University of Bergen

Department of Information Science and Media Studies

Masters Thesis

Designing an e-learning platform for patients undergoing hip replacement surgery

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"I know words. I have the best words".

- Donald Trump

Abstract

This thesis is using information technology to create a tool, artifact, to be benefit patients by understanding and meeting their information needs and offering an online practical support.

Going through a large surgery can be both challenging and intimidating for many of us as patients. One of the most completed surgeries in Norway each year is total hip arthroplasty, and it is often the first large surgery that thousands of people undergo every year, where most of the patients are defined as elderly. Both before and after the surgery there are many relevant factors that can improve both patient safety and rehabilitation, but access to the relevant and credible information is often experienced as not easily obtainable as it should be in 2018. It is therefore important to provide this information in a proper modern manner to ensure that it is accessible for everyone, and especially the main user group, which are elderly people.

The goal of the thesis has been to gain an insight and impression whether the use of an e-learning platform can provide an opportunity for patient education and increased feeling of patient safety, while improving postoperative patients' rehabilitation.

From the technology point of view, the work has explored how UX design can provide intuitive navigation and high usability for a focus group, i.e. elderly people. Design Science framework was used though four iterations to deliver a set of prototypes of an e-learning platform. The design was based on data collected from patients and healthcare professionals, as well as on the evaluations carried out with usability and healthcare experts. The results clearly indicated that the use of an e-learning platform could help improve patient safety and rehabilitation by providing education and access to information.

The current functions provide the information, exercise, and patient self-assessment tools. In total, the overall feedback was positive as expressed by high evaluation scores: System Usability Score (SUS) of 90 and Nielsen's Heuristics of 9,2 (average). New functionalities and further development were sought after and, according to the patients, further development should be initiated by Helse Vest.

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Chapter 1

Introduction

To prepare for, undergo and recover from a surgery is a new experience for most people. In 2017 alone there were over 15000 arthroplasty surgeries in Norway, where most of these patients having this as their first large surgery [1]. In the field of arthroplasty, the presence of adverse and unwanted events is quite high, so it is of vital importance to identify risk factors leading to these adverse experiences. It is not clear whether the knowledge and patient education could be improved to minimize those risks related to the patient themselves. Unfortunately, not all of the patients undergoing surgery are health-care-professionals to that can appreciate the role of information and education. Research suggest that better prepared patients are likely to cope better prior and after surgery [2].

At the moment, there seem to be no recognized e-learning platform created to help patients educate themselves or prepare for an arthroplasty surgery. So to investigate the utility and importance of educating patients in the field of arthroplasty, and in turn help decrease the occurrence of adverse events, an e-learning-platform has been designed.

1.1 User group

The main user group for the E-learning platform created in this project will primarily be patients. The patients will educate themselves through a web-based e-learning platform which they will access after consulting a physician regarding their planned arthroplasty surgery. The website will educate the patients by teaching them how to prepare themselves for an operation and their expected course of postoperative recovery. The goal is to have educated patients that hold- important knowledge which can improve patient safety and prevent unnecessary and adverse events prior to and after an arthroplasty surgery. Medical personnel, such as physicians and nurses, will also be an important user group for this project. These people will not use the e-learning platform themselves, but will be able to give us developers important insights regarding vital clinical information, experience, risk factors, which would allow us to design a relevant and credible e-platform. Since the website will contain medical advice and guidance regarding patients well-being, health care professionals are very important user group.

1.2 Research question

RQ1: Can patient safety be improved by designing an e-learning platform for hip arthroplasty patients?
RQ2: Can involvement and education of patients improve the rehabilitation process for hip arthroplasty patients, according to healthcare professionals?
RQ3: Can useful web platforms in the healthcare domain be developed through involvement of patients in User Centered Design processes?

1.3 Outline

The thesis will have the following outline.

Chapter 2: A presentation of relevant literature and theory and related work to the research in this thesis.

Chapter 3: Methodology and methods that has been applied in the research.

Chapter 4: Requirements, which will explain the different established requirements for the e-learning platform.

