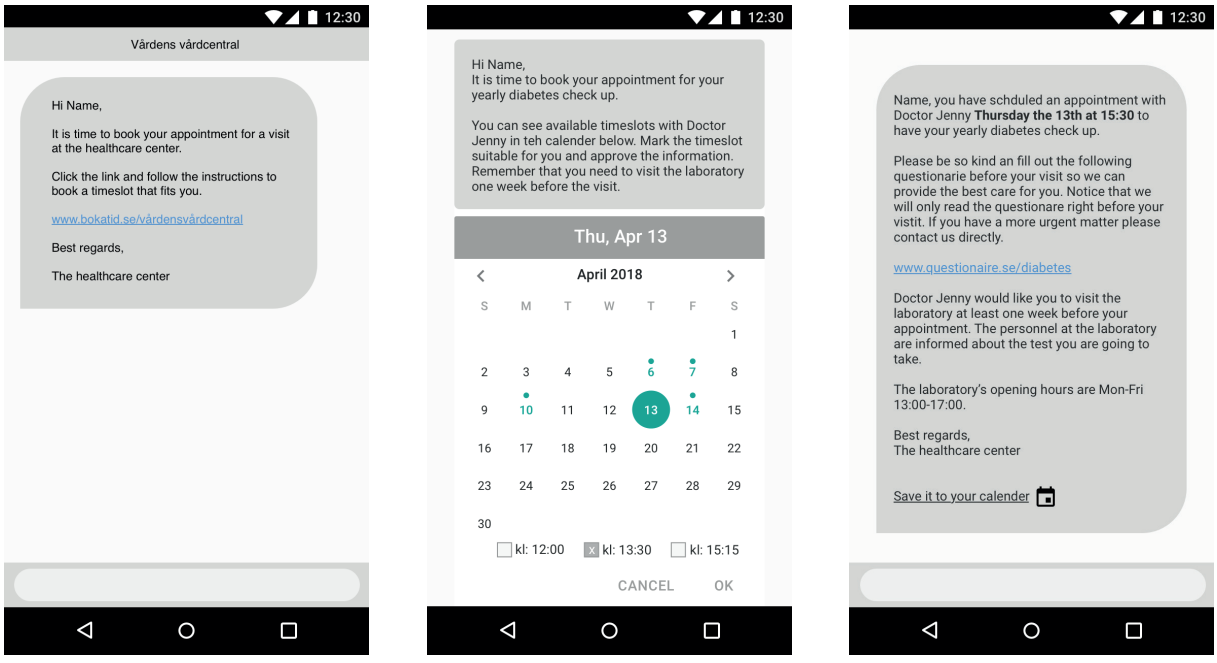


Figure 2.7 Involve the patient interface

The workshop

The insights derived from the workshop (see figure 2.8) included both functional aspects of the systems presented as well as general insights of what will be important to consider in a system like this. The mix of competence in the participating group gave insights from different perspectives. The analysis of the workshop was made in two steps. First, by analysing comments and notes stuck onto the printed versions of the concepts it was possible to evaluate them one by one. Then the topic of patient communication in general was analysed to reveal insights that could affect the system no matter what would be chosen to continue with.

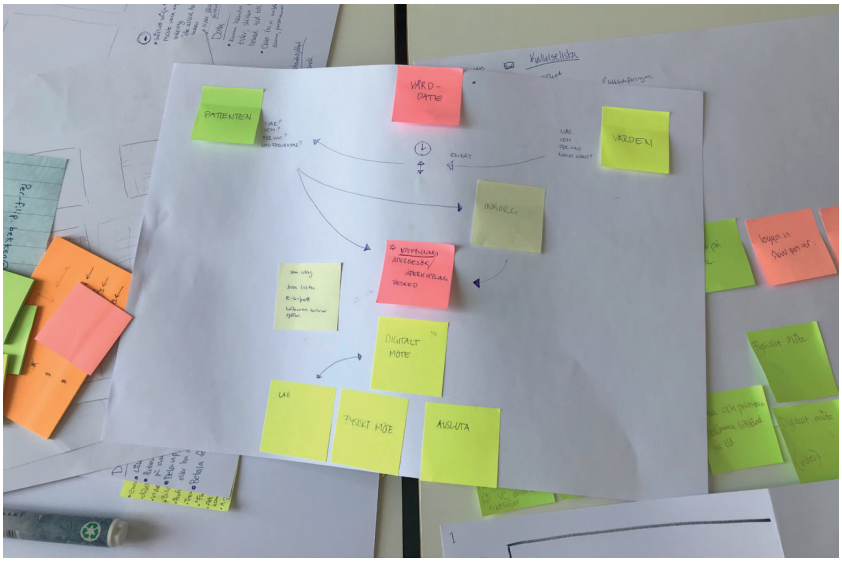


Figure 2.8 Workshop ideas

Small System

The small system was appreciated for its simplicity and the benefit of being easy to implement in the current system of the Company. Yet it was questioned if *the small system* would need to have an integration to the medical record at all. The suggestion form workshop participants were to develop the idea further to eliminate all types of system integration to match the goal of the Company to build a scalable system.

The participants liked the structure of the concept with the left side menu. However, it was obvious that the labelling of different communication reasons were not clear to all participants, not even the doctors.

The Large System

The reactions on the overview page of *the large system* was positive. Especially the doctors appreciated how it allowed them to keep track of their daily assignments, hence something to keep in mind for further development. From a business perspective the system was far too complex to develop within a reasonable timeframe and because of being a medical record system it would also shift the business area of the Company. All participants could see the benefits of integrating with other systems and understood what enhancement of usability the possibility of working in one system solely would give, yet the cost, time and complexity of a system like this still made it unrealistic to aim for. To bring with to further to development was to develop flows that minimize the movement back and forth between the medical record system and the Company's system.

Involve the patient

The *involve the patient* concept works well together with the Company's aim to let the patients take a more active role in their care. Many of the participants also believed that a system like this would be appreciated by patients since it would give them a chance to fit their care into their daily schedule. Participants also mentioned that the risks with a system like this would be that caregivers might have less control over the patient inflow. Another risk is that there might be cases where the patients feel that there are not enough time slots to choose from. That would make the freedom of choice very limited, and could have a reversed effect on the experience.

A system based on this kind of concept would require integration with the system where the doctors have their schedule, which currently is the medical record system. This would also require a cooperation between the companies behind those systems. That demand might hinder the scalability of the Company. Although, the integration and cooperation would be possible. Similar systems have been used when insurance companies cooperate with the healthcare centers.

General insights

All concepts presented will, more or less, change the way of working at a healthcare centre as of today. The new procedures will need to be introduced in an implementation phase of the new system. To consider in the further development of a communication tool is therefore to what extent the system should imply changes in today's workflow. Radical improvements usually require changes in procedures whereas something that fits in the workflows as of today is more likely to work and become accepted faster.

Similarly, the level of complexity of a new system is also something to consider. On one hand the new system should meet all possible demands of the user. On the other hand, the system should be as simple as possible to meet the demands of being easy to use and understand for a first time user.

Additionally, automatization was a topic of discussion in the workshop. Automatization can bring efficiency and enhance usage in many ways. Workshop participants did mention that a risk with automatization is reduced level of control for the caregivers. The general opinion among the doctors participating in the workshop was that they are responsible in the communication with their patients, and this demands the possibility to overlook the whole communication chain. Nevertheless, they did also agree that a lot of the digital tools used in healthcare today have too little automatization and therefore slows down the work process.

To summarize, all the concepts in the workshop had positive and negative aspects and all are in need of further development. The main insights from the workshop, to bring along in the coming development process, was that integrations with other systems should be avoided and overviews of "what to do" was appreciated. It was shown that a communication tool will be useful in primary care, but the labelling of ways of communication used in this section is not admitted and need to be reformulated.

Further development of a concept

After the workshop all the ideas and thoughts were collected and analysed. Thereafter a decision was made to focus on the task of follow up patients among the many reasons for communicating with patients. This was due to the fact that the process of sending out invites and scheduling patients for physical appointment through the current system would require too much integration with other medical record systems. The Company would therefore loose large parts of the control of the user's workflow to other systems. By developing a way to follow up patients the Company would keep the control of the user experience and could continue build the function in the existing system. A communication tool for follow ups could also potentially increase the use of the Company's questionnaires.

There was also a possibility to reduce the number of physical appointments that are scheduled for follow ups. This would save time for the healthcare personnel and enable the treatment of more patients. A designed tool for follow ups would also facilitate for caregivers and enable a more secure care where caregivers can check up on symptoms and treatments.

INSIGHTS TO BRING TO PHASE 3

From this phase the main insight to be brought in to the coming phase was that follow up on patients would bring a lot of value to patients and caregivers. The area is a good target for the Company do develop a function for since it does not require integration with other IT systems and can make good use of the functionality in the system as of today.

To follow up on a patient is a safe way of working, that enhances the quality of care. The caregiver can wait and see how a symptom is evolving over time and by doing so set more accurate diagnosis. The patient is likely tool feel less worried in the caregiving process if promised a follow up since they are not facing the risk of starting the process of seeking care again if the treatment or advice would not work. Also the patient will have more time to reflect on their health status and make sure they understand the information from their caregiver.

There are many benefits with the possibility of following up on patients. However, there are also some gates and parameters to consider during the process of developing a system for doing it. The coming development phase needs to take in to account to what extent a new system should cause changes in the workflow at healthcare centre. Likewise, the amount of complexity and automatization need to be considered and carefully developed in the system. It should be used where it is useful but it is clearly important that the caregiver still feel in control and can monitor the processes of contacting patients.

03.

PHASE THREE

THE DESIGN PROCESS

This phase includes method, execution and result from the process of designing, developing and setting the parameters for a final concept. The chapter includes the perspective of both healthcare personnel and patients.

METHODS AND PROCESS FOR PHASE THREE

The following sections describes the process and methods used for the continued design and development of one concept before finalization (see figure 3.1). This phase includes many iterations between the steps in the design process to be able to enhance and improve the concept.

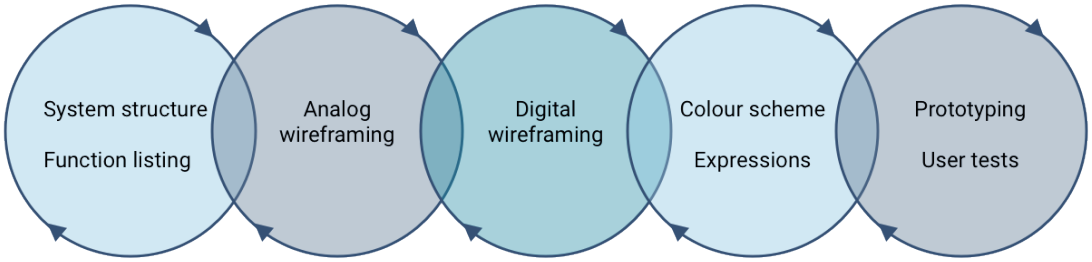


Figure 3.1 An iterative process

User studies of the patients

To further develop the service and design, the patient perspective needed to be expanded. To deepen the understanding of the patients, information was collected from the Company's understanding of their current users and their usage patterns. In addition, a few potential patients were interviewed regarding their expectations on primary health care in form of a semi structured discussion.

The doctors understanding of patients, their requirements and needs was also part of the analysis. Since doctors see many patients a day they were therefore a reliable source to information about patients and the variety in the group.

Another aspect considered relevant in the analysis of the patient group was the digitalization of society in general and its effect on people's expectations of digital services of today. An analysis of other common digital services as well as usage patterns of digital services was therefore conducted.

Development of a new workflow

To be able to minimize and streamline the amount of time a nurse or a doctor spend on a follow up, different workflows were created. With the help of post its and sketches the different steps of the workflow could be mapped out and easily transformed. The physical representation of the workflow contributed to a good overview and worked as food of thought in the process.

Function listing

A function listing of the important and necessary functions was created. Previous research and knowledge were used to make a hierarchy of functions to define, which were the most important ones. Post its notes were used to list and group, which functions are necessary for a communication tool, for the healthcare personnel and for the patients. Functions that did not seem essential but still added value were also included. Thereafter post it's with functions that belonged together were grouped together, which created logic groups and a structure of the system.

Structure of system

Quick mock-ups were sketched of the interface for both patient and caregiver, to try out placement and size of different functions and information. The interaction pattern of contacting a patient was also discussed and tested. The goal was to find a pattern that was easy to follow and understand. The paper mock-ups were later made digital to clarify and define a main structure of the interface with the predefined functions and added details.

Prototyping

To make sure that the concept and interaction pattern added value to the healthcare personnel prototypes were built to be shown and tested by doctors and other stakeholders. Similarly, the patients view was prototyped and tested with patients. The prototypes were made based on the developed and refined mock-ups and were made interactive using a prototyping tool called Invision. The different screens were first made in Sketch and then put together in Invision. The prototypes for caregivers were shown and tested on a laptop to resemble a user scenario at a healthcare centre. Similarly, the prototypes for patients were tested on a smartphone.

User test for caregivers

User testing was conducted to evaluate the functionality and experience of the concept. The first round of tests were formed as scenarios with a following case for the participant to solve. Participating in the test were four doctors with multiple years of experience from working in primary healthcare. Additional three other people with knowledge of design, usability and software development participated.

The participating doctor was introduced to the background of the project and then given a scenario. After assuring that the doctor had understood the scenario and introduction he/she was introduced to the case. The assignments were presented continuously after the participant had completed the previous one.

- Contact a given patient and set the time for a questionnaire to be sent in a week.
- Find the pending message in the interface.
- Contact another given patient but this time by sending a message instantly.
- Locate the patient in the interface.
- Identify and describe the symbols structure and details in the interface.

The participants were asked to think out loud during the process and afterwards a discussion was held to collect more information about the interface. The main goal was to evaluate the idea and the workflow to see if this will be valuable and a system the doctors could see themselves use.

Additional user tests were conducted after iterations of the design and prototype. The aim was to improve the workflow and get additional feedback on the look and feel of the concept. Five people, whereas two doctors, got to test the improved designs. The participants first got to see a darker version of an interface where they had the possibility to interact with it and try to contact a patient. The participants were asked to think out loud and describe how they interpreted the interface and what they thought about different menus, symbols and labels. After the first prototype they got to try a second interface similar in functionality and design, but where the colour scheme was lighter. The participants once again where asked to try out the interaction. During the test the test leaders were asking probing questions to get a better understanding of how the interfaces were experienced.

User test with patients

To evaluate the experience and structure of the patient view a user test was set up. Four potential patients tried out the two prototypes of the patient view. The test was initiated with an introduction to the service and in what situation they could imagine themselves to use it. Thereafter they were given a mobile device with the service. They were asked to think out loud as they navigated through the service and exploring its functions. The test was structured around three topics of discussion

- The impression - What feelings the interfaces evoked and what they communicated.
- The functionality - Would they use the function and does it seem understandable to them.
- The design - Are the joint design features appealing to the participant.

Designing interfaces

The design process was an explorative and iterative process with its base in the prior research of target groups and context. The process started with inspirational research of other interfaces for medical application and interface design in general.

To create an appealing and purposeful design for the caregivers and the patients the strategy was to create and iterate designs in a high pace. The design was constantly evaluated were nice parts were further developed and the ones that did not meet the desired goals were discarded. In the various versions different colour, symbols, structures, typography and proportions were tested to explore the full spectra of possible designs. When finding an appealing trait in the design it would be taken to a more detailed level.

To evaluate the detailed concepts, they were analysed on how well they expressed emotional values. Different word scales and words of expression were used as a guide to understand, in which direction the interface should go and what directions to avoid. A complete design with all its components should together contribute to a unified experience of using the interface.

RESULT FOR THE PATIENTS' INTERFACE

Below follows the result from phase three regarding the patients' interface. Results from caregiver interface are presented in the next section.

User studies of the patients

The Company see their users to be in all ages, however a majority of the users are midlife adults. Women are also over-represented in the service as of today. This is likely to depend on the fact that women more often seek care for their children. Also, females' health reasons for contacting healthcare can be suitable for the digital healthcare service the Company is providing today. The majority of the patients using the Company's service are using their smartphone, even though it is possible to access it from a desktop as well. The patients are in general very content having their medical contact in a chat format, yet they have chosen that way of communication themselves in the first place. Hence the ones who do not appreciate digital contact would have chosen a conventional way to contact healthcare and are therefore not represented in the statistics.

From interviewing patients, the general insight is that patients find it inconvenient to be in contact with the healthcare service. They experience long waiting in their first contact with their healthcare centre and if getting an appointment, it is likely to not be as soon as expected, according to patients. Generally, patients are worried and want a professional evaluation of their issue, waiting to get in contact are therefore frustrating. Many patients also claim to know what they want the outcome of the contact with healthcare to be, such as a prescription of a drug they are used to always take. Not being able to manage such cases in a fast and effortless process are below patients' expectations.

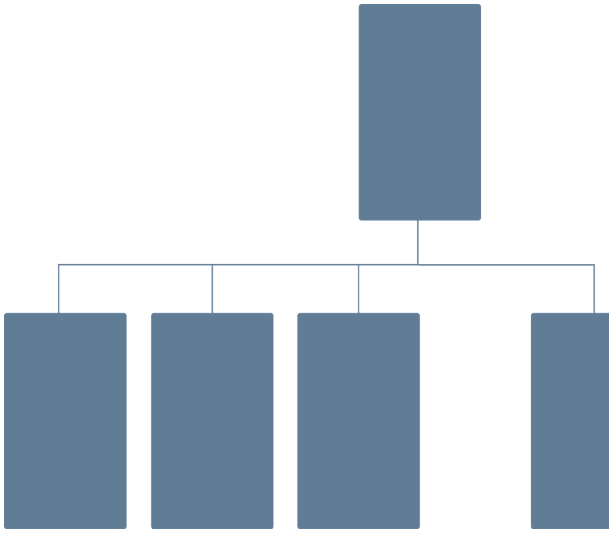
Doctors are experiencing their patients to be more worried today. They claim that patients sometimes demand to see a doctor for issues that do not need that level of care. Although, many doctors consider their role to include the task of informing patients of when to see the doctor and not. Doctors do also highlight the importance of giving individual care. All patients do not have the same ability to understand information, do self-care or they have different health background. Due to this the doctor needs to adapt the care to the specific patient and cannot have a standardized care process for all patients with similar issues.

The general citizen in today's society uses a smartphone and digital services in work, everyday life assignments as well as for pleasure and social causes. Digital services are ranging from social media, private baking to games and shopping. Hence people in general have experience from digital services and know what to expect from them in terms of functionality, experience and design. So even though digital healthcare is not as developed as digital services in other areas it is likely that the users will transmit their expectations from other services when using a digital healthcare service. A distinction from other digital services is, in this case, that a service for health care needs to be adapted to all since patients as a target group is very diverse. Also, patients have less possibility to choose what service to use when in contact with healthcare.

Function listing for patient view

After a deeper understanding of the potential patients and their needs, a list of functions regarded as important for the communication interface for the patient could be generated. These were both general functions that were a necessity, but also functions that would add extra value for the patients. The list of function can be found in the appendix IV.

System structure for patient interface



Due to laws and regulations (Socialstyrelsen, 2016) an interaction flow was created where no information regarding the patient and the reason for being contacted by the healthcare centre is revealed to others but the patient. Therefore, the interaction starts with the patient receiving a text message with a web link from their healthcare centre. The patient can then log in using his/her *Mobilt Bank ID,* which make the information only accessible to that patient. When logged to the web portal the patient can read the message that has been sent by their doctor or nurse.

A simple structure and interaction pattern for the patient was aimed for. By creating an interface with few actions the patient would not risk getting lost. The patient interface should have a home screen, which will include all functionality and menu options. It should also enable the possibility of having multiple digital treatments on going at the same time. For example, if the patient has multiple cases ongoing or if the patient is seeking healthcare for herself and a child.

Different menus were tested, which revealed different amount of information and with different placements. Based on the variety in digital experience in the target group it was decided that a menu should be kept simple and always show the options possible. The reason being that the patients should not be able to miss information.

To lower potential thresholds of using a digital healthcare service, the chat interface should be designed to look similar to other chat applications. This is so the patient can easily understand its functionality and to be able to use their previous knowledge from similar services.

To create a genuine interface with a human touch, the use of language and phrases were considered important. Also, images of the doctors sending the messages could enhance the feeling of a person to person conversation.

Design of patients' interface

Based on user insight, user testing on prototype and an iterative design process, the design for the patient view of the service was developed. A set of expressions was formulated as a goal for the design process. The design of the service should express itself to be caring to meet the patient worry and stress from being sick. It should also be easy going to lower the hiders for new users and meet the user demands of easy access to healthcare when they are in need of it. Also, the service will need to have a genuine feel to it, and reflect that it is two persons communicating and not reduce the service to an anonymous chat. Lastly the service should communicate that it is a new and convenient way to contact the healthcare service and should therefore look and feel modern.

Similarly, word scales were used as a way to guide the design decisions. For example, the interaction should feel personal but not private, and the patients should feel seen but not as they are being monitored.

The process primarily resulted in a large set of different structures and designs of a first page of the service (see figure 3.2). The ones that best reflected the set of expressions was taken to further development iterations were made with different colourings proportions and typefaces.

In the same way as described in phase three, Design for all, it is important that the interface is designed to be accessible for all users.

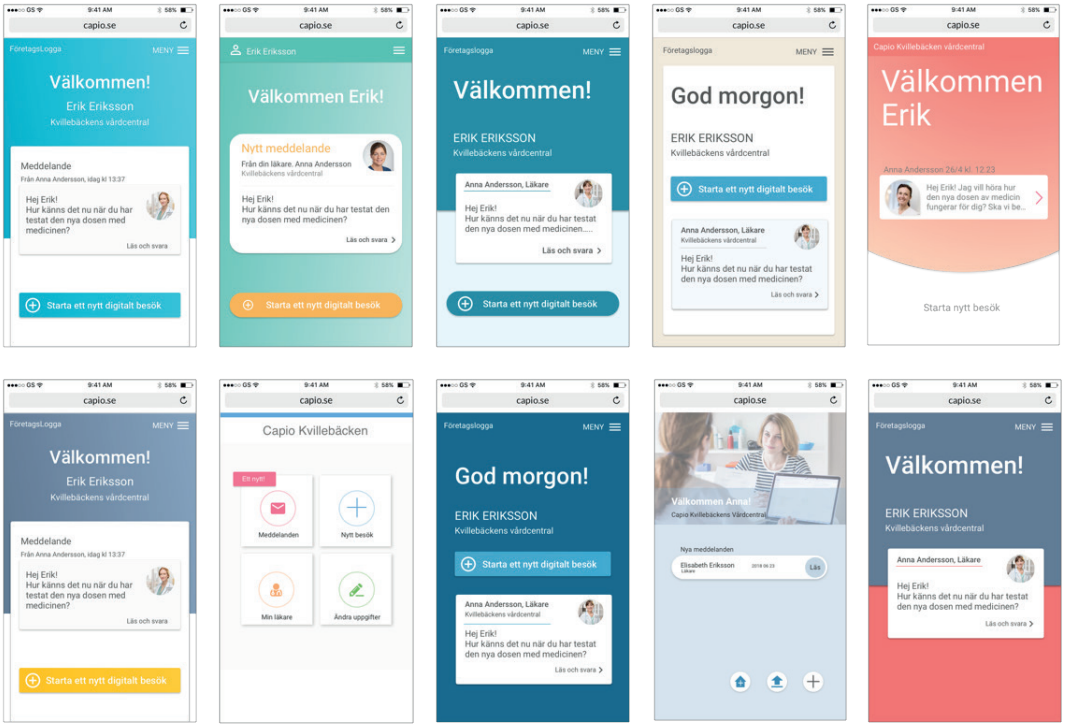


Figure 3.2 Design exploration

Prototyping the patient view

Two prototypes based on the defined list of functions but with differences in design and details were built to be tested with users (see figure 3.3 and 3.4). The prototyping revealed insights on logic structure of the functions. It also brought up discussion about how much and what kind of information that could be presented to the user at the same time.

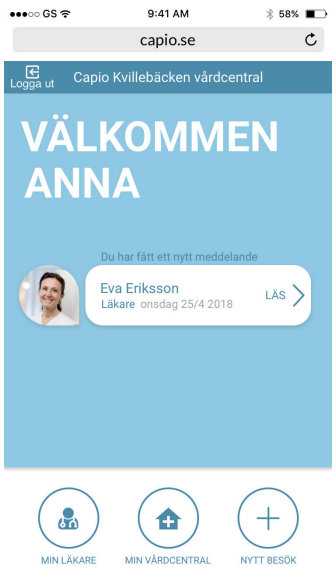


Figure 3.3 Prototype one

Figure 3.4 Prototype two

User tests with patients

The tests of the prototypes revealed that people's associations with the different elements in a design is highly relevant to consider in the development of the design. Prototype 1 (see figure 3.3) was experienced as caring and kind whilst prototype 2 (see figure 3.4) was experienced as professional and accurate. Since all of these expressions were desired a mix of the design elements and functionality from the prototypes could lead to the desired expression. Another insight from the user test was that too much green in the colour choices lead people to think of a dental care rather than healthcare.