Chapter 5: Prototype development with the different iterations that has been carried out and completed.

Chapter 6: Implementation with information regarding tools that has been used.

Chapter 7: Evaluation of the platform conducted with usability experts and healthcare professionals.

Chapter 8: Discussion which evolves around the methods, methodology, prototyping, evaluations and provides an answer to the research questions'.

Chapter 9: Conclusion and future development regarding the research findings and recommendations for future development of the platform.

Chapter 2

Theory

This chapter presents the relevant theoretical topics for my research. An introduction to total hip replacement surgery, adverse events, patient safety, e-learning and Human-Computer Interaction.

2.1 Total Hip Replacement

Arthroplasty is a surgical procedure within orthopedics that is used to restore the function of a damaged or destroyed joint, mainly in either the hip or in the knee. This could be by done by either resurfacing or restoring the bones in a joint, or to replace the broken joint with an artificial joint[3]. Total hip replacement surgery is shown to provide considerable pain reduction for patients, as well as improve their functional capabilities, hence improving patients quality of life [4]. Hip arthroplasty is, according to cost-benefit analyses, ranked as one of the most successful medical and surgical treatment available, with several thousand yearly surgeries in Norway only [5].

A hip prostheses is an artificial hip that consists of a stem that runs down in the femur bone with a "head" placed on top of it, replacing the femoral head. A second part is a hip socket, which is a cup shaped to house the stem head[1].A prostheses is shown in Figure 2.1. Different prostheses can be made out of different materials and designs, as its either more fitting for a situation, or research moves forwards and evolves better products as it moves along[1].

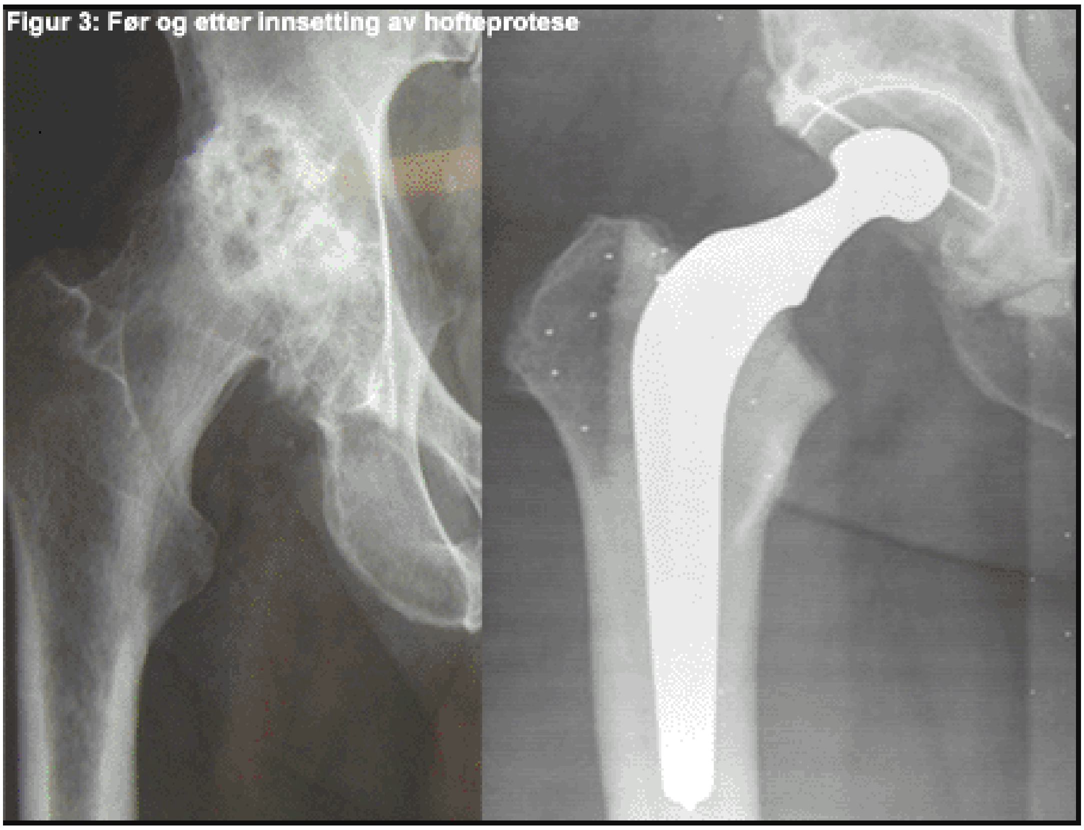

Figure 2.1: Before and after total hip replacement surgery

There are many reasons for having a joint that needs replacement or some repairing, but the most common reason is osteoporosis, which is a degenerative joint disease that weakens bones[1], or arthrosis, which is a joint disease caused by wear and tear of a joint[3]. Most arthroplasty surgeries involve either the hip or the knee, but surgery on the ankle, elbow, shoulder and fingers have their appearances as well. Every year in Norway, the Norwegian National Advisory Unit on Arthroplasty and Hip Fractures receive information on about 8500 new hip arthroplasties, 6000 knee arthroplasties, and about 1000 arthroplasties concerning other joints [1].

The primary group of patients that needs a hip prosthesis is elderly people, as they are more prone to wear of a joint or hip fracture, but people of all ages have the surgery each year. For hip fractures in Norway, the average age of a person at the point of an accident is 80 years old, and approximately 9000 of these incidents happen each year [1]. Figure 2.2 illustrates the age and sex of patients that had a prostheses installed in Norway between 1995 and 2015[1].

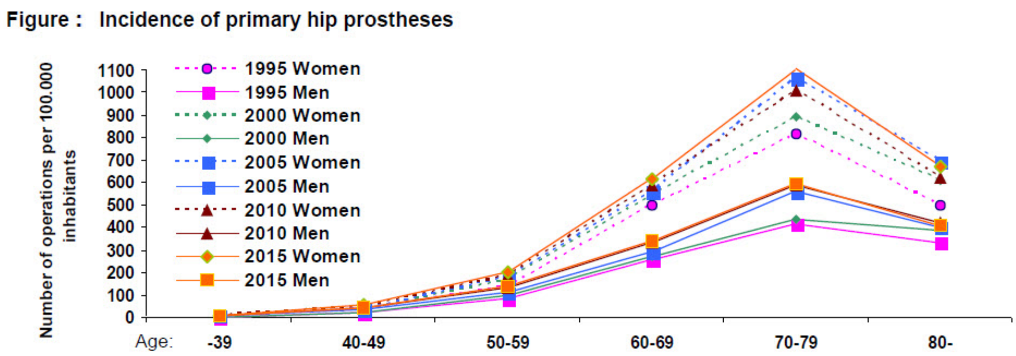

Figure 2.2: Incidents of primary hip protheseses for males and females 1995-2015

Potential Post-overative complications

There are several complications connected to total hip replacement surgery. The most common problem post-surgery is dislocation of the prostheses, which occurs approximately to less than 1 percent of patients in Norway each year [1]. There is a set of other post operative complications, where the most occurring are:

- Spontaneous subluxation (Partial or incomplete dislocation)
- Infections, both in superficial and deep wounds
- Aseptic loosening
- Leg length disparancy.
- Osteolysis
- Implant failure
- Implant fracture
- Neurological injuries (i.e loss of movement with or without pain)

Medical complications from surgery include, but is not limited to urinary-tract infections, cardiac failure, hemorrhage and thrombophlebitis. The mortality rate is considered very low, with a 0.4 percent mortality rate in 2,012 conducted hip arhtoplasties on 1,684 patients [6].

2.1.1 Total hip replacement in Norway

In Norway, the Norwegian Arthroplasty Register (NAR) is responsible for collecting data from all surgeries conducted in the country. NRA was established in Bergen, by the the Department of Orthopaedic Surgery at Haukeland University Hospital Bergen in 1987, and has collected data from 221 899 hip replacement operations over the last 40 years [1]. According to the annual report from NRA [1], 9086 hip arthroplasty surgeries were registered and performed in 2017, which is an increase of 142 compared to 2016. The register publishes research and reports every year that aims to improve the field of arthroplasty.