Refinements

After the user tests the design and layout was iterated and a new version of the interface was created (see figure 3.5). The best features of each of the prototypes were used and then mixed together to create an improved interface. Different placements of the menu, wording and symbols were explored and tested to find a concept, which embodied the desired expressions. To place the menu at the bottom of the screen made it accessible, and a central placement of the message box made it prioritised for the viewer. Differently weighted text was tried out and found to provide a more expressive layout.

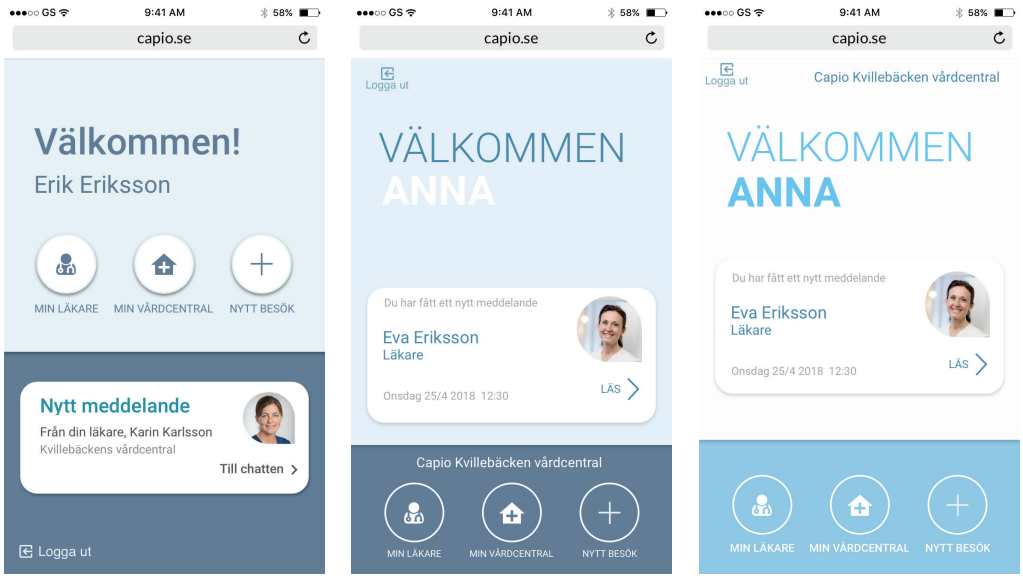


Figure 3.5 Refinements and exploration of details and design

RESULT FOR CAREGIVERS' INTERFACE

Below follows the result from phase three regarding the caregivers' interface. The result is a development of the concepts from phase two were follow ups was decided as the main focus for communication between healthcare personnel and patients.

Workflow

An alternative way of working with follow ups was developed that will minimize the time for the healthcare personnel doing the follow up (see figure 3.6). The thought behind it was that a doctor or nurse will already during the patient appointment know that they would like to do a follow up of the patient. They can therefore ask the patient if he/she would like to get their follow up digitally, and if so ask for the phone number and the patient's consent to use it. The doctor can then in connection with the appointment write down the questions they would like to ask the patient in the system. Thereafter the doctor can decide when he/she want the follow up to be sent out. The doctor does not have to do anything else until the questions have been sent out and the patient has replied.

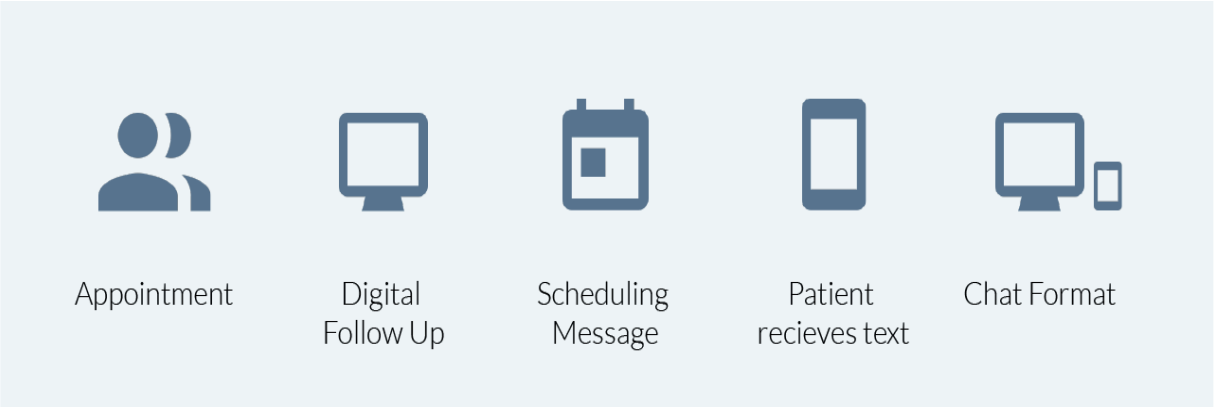


Figure 3.6 The workflow

Function listing

To be able to make a structured and well thought through design, a listing of all potential functions was created. The list included both general and specific functions of the whole system and the workflow of following up patients. The list can be found in the appendix V.

Structure of system

Based on the research, effort was put in to develop and change the current system of the Company to a system that is more suitable for the daily work at healthcare centers. Therefore, the whole system was taken into account in the design process although the main focus has been on developing the interaction pattern of doing a follow up of a patient.

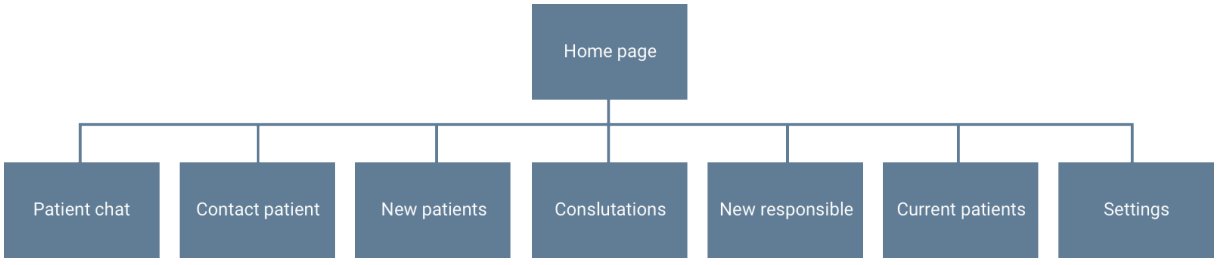


Figure 3.7 Structure of system

The new system was developed to be flat, where all main pages can be reached from the home page (see figure 3.7). With the reason for it to be easy to use and hinder the risk of user getting lost in a hierarchy.

The main pages were located together and where decided to be kept in a sidebar menu at the left of the screen (see figure 3.8). This was due to the fact that this is a conventional way of navigating and it should be kept simple (Cooper et al., 2014). The menu of the current system includes shortcuts to different patient chats for easy access when changing between patients. These shortcuts were shown to be popular amongst doctors and was therefore decided to be kept, although the placement of them were tested with different prototypes.

Other functions such as search, settings and user's current mode was placed at various places before settling for a placement at the top of the screen. From there they will not be in the way for the user but they will still always be accessible.

Figure 3.8 Menu placements

Lists

The current patients that the doctor or nurse is working with was decided to be kept in a list format. This since the patient information is most suitable to be displayed in a list. Different types of lists were tested until a final one could be decided. The prioritisation of the patient information was also tested to get a list that has a good overview and is easy to understand and comprehend.

There was also a decision to keep all patients that one doctor is treating in the same list. Previously there were different options where patient who had contacted the healthcare centre themselves were in one list, and the patients who the doctor had contacted for a follow up was in another list. Although, to keep it simple all patient that one doctor is treating will be in one list. A marking will show if it is a follow up patient or another patient.

How to contact

Different ways of how the doctor could contact a patient were designed. The two main options were to do the procedure in a chat interface or through a form. The later was chosen for the finalization. This since a form only contains the necessary parts of contacting the patients and do not have all the extra information a chat interface may contain. It was also easier to prioritise information and guide the user through a form. Different ways of structuring the form were made into prototypes and tested.

The home page of the system was decided to contain the list of the caregiver's current patients, since this list was regarded as the most important list when working at a healthcare centre. Depending on how the work day will look at the healthcare centre there will be different ways of working in the system. Although the doctor's own patient will always be the most important ones and should therefore be the first list that is shown in the system. Different ways of working will also affect how new patients are taken care of. Some healthcare centers might have a nurse who is triaging the patients and then assign them to the doctors while other centers might have a list of new patient and each doctor and nurse picks from that list. Since it was not yet decided how the system would work this question has been left out of the scope of this project.

Integration with other system

Since there was a decision in phase two of trying to limit the integration with other systems, the concept should be a standalone system. Although after evaluation it was decided to have one integration with the public record system. It is a Swedish organisation, which register all Swedish citizen and where they live. By having an integration with the public records, the system can check the personal identification number and give back the name of the person it belongs to. This will work as an extra verification for the caregivers so they can make sure that they have typed in the right personal identification number.

Interaction pattern

Idea generation and discussion with doctors lead to the development of an interaction pattern for doing a follow up of a patient. The pattern starts with a link from the home page, which lead to a contacting form where all the details can be filled in. The message can then be sent to the patient right away or be scheduled for a later date.

Different options were tested of where the message should end up after it has been scheduled. It was decided that it is important to have a designated area of where the message can be found if there is something that needs to be changed or if the message needs to be cancelled. If the message is sent out right away it ends up at the bottom of the list of the doctor's current ongoing patient.

Chat

The chat interface was chosen to be kept in a similar way as other chat interfaces. This was to minimize the threshold of learning and understand how to use it. The chat interface should clearly focus on the patient and create a feeling of human interaction. The patient questionnaire should be easy to find and read. The same important for the toolbox of different settings and actions that are related to the chat. These should be in close reach of the chat and displayed with icons and text to be easy to distinguish and understand.

Some functionality was also added to the chat. For example, the possibility to write own notes for the doctor/nurse about the patient was added, together with the possibility to mark a patient as important if the personnel want to keep an extra eye on a patient.

Prototypes of caregivers' view

Based on the defined functions and the overall system structure paper mock-ups and digital mock-ups were created of different design ideas. These designs were then evaluated and a few versions were chosen as a design for a digital prototype to test the interaction and workflow.

The prototyping process was iterative and multiple prototypes were created and tested during this phase. The early prototypes were mainly built to try out the interaction pattern and to get an understanding of

how the system could work in reality. The later prototypes were more focused towards design and the look and feel of the system.

User tests with caregivers

The participants liked the prototype (see figure 3.9) and the interaction pattern of contacting a patient. All four of the doctors saw a potential to use this tool in their daily practise and all said that they would want to use it. For example, they saw potential in using it as a communication tool for young adults with mental health problems or for more personal follow up were a standardized template is not suitable. They also agreed that they would know during a patient appointment that they would like to do a follow up. Therefore, they confirmed that schedule the feedback for later during, or right after the meeting with the patient would be a good way of working.