2.2 Patient safety

Patient safety, according to Worlds Health Organization (WHO) [7] is "the absence of preventable harm to a patient during the process of healthcare and reduction of risk of unnecessary harm associated with healthcare to an acceptable minimum", and it is considered a fundamental principle of healthcare [8].

2.2.1 Engaging patients in Patient safety

Patient safety is primarily the medical experts and professionals responsibility, as they are responsible for minimizing harm to their patients, but patients have access to a big pool of experience and expertise that the experts have little knowledge of. Patients have an unique insight in the events that only they can have after experiencing and observing an entire process of care by being in the centre of it. They experience, first handed, how healthcare professionals succeed or fail in their tasks of accommodating a patients safety, and therefore have the possibility to impact how patient safety is achieved in certain settings [9].

2.3 eHealth and e-learning

eHealth is a field that crosses medical informatics, healthcare professionals, public health and business, that refers to health services and information delivered or enhanced through the internet or other relevant technologies [10].

One category in the field of eHealth is e-learning platforms. An e-learning platform is a digital platform that provides instructions that is intended to support learning for the user. The platform often consists of instructions in the form of words, pictures or media, as well as individual study and reporting in order to educate learners. The goal is to help users build new knowledge and skills through the use of these instructional methods [11].

Compared with traditional face-to-face learning, e-learning can deliver content faster, be individualized to meet pace, and adapt to its users [12]. There are numerous pros connected to e-learning, for example, it can be cost saving, it is efficient in delivery of educational material and it has the ability to meet individual needs for learners [12]. A study conducted by Chou [13] was done to measure how online e-learning platform usage is perceived by patients, and to understand the factors connected to patients' relationship with online e-learning. The findings strongly demonstrate that e-learning systems provide an excellent mechanism which patients can utilize to enrich their knowledge of their own healthcare situation [13].

An important factor to consider when developing an e-learning platform in the healthcare field is the quality of its content. As access to online health information has grown rapidly [14] there is more potential for patient self-education which helps patients to better prepare for their surgery. However, it is hard to separate low-quality information from the high-quality. As information is becoming easily accessible through different online e-health services, less than half of this medical information is reviewed by doctors [14], and it is normally quite general information without a specific user in mind.

2.3.1 Patient empowerment with eHealth

Placing patients in the centre of an empowering process through the use of digital health technologies is of great importance in the field of healthcare, as this can encourage patients to take a more active responsibility in the self-management of their own healthcare [15]. According to Fricker, Thummler and Gavaras [15] the development of internet-based self-management products is needed to increase mobility and improve flexibility for both patients and and medical professionals. Allowing patients to use their computer or phones to take control of their own status will play an increasing role in personalized healthcare in the future [15].

2.4 Human-Computer Interaction

"Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and the study of major phenomena surrounding them" [16]. It is an interdisciplinary discipline that emerged in the 1980s that draws expertise and resources from disciplines such as computer science, psychology, sociology, anthropology and industrial design. The discipline has emerged as an important topic in computer science over the last decades and continues to develop itself further[16]. The focus in this discipline is the interaction between humans and machines and the occurrences surrounding this relationship. This can include concerns such as the joint performance of tasks done by humans and machines, or a humans capability to be able to use a machine [16]. The discipline of Human-Computer Interaction is applicable to the research in this thesis as it contains tools that enables understanding and insights into the wide variety of potential users for the platform.

2.5 Related Work

2.5.1 SeamlessMd

Enhanced Recovery after Surgery (ERAS) programs for patients having different surgeries are examples of similar e-learning platforms. These programs are being tested in different medical fields to reduce complications, improve patient care and shorten the length of a hospital stay following a surgery. A project called SeamlessMD is a ERAS project in the form of a phone application that a patient could use to prepare for a surgery or the time after a surgery. It allows a user to investigate how a surgery is done, how they should prepare for it and gives them information about how they should behave after a surgery. The application is backed up by several case studies that suggest that the application can reduce recovery time, hospital visits and adverse events post-surgery [17].

2.5.2 Aktiv med Artrose (Active with arthosis)

Aktiv med Artrose is a norwegian website with an intention to implement international guidelines for patients living with arthosis. One of the modules that exits on this platform is created to provide patients with information and workout-guides to reduce adverse events and improve functionality and quality of life after suffering from arthrosis. Access to the rehabilitation module with video guides is given after consultation with a physiotherapist connected to their own program called "AktiveA", setting some limitations to access for people suffering from arthrosis [18].

2.6 Relevant existing information sources

2.6.1 Hospital leaflets

The traditional way of delivering information regarding hip arthroplasty at hospitals is by using paper leaflets. These leaflets often contain basic practical information regarding a surgery, the hospital stay, and some illustrations of exercises for rehabilitation. Each patient that is accepted to surgery is given one of these leaflets by a physician when they are accepted, and it can also be downloaded online through most hospitals websites. A flaw with the leaflets is that they only contain a limited amount of information and they are easy to loose over a longer period of time.

2.6.2 Information days

Some time before a patient is cleared and submitted for surgery at a hospital, some hospitals arrange an information day for patients. These information days are held to introduce patients to the practicalities of going through a surgery, and sometimes allowing them to ask both physicians, nurses, surgeons and physiotherapists questions'. The information that is presented are different from time to time, based on whoever is holding the presentation, but it primarily outputs the same information that is given through the paper leaflets, but with some additional details. These information days are great for those who can attend them, and it allows patients to connect and communicate with healthcare professionals. There are some problems though, as patients have to remember or write down the information, as the arthroplasty process takes a long time from start to finish, making it difficult to remember and use the information weeks later.

2.6.3 Online resources

There are several online resources that functions as information sources for patients, allowing them to learn more about the process of hip arthroplasty. Information can be found on several of Norwegians hospitals websites, where practical information regarding preparations for pre- and post-surgery and different rehabilitation possibilities, as well as useful medical info for patients. However, these websites does not offer a complete collection of the relevant information, and one has to visit several different websites to acquire all the different information that one might want to read or study.

Chapter 3

Methodology and methods

3.1 Design science Research

Design science research is a research paradigm where questions regarding human problems and challenges are solved through creating new and innovative artifacts. The artifacts are designed based on knowledge and understanding of a problem, and the solution of it is acquired in the building, use and application of the artifact. An artifact can be represented in many forms, varying from, and not limited to, software, human/computer interfaces, formal logic, natural language and mathematics [19].

Hevner, March, Park and Ram employ seven guidelines for design science [19] to assist researchers, reviewers, editors and readers to understand the necessary requirements for conducting proper and efficient design-science research. All the guidelines are derived from the fundamental principle of design science research which is having knowledge and understanding of a specific design problem, and that the solution is acquired through the building and application of the artefact [19]. The completion of each guideline is necessary to successfully create and evaluate an artefact, but there is no specific order for their use.

Hevner et al [19] advise against a mandatory use of the guidelines, and it is up to each person in a project to use their creative skills and judgment to decide how, when and where the guidelines should be applied.

3.1.1 Design as an artefact

An artefact is defined as something man-made. In design science research the first guideline is that one must create the artefact as an instansation, construct, model or method. Artifacts constructed in design-science research are rarely complete information systems that are complete and used in practice, instead they are innovations that can define different ideas, practices, technical capabilities and products [19].

The e-learning platform is an artefact in the form of a high-fidelity prototype that was created with Adobe XD. The prototype is highly functional and can complete and fulfill all of the established requirements that are elaborated on in section 4.1.

3.1.2 Problem relevance

The second objective of Design-science research is about acquiring knowledge and understanding that enables development and implementation of technology-based solutions to unanswered business problems. In Design science the solution for such questions is acquired through the construction of innovate artifacts that aim to change the given phenomena that occurs in the given settings [19].