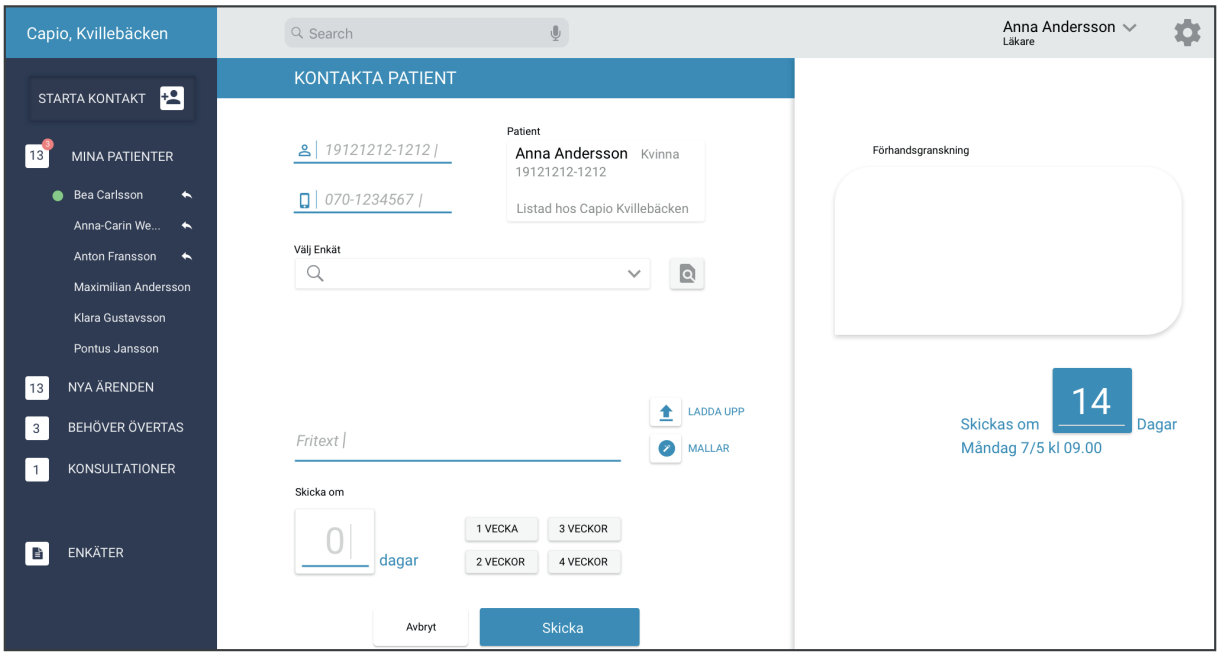


Figure 3.9 First version of cargiver's interface

The participants also had some suggestions of changes that could be made. The most common suggestions were labelling of certain buttons or items, and the meaning of some symbols. Several of the doctors mentioned the same labels and symbols as objects that they did not understand or wanted to change. After the first round of tests a lot of information had been collected and new information started to decrease. It was therefore decided that the number of tests were enough to get the most important information for the first round. The feedback from the doctors initiated a few changes and improvements to the design and details in the interaction pattern.

For the second round of test the design and look and feel had a bigger focus. The participants liked both designs (see figure 3.10) and said that they felt professional, comfortable, modern and easy to use. They felt that it was the right amount of information displayed without feeling packed. Although the majority preferred the darker interface since they thought it made it easier to prioritise on different areas on the screen.

During the test useful information about the interaction and comprehension of the interface got revealed where some labels and symbols were confusing and should therefore change. The participant also had some input of extra features that could be added, for example the possibility to add notes for personal use when sending out a follow up to a patient. It also became clear that different users prefer information

differently. Where some thought a symbol together with text is excessive information others liked the fact that both existed. Overall all the participants enjoyed the interaction with the interface and said that they would enjoy using it.

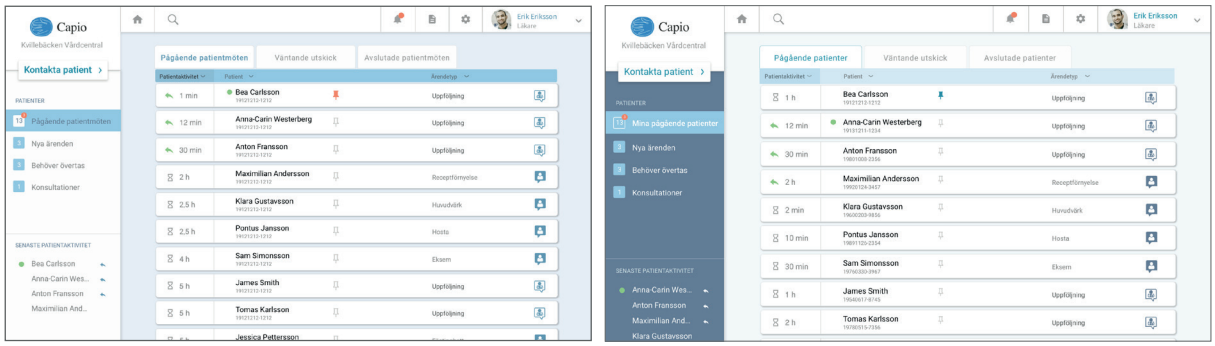


Figure 3.10 Caregiver's interface in light and dark version

Design of the caregiver's view

Based on the research and understanding of the target group a set of words were collected to guide the design process. The interface for the caregiver should communicate an easy-going and caring feeling. The interface represents a new step in Swedish primary care and should therefore have a modern feel to it, however the most important is that the caregiving process feel genuine and let the human contact shine through the digital interface.

Colour

Colours were found to be an important aspect when creating anticipations of a product. From analysis of current healthcare interfaces, user testing and quick mock-ups the conclusion was that main colour scheme should come from hygienic colours such as green and blue with white and light grey. This colour combination will reflect healthcare and the professionalism it stands for. Mock-ups, which used a contrasting colour for smaller details to make them stand out were shown to be successful. It was therefore decided to use contrasting colours for details that were in need of special attention.

Differentiations in colour were also used to bring attention to different parts of the interface. Especially light and dark shades where used on different objects and menus to create natural areas of focus.

Design for all

The design of the interface needs to be inclusive since it will be used by different people in various ages and with different needs and potential disabilities. The wording and medical terms should be similar to the ones medical healthcare personnel are used to work with to minimize the risk of misunderstandings. The symbols that have been chosen for the interface are often commonly used symbols to minimize the risk of interpreting them in the wrong way. They should be accompanied with a text label or a tool tip for them to be easy to comprehend. Where a symbol or field changes state this is shown both through change of colour and shape/text. This to make it understandable for people with colour-blindness.

Emotional design

Effort was put into creating an interface that values and shows the human interaction between healthcare personnel and patients. This was mainly done through wording of the interface, display of patients and the design style of the interface.

INSIGHTS TO BRING TO PHASE FOUR

The third phase describes the essentials for the design process that has taken place in the project. By complementing research, the user needs of a digital healthcare tool could be defined. This result together with prior research lay the foundation for a function listing for both caregiver and patient view.

For the caregiver one of the most important aspects to consider is the digital tool's integration in the workflow on the healthcare centre. The main finding is that regardless of the specifics in the final design the amount of occasions the caregiver has to administratively interact with a patient needs to be limited to a minimum. The result therefore suggests that follow ups should be made in close connection to the previous meeting with the patient.

The prototypes that were developed according to the defined functions and to fit in to the workflow were tested with users. The test, both for caregiver and patient, confirmed the need of the functionality and the main interaction flow. The tests also revealed deficits in details that should be updated for a better result. It mostly regarded symbols, labelling of menu items and distinction between elements in the interface.

The chapter also defines the vitals of design in the interfaces. To conclude, the interfaces need to reflect the human conversation that is going on through the interface and should therefore have a personal, genuine and caring feel to it. Also, the service represents a new way of working in primary care and should therefore look and feel modern. How these emotional values are achieved is slightly different for caregiver and patient but generally the use of clean typography, rounded shapes and a selected set of blue shades and white has been lead for the desired values.

04.

PHASE FOUR

THE FINAL RESULT

Phase four shows the final result of a digital communication tool between healthcare personnel and patients. From the advantages of doing follow up, through a user scenario and workflow to the final design and details.

INTRODUCTION TO FINAL RESULT

Based on understanding of the structure of Swedish primary care and the daily operations of doctors and nurses, the developed tool is set out to enhance care for both patients and caregivers (see figure 4.1). By making it easier to communicate the solution is approaching one of today's primary cares most apparent issues, getting information out in a safe and efficient way. The developed tool will make contact with primary care more convenient for patients and caregivers and will enhance medical quality, patient experience and make caregiving more efficient. By transforming analogue communication ways in to the digital channels the tool is matching the standards in the today's digitalized society and reflect the quality and professionalism of Swedish healthcare.

Following up patients is an efficient and a safe way of working. The caregiver can examine how a symptom is evolving over time and by doing so reduce prescriptions of medication and set more accurate diagnosis. Further the patient's experience of primary care is likely to be enhanced if the caregiver is assuring their medical condition and putting effort in to medically assist them throughout their period of illness. This process works well in a digital medium with asynchronous communication.

Figure 4.1 Overview of final result

USER SCENARIO

A scenario will be used to bring a good understanding of the interaction pattern when doing a follow up. Both text and images are used to present the scenario.

During a visit at the healthcare centre

The doctor Eric Lindh is meeting with his patient Anna Johansson to discuss her worries of having pneumonia. Eric can confirm Anna's worried by listening to her lungs and hearing her describe her symptoms. He therefore prescribes her with antibiotics. Although, because of Anna's severe condition Eric would like to follow up on Anna in a few days to see that she is recovering normally. He therefore

asks her if she would like to get a digital follow up. Anna think this is a great idea since she will not have to come back to the healthcare centre again. Anna gives Eric her phone number and consent to use it.

Opening the system

When Anna has left Eric opens up the system he uses to have digital contact with his patients (see figure 4.2). On his homepage he can see a list of all patients he is currently in contact with. Both the ones that have contacted the healthcare centre on their own and the ones that he himself has contacted for a follow up from previous appointment. Eric clicks the "Contact patient" button in the left menu to schedule a follow up for Anna.

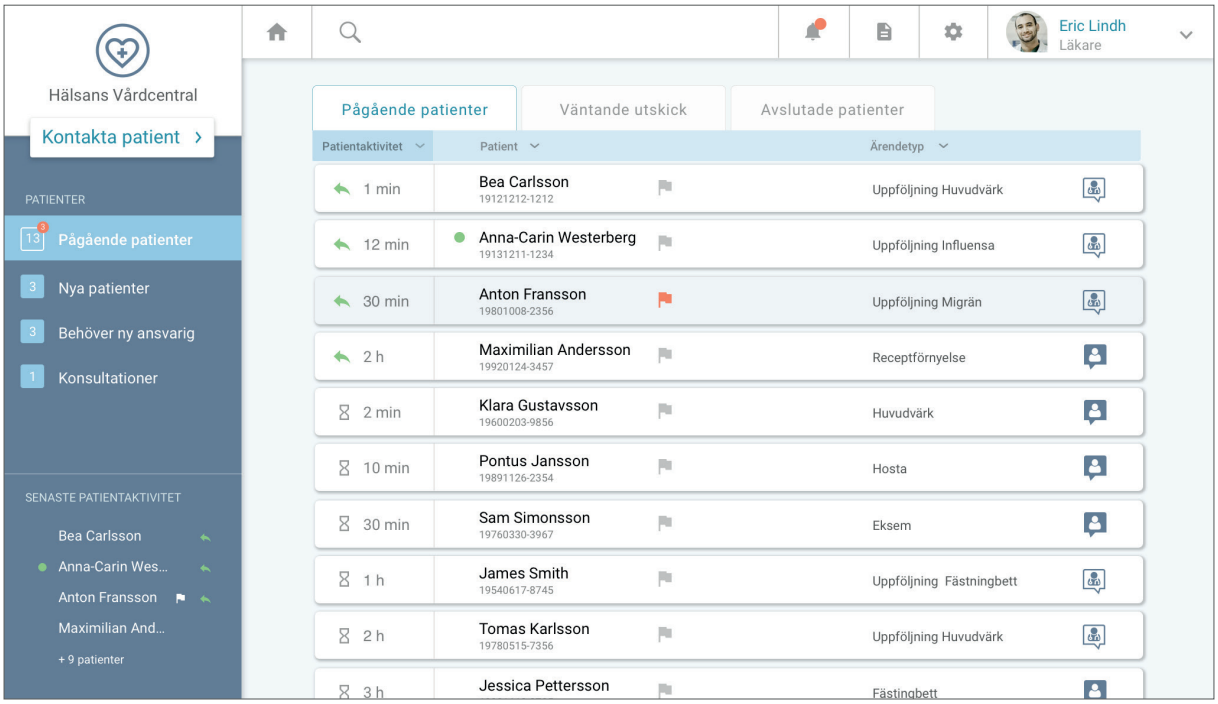


Figure 4.2 Home page of caregiver's interface

Contacting patient

A form appears where Eric first needs to fill in Anna's personal identification number (see figure 4.3). A connection between the system and the public records system generates Anna's first and last name and shows that she is listed at the healthcare centre. The integration with the public records system works as a confirmation that the right personal identification number has been entered. Thereafter Eric enters Anna's phone number as the chosen mean of communication. It is also possible to add an email address if Anna would prefer to get the link to the chat via email instead.

When the contact details have been entered it is time to write the follow up. Eric can choose if he would like to send a smart questionnaire to Anna about her symptoms or if he wants to write a message. Eric decides to do both. He adds a questionnaire from the database and thereafter writes a personal message to Anna. He uses one of the template that are available to speed up the writing process. To make sure that he picked the right questionnaire Eric clicks the preview icon to get an overview of the questions Anna will answer. Thereafter he schedules the message to be sent to Anna after 3 days. If Eric wants to he can also write a personal note for himself as a reminder of the reason for the follow up. The note will be visible to Eric when opening up Anna's chat.