Even though there are several online platforms that provide some information or guidance to patients, there are no well-known platforms that collects all this information in one place in order to improve patient safety. As mentioned in section 2.6 there are similar platforms available, but the focus area for these platforms is either to small or to large, or simply does not cover the same area of patients.

3.1.3 Design evaluation

The third guideline focuses on how the utility, quality and efficacy of a design artifact has to be rigorously demonstrated through the use of proper evaluation methods [19]. In the research process the different evaluation methods are extremely important. Hevner et al [19] states that the evaluation of an IT artifact requires a clear definition of appropriate metrics, and possibly the gathering and analysis of appropriate data. An IT artifact can be evaluated in many different terms, such as: functionality, completeness, consistency, accuracy, performance and usability, among many [19].

All of the evaluation methods used for the evaluation of the platform is mentioned in section 3.8. Subjects with appropriate backgrounds and education has been used in the evaluation, allowing patients, healthcare professionals and students with HCI expertise to voice their opinion through several iterations.

3.1.4 Research contributions

The fourth guideline says that to have effective design-science research one must provide clear contributions in the areas of the design artifact, design construction knowledge and/or design evaluation knowledge. This is meant to assess how any research provides anything new and interesting contributions [19]. To fulfill this guideline, at least one or more of three potential research contributions must be present. The three potential contributions are: the design artifact, foundations and methodologies [19]. In this project, the e-learning platform contributes in the research area of a design artifact. It attempts to collect and display information in one platform to educate patients and, in turn, improve patient safety, while offering tools for patients and even patient data for potential future research purposes gathered from evaluation and self-reporting. Patient self-reporting is of unique value since it provides the most reliable information on patient's well-being, level of pain, efforts to remain active and involved in treatment.

3.1.5 Research Rigor

Guideline five is about how research is conducted. Rigorous methods in both the construction and evaluation of a design artifact are demanded in Design-science research [19]. The design presented in the project has had several iterations where both, low, mid and high-fidelity prototypes have been evaluated by user groups and professionals. Furthermore, the research has made used of several relevant methods to build the platform prototype.

3.1.6 Design as a search process

The sixth guideline covers the importance of an the use of an iterative search process to search for the most effective solution to a problem, and to create the best, or most optimal, design [19]. This means that to be able to achieve an effective design, one must acquire knowledge of both the application domain (e.g, requirements and constraints) and the solution domain (e.g., technical and organizational) [19].

To design the e-learning platform, the principles of User Centered Design covered the iterative design process, which is described in chapter 5. By using this design methodology one acquires sufficient knowledge about both the application and solution domains, which is very valuable to the development of the best, or most optimal, artifact.

3.1.7 Communication of research

The seventh and final guideline describes how design-science research must be presented to both technology-oriented, as well as management-oriented, audiences. First, the technology-oriented audience needs sufficient detail to enable the given artifact to be constructed and used within an appropriate organizational context. The reason for this is that it enables the practitioners to utilize the benefits offered by an artifact, while researchers can build a growing knowledge base for further extension and evaluation of the artifact [19].

Both technology-oriented and management-oriented audience has been covered in this thesis through presentations and discussions, but no publications has been produced up to this point.

3.2 Research through Design

Research through design was created by conducting a literature review that focused on design in HCI, to work on the relationship between design and Human Computer interaction. It was constructed to combine knowledge from the different fields of design research, HCI engineering and behavioral sciences to allow further collaboration between the fields. It provides a set of lenses that enables evaluation of what makes a good interaction design research contribution.

According to Zimmerman [20], the Research through design model provides five main benefits, which are the following:

1. It allows the HCI research community to engage with wicked problems that cannot be easily addressed through science and engineering methods.
2. It feeds back technology opportunities to the engineers and gaps in behavior theory and unexpected behaviors to the behavioral scientists, motivating new research.
3. It provides a new method for transferring knowledge produced in the HCI research to the HCI practice community, potentially increasing the likelihood this knowledge will move into products in the world.
4. It allows interaction designers to make research contributions that take advantage of the real skill designers possess—reframing problems through a process of making the right thing.
5. 5. It motivates the HCI community to discuss preferred states and to reflect on the potential impacts research might have on the world.