To the right side of the interface Eric gets a preview of how the message will look when Anna receives it. He can also change the title of the message if he would like. He clearly sees when the message will be sent and at what time. When he is finished he presses send.

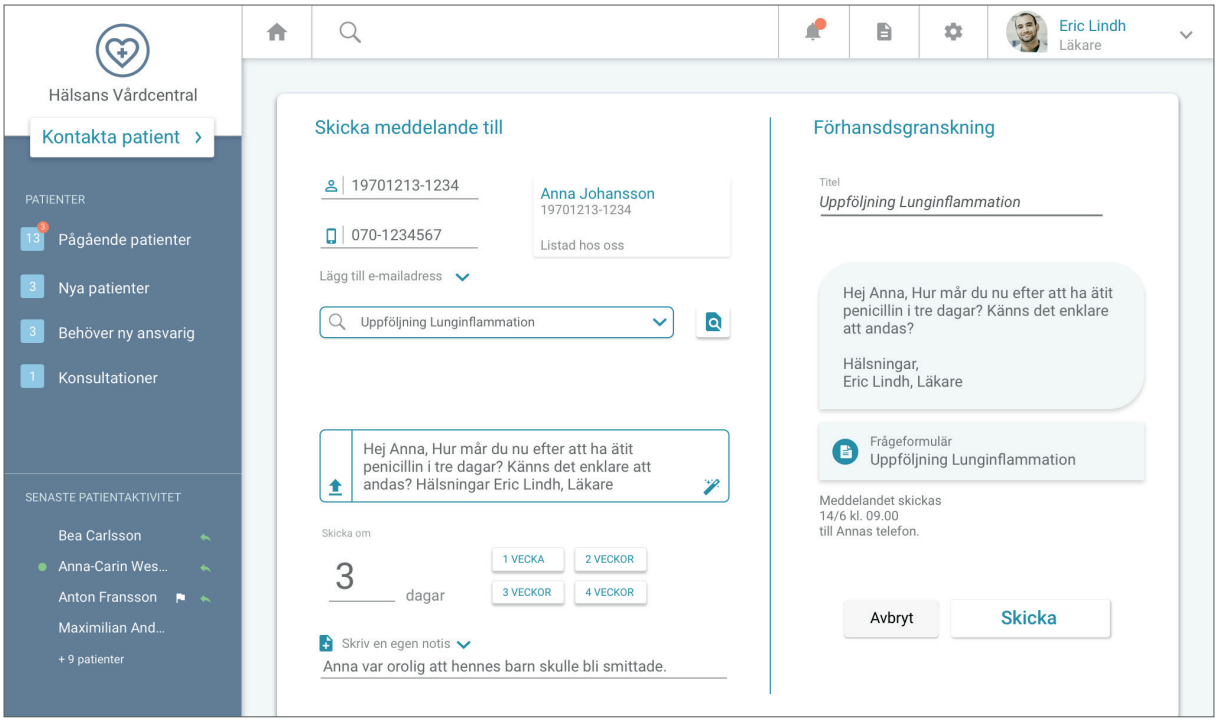


Figure 4.3 Filled out contact form

Sending and waiting message

After pressing send Eric gets a confirmation that the message has been scheduled and that it will be sent after 3 days (see figure 4.4). It also tells him where to find the scheduled message if he would like to do any changes to it.

As a sub menu to "Current patient" is "Waiting messages". Here Eric can see when his scheduled follow ups will be sent out. He can also make changes to them or delete them if they are no longer valid or necessary.

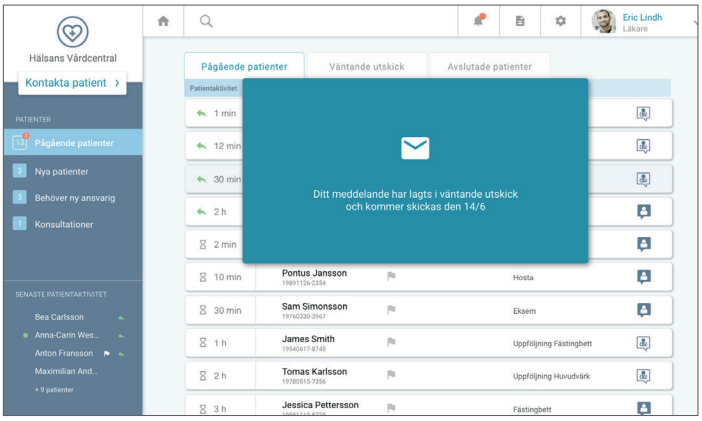


Figure 4.4 Sent message confirmation

The patient's view

Three days after Anna's appointment with Eric she receives a text message stating that she has a message waiting from her healthcare centre. She is currently trying to get her kids to school so she waits until they have left to look at it.

When her kids have left for school Anna goes to sit down and read the message. She clicks the link in the text message, and by using her personal identification number and *Mobilt BankID* she can securely login. She is greeted by a home screen showing a message saying that she has received a message from her doctor Eric Lindh regarding her pneumonia (see figure 4.5). She also has links to more information about her healthcare centre and about her doctor Eric Lindh. Additionally, she can start a new digital appointment if she has another issue that she needs help with.

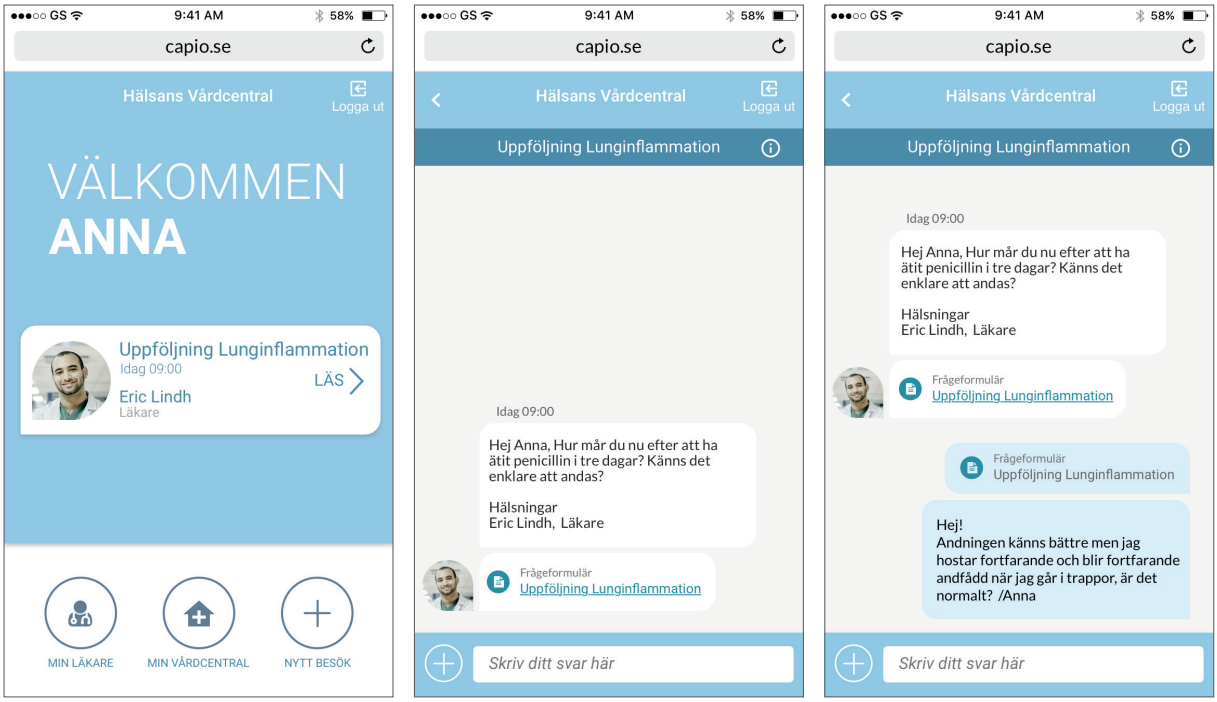


Figure 4.5 Patient chat sequence

Anna clicks on the message to reveal the chat interface. Here she can read the message Eric has sent her and answer both the questionnaire and the additional questions.

At the healthcare centre

Eric is currently taking care of physical patient visits. Each hour he has 15 minutes set aside to take care of his digital patients. When he login to the system with his digital patients he can directly see in the list on his home screen who has answered since he was working the last time. In the list the green arrow together with the time shows him, which patients he should start with. The green circle indicating that a patient is still active, which makes it easy to prioritise who to answer. Eric sees that Anna has answered and she is still active, he therefore decides to start with her.

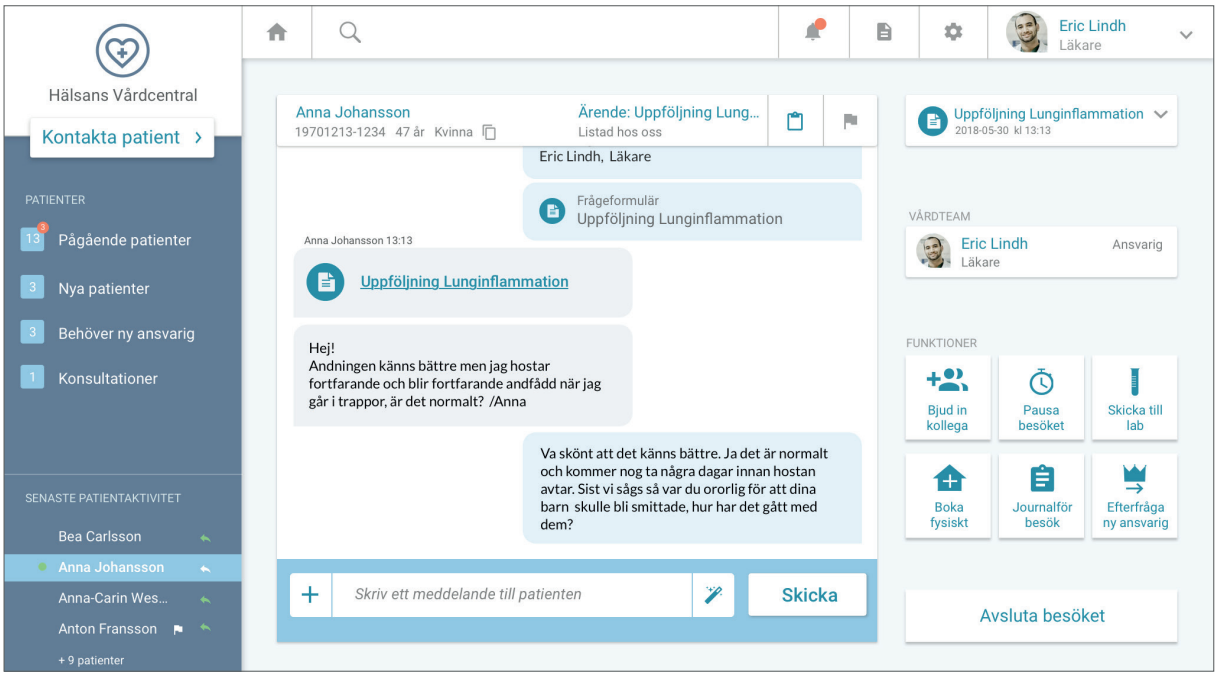


Figure 4.6 Caregiver's chat view

When Eric clicks on Anna he directly goes to the chat interface (see figure 4.6). Here he can read the answers Anna has given in the questionnaire, he can also see her written answer in the chat. With the information he can make a decision of what the next step should be in Anna's treatment. Either it could be a new physical visit, a new digital follow up or if everything is fine he can end the follow up.

THE ADVANTAGES WITH THE WORKFLOW

With the procedure described the medical personnel will spend a minimum administration time to do a follow up. The message will be sent at the predefined date and time and the caregiver will not be notified until the patient has answered. This will eliminate the trouble with patients not answering and caregivers forgetting to follow up as mentioned in the user study. Most importantly it reduces the number of occasions the caregiver needs to handle a patient. The amount of small tasks, such as bookings, follow ups, signing and prescriptions is massive for a caregiver. By eliminating this in the following up procedure the new system can enable a stress free and streamlined process.

At the set time the patient will receive the message from the doctor and can, in a self-decided pace, describe the current health status and what they expect from a continued healthcare process. The caregiver can then evaluate the health status of the patient and suggest if or how the medical contact should continue on an individual basis. If another physical appointment will be needed it can be prioritized and scheduled by the caregiver and the patient will not need to go through the process of making a new appointment again. Yet in many of the follow ups made today the patient are not in need of more care and the case can be closed. The ones that cannot are often suitable for a digital caregiving process, and are therefore preferably initiated that way.