3.3 Data Gathering

This section will describe and clarify the different methods that were used for gathering data to this thesis. As there are several different techniques for gathering data, it is desirable to pick the best and most fitting of them and combine them to achieve the best results. All of the data gathering methods will be discussed in the following section.

3.3.1 Qualitative data

Semi-structured interviews

Interviews were used to collect qualitative data to gather data on both knowledge, requirements, and opinions regarding the concept from both patients and health-care-professionals, and to discuss the prototype during each design iteration over the project period. Interviews enable the creation of deeply contextual accounts of a participants' experiences and their interpretations of them, and can contribute in building a relationship between the researcher and the participants [21]. The interview-format used to collect data in this thesis are semi-structured interviews, as this format allows flexibility and provides a good structure to collect the relevant data.

A semi-structured interview is the most common type of interview used in qualitative research [21]. The researcher creates an interview guide containing predetermined questions' that are developed to collect data and set a sense of order [21]. The order or wording of the questions' are not necessarily important, which allows the interviewer to adapt the interview according to the flow of the conversation. The interviewer can also add additional questions', which makes it easier to seek clarification and new ideas based on the response from the interviewee [21]. By giving the questions' an open nature the semi-structured-interview encourages depth an vitality which helps new concepts emerge [21].

According to Barribal [22] there are several advantages for using a semi-structured interview when conducting a personal interview:

1. It has the potential to overcome the poor responses of a questionnaire.
2. It is good for exploring the interviewees attitudes, values, believes and motives.
3. It allows the interviewer to evaluate the validity of an interviewees response by observing non-verbal indicators. This could be very useful when discussing personal and sensitive information which is relevant for this thesis.

4. It could facilitate comparability from all interview-subjects by ensuring that all questions' are answered by each respondent.

5. It ensures that the interviewee is unable to receive assistance from others that may affect their response.

There are certain drawbacks connected to conducting semi-structured-interviews, with the most important for this thesis being that novice researchers, such as myself, sometimes may be unable to identify when and where to prompt questions' or probe responses, and therefore missing possible relevant data [21].

3.3.2 Quantitative data

Questionaires

Two questionnaires were used to generate quantitative data for the research. A questionnaire, which is a pre-defined set of questions', often referred to as items, allows respondents to provide answers that can be analyzed and interpreted as data by researchers. It provides a fast and easy way to collect data from a large number of people [23]. The first questionnaire was used in a Heuristic evaluation, and the second in a System Usability Scale, as described in Section 3.8.

Direct observation

To collect data about how users act and assess what they actually do, direct observation was conducted. Direct observation is a data generation method which observes behaviour and actions of a user in a controlled environment, where many different aspects such as body language, noise, movements and expressions are taken into account. This allows a researcher to generate data about things that a user might not be aware of or would consider not important when providing feedback elsewhere [23].

3.4 Prototype

A prototype is an intractable design that is made to allow product owners and stakeholders to examine the usability and suitability of a product. Prototypes are useful when one may want to discuss and evaluate different ideas with stakeholders. It also allows designers to quickly explore different design ideas and reflect over the products possibilities. A prototype can be everything from drawings and illustrations on paper, to a completely functional phone application, computer software or an interactive visual representation. The functionality of a prototype is often limited to only display the important aspects of a product to characterize what the main goal of the product is, therefore there are some aspects that are prioritized more than others in a prototype [24].

This section will elaborate on the different techniques and approaches that have been used in the prototype development.

3.4.1 User-centered Design

User-centered design (UCD) is a general term for a philosophy and methods that focus on the involvement of the end user in the actual development of a product [24]. There are many different ways that an end-user can participate, and it has been shown that the involvement of end-users in design in one way or the other, lead to more usable satisfying designs [24].