Since the patient is present at the appointment when the doctor decides to schedule a follow up the caregiver can evaluate if the patient is capable to handle communication digitally. The caregiver can also ask for permission to use the patient's telephone number for medical contact, which is required by regulations.

Asynchronous follow up is also beneficial for the patients. It saves time and becomes more effective when the follow up can be done remotely without the patient having to visit the healthcare centre. The patients can feel calm that they know that their doctor will be in contact and that the patients can then answer when it is suitable for them. The process of follow up will also provide the patients with a more secure and followed through healthcare.

Edge cases and different type of use

The tool for contacting a patient has been designed to be flexible and can therefore be used for other reason than follow up. For example, a doctor can send information to a patient during an appointment. This can be useful if the doctor feels that the patient is not capable of remembering instructions in that moment or if the patent is worried and needs more information to read at home. The caregivers can also upload and send documents to the patients, such as links to other website with health related information, for example 1177.se.

If the doctor treating a patient is unsure of the patient's symptoms, or needs consultation, he/she can invite other personnel to the chat. This could for example be other General Practitioners, psychologists or physiotherapist. This enhances the healthcare treatment and collects all personnel working with the patient in one place. Which is beneficial for patients that require a more advanced treatment with caregivers of different professions.

A digital follow up or treatment can be paused by the caregiver if necessary. One example could be if the patient needs to go and do tests at the lab and the doctor needs to wait until the results get back, to be able to decide what the next step should be in the treatment. A doctor could also decide to pause a visit if the patient needs to get a referral to another health instance. The doctor can then keep the paused chat in the list to be able to check on the patient to make sure that the patient got a booked appointment at the other health instance.

The developed system is designed to enhance the workflow of caregivers at the healthcare centers. When implementing the system, it is important to show the advantages of the developed workflow to the personnel to get the best effect out of the system. Since it is designed to be flexible it can be used for more type of communication than just follow ups, as described above. The healthcare centre independence is important and therefore they will have the possibility to set their own preferences and adapt it to the centers demography, capacity and personnel.

It needs to be clear for both patients and caregivers what is required of them. For example, how long it can take before an answer should be expected or during, which opening hours it is possible to have a conversation. These are aspects each healthcare centre needs to decide for themselves.

DETAILS

Apart from the functionality and design described in the user scenario above, there are several other interface details that have been developed, which will be described in this section.

Interface for caregiver

In addition to visual functionality there are guidance and ques in the interface revealed by movements in the interface. There are tooltips included in both type fields and when hovering over symbols. When pressing buttons, they will provide visual feedback, assuring the user that they have pressed the button. The cursor will also change if hovering over buttons or type fields.

Lists

- In list views the caregiver has the possibility to mark patients with a flag (see figure 4.7). The marking also makes the patient bar slightly grey to make it stand out among the others. This function can be used for patients with alarming symptoms or patients requiring special action.
- For patients that have not been answering for a long time the hourglass will turn into an alerting orange colour to notify the caregiver.
- In the top of the list the caregiver can also see closed cases in a separate tab. This can be used if the caregiver needs to go back and search information.

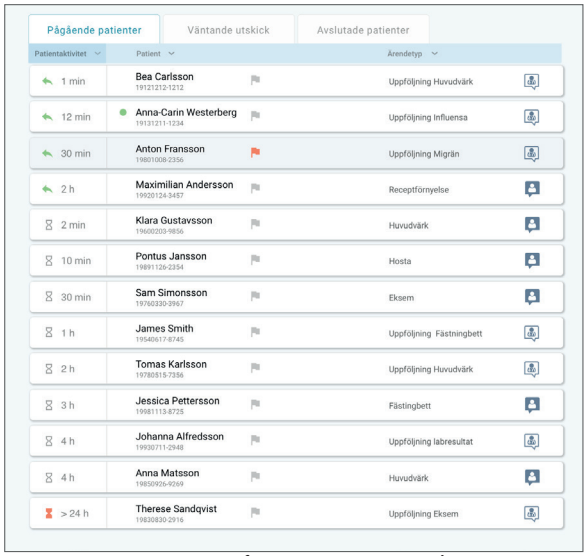


Figure 4.7 List of patients in caregiver's view

Top bar

- In the top-bar there a search function that can be used for searching for patients, medical issues and functionality (see figure 4.8).
- There is a notification bell symbol in the top bar. If the user hovers over the symbol a drop-down menu will be visible and in an informative way tell the user important news in the workflow. What the user will get notified regarding will be decided from his/her own preferences and can be modified under settings.
- The top bar also includes a questionnaire library, in which the caregiver can get previews of the questionnaires to assure what questions the patient will be asked.
- Beside the questionnaire library there is a settings symbol. In the setting mode the user can adjust his/her preferences for the functions in the interface, such as notifications and templates.
- A user can take on different roles in the interface and get different layouts depending on the role. This is made by hovering over the profile picture in the top bar and then selecting the role wanted.
- Under the profile picture there is also a sign out button.

Figure 4.8 Top bar in caregiver's view

Left menu

- To the left in the interface is the menu with links to all parts of the interface with different groups of patients (see figure 4.9).
- At the top the name of the healthcare centre is displayed
- The contact patient button is clearly displayed and will take the user to a new page for starting the contact
- At the bottom there are fast access links to the patients who have recently been writting

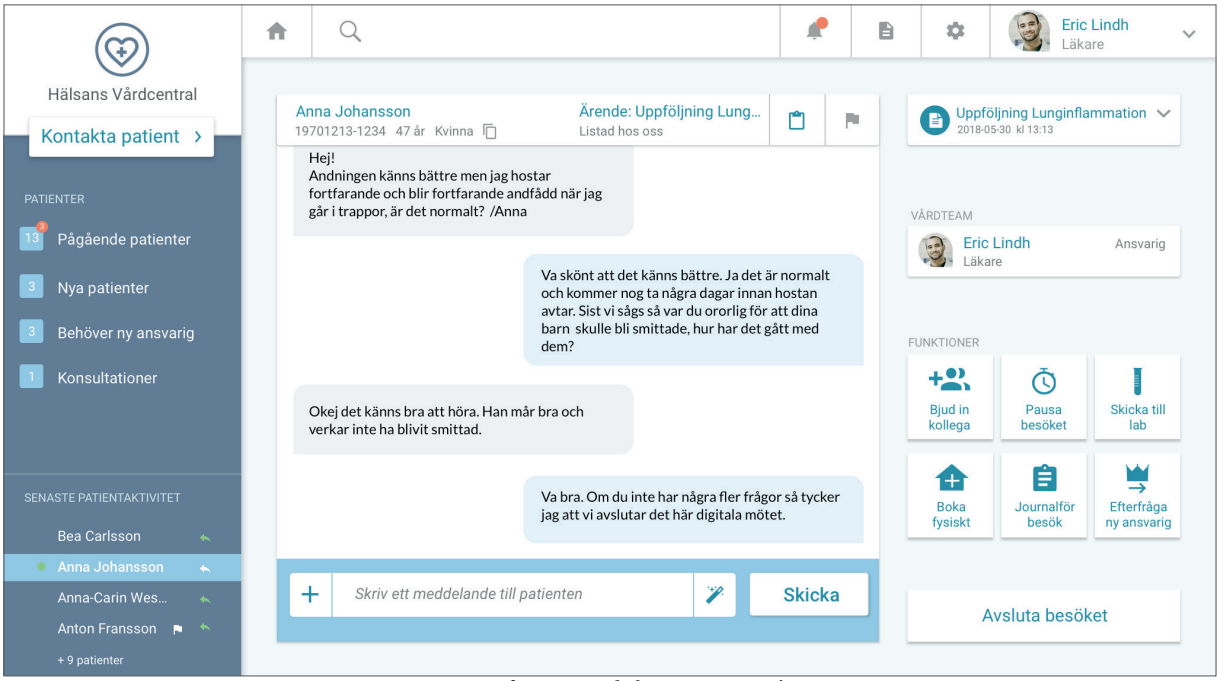


Figure 4.9 Left menu and chat in caregiver's view

Chat

- When having sent a message the caregiver and the patient still have the possibility to edit the message, but the receiver will be able to see that it has been edited and if wanted also read the un-edited message. This to keep a clear communication and reduce misunderstandings.
- The caregivers will have the possibility to upload images and files to the chat.

Interface for patients

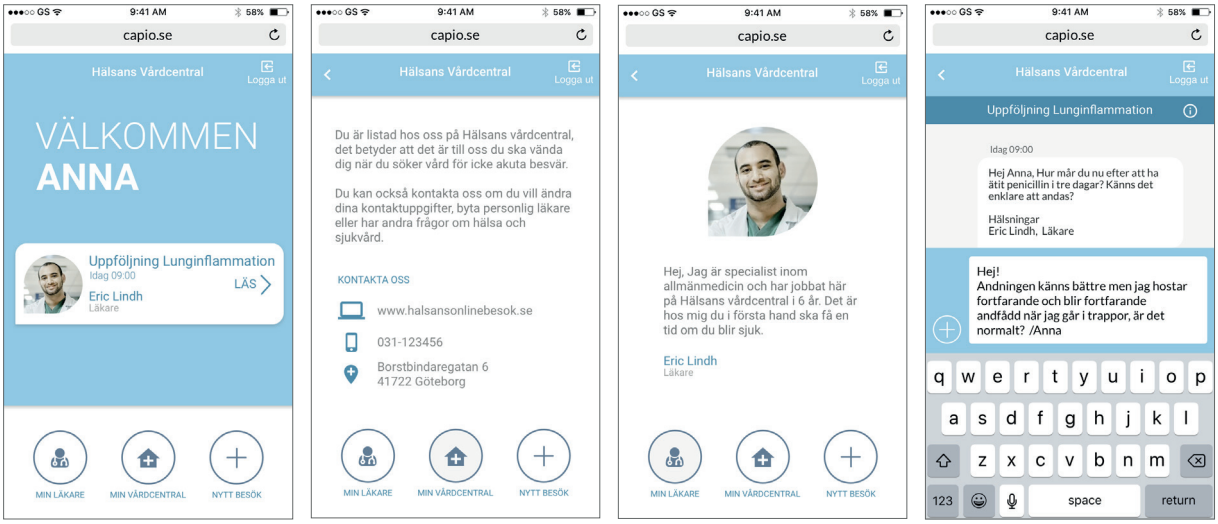


Figure 4.10 Details in patient's interface

Homepage

- At the top, clearly stated, which healthcare centre the patient is in contact with (see figure 4.10)
- Welcoming headline with the patient's name
- Notification that a message has been received, clearly showing the topic and who has sent it with both image and name.
- At the bottom, access to more information about the doctor, information about the healthcare centre and the possibility to start a new digital appointment.
- At the top, quick access to logout.

My healthcare centre

- Shows information about the healthcare centre and what it means to be listed at a centre.
- Showing opening hours and other ways to contact the centre.

My doctor

- Short description about the patient's doctor with an image

Chat view

- Showing the topic of the follow up
- Information icon showing information of what to expect of a digital appointment
- Possibility to send files in the chat
- The patient will have the possibility to require a new way of communication from the chat view. This can be used if the patient realizes that the issue they want to describe is hard to do in an asynchronous format.

DESIGN OF THE FINAL INTERFACES

Structure caregiver

The caregivers interface in structured to be easy navigated and give the caregiver the right information at the right time (see figure 4.11). The interface has a flat structure and have a strictly limited amount of pages to eliminate the risk of getting lost. By building the system from conventional elements with a left column menu, tabs and clearly clickable items the system will be easy to use even for a caregiver with limited digital experience.

Structure patient

Similarly, the patients' view is a flat system where the chat and messages from the caregiver is the central part. In addition to the message the patient has information about the healthcare centre and the doctor. This for the purpose of providing information at the right time but also to build trust and to create a connection to the patient's caregiver and healthcare centre.

Design style

The caregiver's view has a wellstructured and organized design. Buttons in the workflow is shadowed to visualize that they are clickable, and make them call for attention. In contrast, buttons in the top bar has a flat design, this makes it possible to always have them shown yet not take attention from other functions. Helping the user to separate between different tasks do not only simplify the workflow but also contributes to an appealing design.

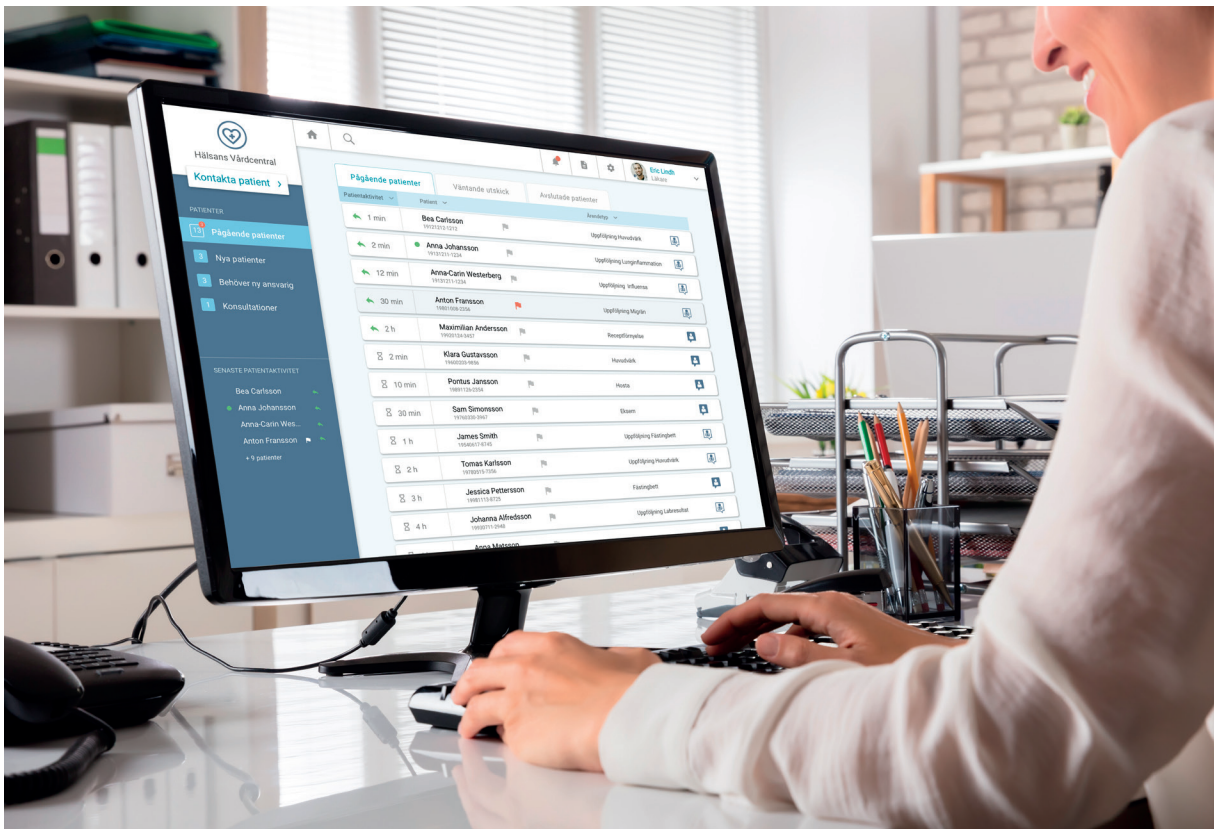


Figure 4.11 Design of caregiver's interface

Contrasts are used in the interface to help the user to distinguish between interface elements. However, the contrasts are consistently made soft to keep a calm and clean impression of the interface. Another design feature used to keep a pleasing effect is alignments of elements. In the interface elements are aligned to the extent that the interface has a clear layout, yet there is some asymmetry to catch users interest. Symbols and text are placed and sized to allow whitespace around them. The white space around items gives a more delicate impression to the design and an overall airy look. The upper left corner is kept white to allow for each caregiving company to place their logo and state the name of the healthcare centre.

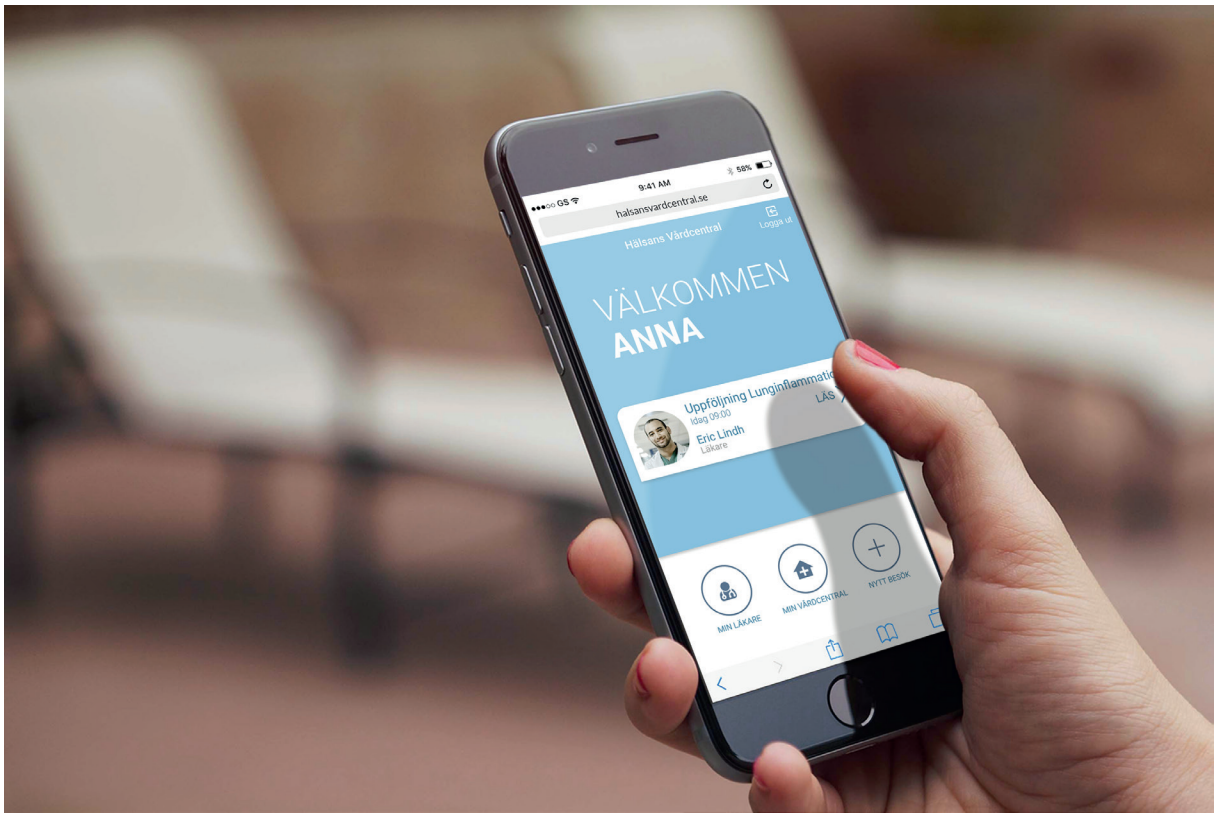


Figure 4.12 Design of patient's interface

The patients view does not use shadows for buttons or chat, apart from the message notification on the home screen (see figure 4.12). This is because the message notification is the most important item for the user. The flat and clean design will give a modern and simplistic look, that reflect that it is a healthcare tool.

Buttons and the message notification are proportionally large. This in combination with lack of other information will make the interface communicate that it will be easy to use, and facilitate for those users having issues with finger precision.

Contrasts are slightly harder in the patient view for a set of purposes. Firstly, the patient will not work in this interface and will not experience the same learnability as healthcare personnel would. Also all user need to be able to handle the interface and a distinct contrast could facilitate for the ones with visual impairments. In the user tests it was also shown that the sharper contrast contributed to a professional impression of the caregiver and healthcare centre.

An appealing design of the interfaces has a purpose in itself. Being aesthetically pleasing will contribute to a pleasing workday for the caregiver as well as a pleasing healthcare contact for the patients. Communicating feelings as easy going and genuine in the design can also affect the interpretation of the messages sent through the system with these emotional values. Only initial testing of the designs effect on users

has been done in this project.

Humanized design

The interface is set to be a professional and efficient way for caregivers to communicate with their patients. Yet to reach the high level of care aimed for, and to meet the expectations of the patients the caregiver needs to keep the relation and communication language they would use in a physical meeting. To highlight that it is a caregiver - patient conversation the patient name is clearly highlighted in the interface. Also the interface is built by rounded shapes, kind symbols and colour scheme to represent a kind and caring feeling.

The patient interface also has the rounded shapes but is a bit more colourful and light to give an easy going, modern, and genuine experience. The design elements are together building a trust and reflecting genuine conversation by always showing the caregivers profile picture and name. The title for the follow up is always visible to the patients to assure them they are in the right chat. Also by always keeping the healthcare centers name in the top bar the patient will subtly feel a connection to the physical healthcare.

Colour scheme

The blue colour scheme of the interface is chosen to represent and communicate healthcare (see figure 4.13). The caregiver interface is overall light with a darker contrasting left menu, since the contrast will make it easier for the user to focus on the different areas. A lighter more coloured blue together with a darker blue-green colour are being used as a call to action colours. A lighter red-orange colour is being used as an alerting colour that calls for attention for important tasks and actions. A lighter green colour

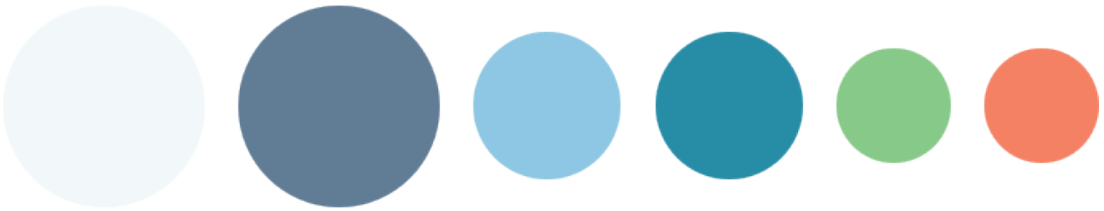


Figure 4.13 Colour scheme

is used to communicate where an action should be done or when a new task is available. To minimize the risk for colour blind users the change of colour is always connected to a change in text or symbol as well. Effort was put into match the interface of the patients with the interface of the caregiver. Therefore, the same colour scheme was used. Although, since the interface is used less frequently by patients the possibility to add larger areas with a more colour was used. The more colourful interface also created the impression of it being caring and lively.

Typography

The main typefaces used in the interfaces are Roboto and Heebo (see figure 4.14). They were chosen since they are simple, clean and easy to read on screens. To create a more personal feeling in the chat another

Roboto Heebo Lato

Figure 4.14 Typefaces in the interface

typeface called Lato with a bit more character was chosen. Although a subtle difference, it will create a more personal feeling.

To prioritize information and build and appealing feeling the typefaces have been used with different weight and size. Naturally, the most important information is large, bold and intense in colouring.

RECOMMENDATIONS FOR FUTURE WORK

The project resulted in a concept focusing mainly on one user interaction, to initiate contact with a patient. For a complete system the concept needs to be complemented with all other possible user interactions in the user interface. These will include converting possible user interactions from the company's system as of today into the design used in this concept. The concept also needs to be updated with workflows that have not been existing before, such as caregiver view for other roles such as triage nurse and administrator. Also, pages that are accessible from the concept but not yet existing, i.e. settings, questionnaire overview and search function, need to be designed.

User testing of the system has to a basic extent been done within the frame of this project to assure the fundamentals of both in visual design and functionality. However, the authors recommend a more profound phase of user testing to take place as the system is complete. The user testing can confirm design decisions or reveal updates necessary to achieve the desired user experience.

The concept also needs to be taken into a technical development phase to make this concept a functioning digital tool. It is possible that the development possibilities and requirements will require changes in the design.

Finally, the system needs to be implemented at healthcare centers. The implementation and introduction of the concept is essential for how well it will be received and used. The authors therefore recommend a carefully planned and informative implementation phase that explains the wins of using the system and in what situation it can create the most value.

DISCUSSION

As in any project the choice of method and the execution of the method is decisive for the outcome and result. In this project a larger group of participants, with greater diversity, in user tests, interviews and workshops would have been likely to provide the project a broader base of insights. This could have revealed deficiencies as well as confirmed features in the workflow and interfaces. Simply, the more people involved in the process a more accurate result could be considered. Though, the involving design process is competing with time and speed of iterations, and this can provide a project other values. In this project frequent iterations and speed were considered more valuable than statistically assured test results.

To design and develop a tool for a user group, which does not yet have access to the technology in their daily work has been one of the project challenges. The interview insights are all based on the healthcare as of today. The project decisions are therefore, to some extent, based on assumptions of how a system will be used in the near future. To minimize the risk of making a design based on the wrong assumptions the final solution has been designed to relatively flexible and can handle different types of communications than just follow ups.

Design processes and decisions in general is of a somewhat subjective character. Even though setting the functionality and style parameters of the interface according to needs and demands there have still been room for interpreting the guidelines in different ways. In this room of interpretation, the designers in the project have influenced the design and the project result. The same project conducted by other designers could consequently have had another appearance. This mainly depending on the complexity and subjectivity in translating emotional values into visual design.

Result

The prioritization in this project has laid within user experience and design. It is likely that technical development and business demands also could have competed with the demands on design and experience in the project and thereby affected the outcome. Nevertheless, the company have been included in the process and have had the possibility to give input during the project. Hence other perspectives on the development process have not been discarded, yet not been the main focus.

The company's system as of today and the functionality they provide to the caregiving process has been the foundation for the system developed in this project. This does necessarily not hinder a good user experience yet it has set the frames for functionality and experience. Taking on the same project without the company involvement would possibly lead to other design decisions.

As shown in research the work process at the healthcare centers differ from council to council. The user research of this project was mainly based in the county council of Västra Götalandsregionen. This might have affected the view of the work processes in primary healthcare and later also details in the workflow of the final result. Although the differences of the county councils were acknowledged early on and kept in mind during the project. Therefore, these differences are assumed to be minor.

The final result in this project can be viewed upon as a first step in the wider perspective on developing the tool for primary care. Digital product development is an iterative process and the product should be under development throughout its life span. When the product has been implemented and tried out in its real context it will be possible to collect data and user insights in a much broader sense than possible during user testing. The continuous development should be perceptive to the insights from real use.

Another aspect that calls for a constant development of the system is the rapid development of digital landscape. How the system is perceived today and the values it communicates can radically differ as other digital services renew themselves. The result in this project is accurate for the period being but needs frequent revaluation to stay that way.

To measure the impact of the thesis result is not possible until implemented and tried out in its real context. However, the estimated effect consisting of increased patient involvement and enhanced efficiency would lead to an improved healthcare. The result would thereby also meet the thesis' aim. However, an adequate question would be how much better would the healthcare become with the tool and new suggested workflows? However, to this question the thesis provides no answer, yet the conceptualization of a concept enables these predictions of future effects to be made.

The final result elaborates on a small area of the mapping of the healthcare system made in the initial phase. The broad study enabled a well prioritized project focus and that a holistic perspective could be held throughout the project and was therefore highly useful. The acknowledgement of other areas to work on do also target further development opportunities for the company, and as second step, enables further improvement of Swedish healthcare.

CONCLUSION

The nine areas, as presented in phase one, are all significant areas in need of transformation to enhance quality, efficiency and to cater for a successful implementation of a digital workflow. From the identified areas the most relevant area to develop a digital tool for, is communication between patient and caregiver in a follow up situation. This area is in part determined by the Company's current operations and capabilities, but also the insights and findings from user research.

Today the procedure of contacting patients for following up on a previous medical counselling is time consuming and do not fit in to the workflow of healthcare personnel. The effect of this is that the follow ups are rarely done, although the procedure assures the medical quality and enhances the patient experience. Hence, there is a need for a tool for the process. To improve this process for the caregiver the tools need to consume less time, be flexible, and not require the caregiver to remember to do a follow up. To further assure a good user experience in the process, the tool used for doing follow ups need to be easy to use, be task focused and reflect the human contact.

The patients in Swedish healthcare today experience long waiting time when seeking care. When in the loop of caregiving they feel poorly involved in their own care and many patients contact healthcare many times just to clarify previous contacts or appointments. To improve the situation for patients and meet their worries and demands of effortless healthcare they should be provided a communication channel to their caregiver. The communication tool should provide clear and structured information and the patient should be given time to express their needs and expectations of care, so they feel listened to and taken seriously.

The result presented in phase four conceptualizes how a digital tool that meet the above stated demands can be designed in terms of functionality and aesthetics as well as how to fit into the context it is to men be used. The main concluding remark of the design aspects such as language, colour choices and semantics is that they should consistently reflect the human touch and the supply the value of emotional comfort, for both patient and caregiver.

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APPENDICES

Appendix I: Interview guide

Appendix II: Interview guide, focused

Appendix III: Scenario user test caregiver

Appendix IV: Patient interface function listing

Appendix V: Healthcare personnel function listing

APPENDIX I:
INTERVIEW GUIDE

The following interview guide worked as a starting point for the interviews. It was changed depending on the interviewees background and profession. The interviews were performed in Swedish and the interview guide has later been translated.

Project background:

We are doing our master thesis at Chalmers University of Technology, studying Industrial Design Engineering.
We are doing our Thesis in collaboration with a digital healthcare company.
Our goal with this part of the project is to investigate how the work environment can be improved at healthcare centers with the help of digital services, and what steps the company have to take in order to digitize the healthcare.

Before:

The interview will be anonymous
Is it ok that we record and write notes during the interview?
If there is a question you don't want to answer just say so and we will skip it
You can end the interview whenever you want
Do you have any questions?
Let's start

Background:

- What is your background?
- For how long have you worked in primary healthcare?
- Have you worked at different healthcare centers?

About the healthcare centre:

- How many patients do you have listed?
- How is the demographic?
- How many patients are there calling in for booking appointment?
- How many just want to ask questions? How many have administrative questions?
- How are the patients distributed, calling first get appointment first?
- How many patients do you treat a day?
- How does the distribution look between chronic, emergency, scheduled, revisiting patients?
- How long is the patients waiting time?
- Do you collaborate with other healthcare centers?
- What different profession do you have at your healthcare centre? Doctors, nurses, secretaries etc.?
- If the patient needs transportation to the healthcare centre how is responsible for booking, the patient or the healthcare centre?

Digitalization and systems

- Do you know how many different digital systems that are in use at your healthcare centre? For example, systems for medical records, keeping a timetable, managing prescriptions.
- Does both nurses and doctors have their own room with a computer?

- What type of screen are they using?
- Are you using mobile devices?

Referral, invitations, feedback

- How are the invitations of appointments sent out? Are you allowed to send invitations by email?
- How are referrals sent? Digital, in paper format or other?
- How do you work with feedback to the patient and nurse/doctor?

Administrative tasks

- How much time of your work day do you spend on administrative tasks?

Communication

- How and when do you communicate with each other during a work day?

Front desk

- Tell us about the work procedure at the front desk?

Triage

- Tell us about the triage process, what are the challenges?

What does an ordinary day at the healthcare centre look like?

- What is the first thing you do when you arrive?
- For a nurse?
- For administrative personnel?
- For a doctor?

Improvement areas

- What takes up most time/energy?
- What cost most money? (is there problems we could solve that would save time/energy/money/stress for the personnel?
- What are you biggest challenges right now and the near future?
- What are you working on changing at the moment?
- Are there areas that you would like to do but don't find the time to?
- Are there areas in your routine that could be improved?

Stress

- Do you feel stressed in your work?
- If so, what are the biggest stress factors?

Do you have anything that you would like to add?

Wrapping up

- Depending on your schedule and time, are there nurses or doctors that we could meet and talk to?
- Would it be possible for us to come and observe someone working?
- Is it ok if we contact you again if we have further questions?

APPENDIX II: INTERVIEW GUIDE, FOCUSED ON COMMUNICATION

The following interview guide worked to get a deeper understanding of the area of communication. It was changed depending on the interviewees background and profession. The interviews were performed in Swedish and the interview guide has later been translated.

- How does registration lists work? Do you have a date system for assorting patients to doctors?
- How much time do you spend on planning the schedule? What do you need to think of?
- How do you define different time slots, for example what is acute and what is planned visits?

Healthcare to patient

- When do you have a need to contact a patient?
- How do you do it today?
- How do you think your communication tools work today?

Invites

- Who handles invites?
- When do you do it, all in one day or spread out during the month?
- If estimated, how many do you send?
- If you have to prioritise between patient how do you do it?
- How do you do if the patient speaks another language?
- How would it have been to have a dialog with the patient when sending out invites?
- What do you need to check before sending out an invite?
- What programs/systems do you use?
- In what order do you do things in the invite process?
- What are the time interval that you have to adapt to?
- What can you include in an invite?
- How goes the process of sending out invites?
- How much time does it take?
- Do you have to note in the medical record system that an invite has been sent out?
- Can we see what the process look like?
- What are the positive and negative aspects with the process?

Waiting lists

- Is there a general waiting list? Who is responsible? How do a patient end up there?
- Can a nurse have a waiting list?
- Can personnel see each other's waiting lists?
- How do you sort a waiting list?
- Do you put patients back on the waiting list, or can a chronical patient permanently be on a waiting list?
- How do you experience working with waiting lists? Are they easy to handle and keep track of?

Change an appointment

- What is the procedure if a patient would like to change the time of an appointment?
- How often does patient change their appointments?

- Is it possible for the patient to change the time themselves?

Yearly visits

- When is it decided that a patient should have a yearly visit?
- Does the patient want to have a protocol over the visit?
- What is the procedure with a yearly visit?

Lab results

- Who gives the information to the patient?
- Do you act differently depending on the result? if it is good/bad?

Preparations

- Do you prepare the patient in any way before a visit?
- Is there aspect that you would like a patient to think of/prepare before a visit?
- Does the patient prepare themselves, do they bring notes with questions they would like to ask?
- Are there times when the patient doesn't have to come in to the healthcare centre for a visit? How do you decide that?

Working with personal patients

- How many patients are in your own group of patients?
- How many time slots do you have a week for these type of patients?
- How well do you know your own patients?
- How often does a patient receive a new contact person at the centre?
- Can a patient visit both a doctor and a nurse during a visit?
- How much work is done double by both doctors and nurses?

APPENDIX III:
SCENARIO USER TEST CAREGIVER

For the user test with the caregiver interface a scenario was used. The participating doctors were introduced to the background of the project and then given the following scenario:

"You, as a doctor, have a meeting with your patient Eric Ericsson at your healthcare centre. During the meeting you feel that you would like to follow up Eric symptoms since they are a bit unclear. Therefore, you ask Eric directly during the meeting if he would like to get a digital follow up a few days after the appointment. This sounds great to Eric so he gives you his phone number and approval. (The participant gets a note with the name, personal identification number and phone number). Thereafter you open up the system where you will see a start page of all your digital patients."

APPENDIX IV: LIST OF FUNCTION FOR PATIENT'S INTERFACE

The following list includes functions that are valuable for the patient's interface.

General

- Good overview
- Be able to chat
- Get a notification when there is a response
- See what the doctor has written
- Have multiple cases going at the same time
- Start a new digital appointment
- Upload files and images
- See which healthcare centre the patient is getting help from
- Explicit information about the healthcare centers opening hours and when to expect an answer from the doctor

Extra features

- Change communication channel
- Download and save documents
- See image of the doctor to create a more personal feeling

APPENDIX V: LIST OF FUNCTION FOR HEALTH-CARE PERSONNEL'S INTERFACE

The following list includes functions that are valuable for the healthcare personnel's interface.

General

- Log in and out
- See who you are logged in as
- Change mode/role
- Change personal settings

Communication

- Be able to contact patients
- Be able to add patient to the system
- Be able to chat with patients
- Search for patients in the system
- Notify the doctor/nurse that something new has happened without causing stress
- Be able to schedule follow up messages for the future
- Be able to undo or change a sent message
- Be able to go back or undo action
- Be able to see, which patients have been contacted

Patient information

- Have a good overview over current patients to be able to prioritise
- Show that the patient is alive and listed at the current Healthcare centre
- See past patients that have been treated and are completed
- Easily see new patients who are in need of healthcare
- Easily access necessary information about the patient
- See why the patient need healthcare
- Be able to mark patient who need special attention or action
- See which patients who are currently active
- See when the message has been sent to the patient
- See if the patient has read the message but not yet answered
- Being able to sort between patient who have been seeking healthcare or patients who are being followed up

Questionnaires

- Be able to see the questionnaire and the questions before sending them to the patient
- Easily find the right questionnaire

Other

- Be able to see statistics of digital communication with patients for the whole Healthcare centre

To be able to contact a patient, the doctor/nurse needs to be able to fill in:

- Personal identification number
- Name
- Phone number

To be able to contact a patient, the doctor/nurse needs to be able to choose/fill in:

- Choose questionnaire
- Write a text
- Chose a prewritten text answer
- Attach a file
- Possibility to schedule the message
- Preview the message before sending
- Send

In the chat view the healthcare personnel need to be able to:

- Book/transfer to a physical appointment
- Send the patient to the lab
- Invite a colleague for a consultation
- Pause the visit
- Request a new responsible doctor/nurse
- Payment
- End the visit
- Create a medical report
- Copy the answers from the questionnaire

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