UCD as a term originated in the 1980s and was coined by Donald Norman in the 1980s, since then the concept has been built further by Norman [24]. In his seminal book The Psychology of everyday things (POET) he proposes four basic suggestions for how to place the user at the center of the design, and as a result create a good design. The four suggestions are [24]:

1. Make it easy to determine what actions are possible ate any moment
2. Make things visible, including the conceptual model of the system, the alternative actions, and the results of actions.
3. Make it easy to evaluate the current state of the system.
4. Follow natural mappings between intentions and the required actions; between actions and the resulting effect; and between the information that is visible and the interpretation of the system state.

By following these recommendations a designer can make sure that the user is able to utilize the given product as intended with minimal effort required to learn it beforehand. Instead of heavy and non user-centered manuals, users should only need a small pamphlet to introduce themselves to a new product [24].

Even though Normans four suggestions for placing the user in the centre, and telling designers that products should be intuitive, there is room for failure, and therefore Norman suggests the following seven principles of design that are made to guide a designer through user-centered design [24]:

1. Use both knowledge in the world and knowledge in the head. By building conceptual models, write manuals that are easily understood and that are written before the design is implemented.

2. Simplify the structure of tasks. Make sure not to overload the short-term memory, or the long term memory of the user. On average the user is able to remember five things at a time. Make sure the task is consistent and provide mental aids for easy retrieval of information from long-term memory. Make sure user has control over the task.

3. Make things visible: Bridge the gulfs of execution and evaluation. The user should be able to Figure out the use of an object by seeing the right buttons or devices for executing an operation.

4. Get mappings right. One way to make things understandable is to use design.

5. Exploit the power of constraints, both natural and artificial in order to give the user the feel that there is one thing to do.

6. Design for error. Plan for any possible error that can be made, this way the user will be allowed the option for recovery from any possible error made.

7. When all else fails, standardize. Create an international standard if something cannot be designed without arbitrary mappings.

In this thesis UCD was used to include the user groups in the design of a product made for improving patient safety. By utilizing different users presence and collecting their feedback throughout the design process, the idea of an optimal product could be explored.

3.4.2 User Experience/UX

User Experience (UX) is about creating the most enjoyable and engaging experience for a user by considering all the possible issues and factors that can come to life in both the short and longer term [25]. User experience is very important in E-health. Mival state that if an e-health application is not engaging, people will not use it, and if they are forced to use it, it is likely that they will make mistakes [25].

It is critical that there is a focus on proper UX when developing the e-learning platform, as it aims to solve an issue of availability and usability in the field of patient education and safety in the field of total hip replacement. The platform should be designed to be engaging for the user and make them want to use it, which will lead to improvement of patient safety.

3.4.3 Design Principles

Design principles is a set of generalizable abstractions used by designers to help them orient themselves towards thinking about different aspect of their designs. These principles are used by interaction designer to help them think when designing a user experience [24].

The design principles are the result of a mix of theory-based knowledge, experiences, and common sense, and they tend to be written in a perspective manner, suggesting to the the designer what to do and what not to do in an interface. They are not intended to specify how the designer should design, but rather how to avoid fallacies and ensure that certain features are provided [24]. There are many promoted design principles, where the most well known are visibility, feedback, constraints, consistency and affordance. They are all concerned with determining what a user sees and does when executing tasks in an interactive product.

The following design principles were followed in the design of the e-learning platform to achieve a good user experience.

Visibility

Visibility is about how the presence and visualization of different functions in a product are displayed. It focuses on providing guidance to a user on what their options are, and indicate which option is the natural next step in a process. The goal is to create high visibility, and if there are more visible functions, it is more likely that a user knows what to do next [24].

Feedback

Feedback is about producing some kind of effect which allows the user understand that what they actually did something with their action and that they can proceed with the given activity. In HCI there are several forms of feedback available, such as: audio, tactile, verbal, visual or different combinations of these [24].

Constraints

Constraint is about using different techniques to restrict the kinds of user interaction that can occur in a certain setting. This is supposed to prevent users from selecting incorrect or unwanted options, and thereby reducing the chance of making mistakes. Popular techniques for this could be to gray out options or remove the ability to select them, restricting the users ability to make an error [24].

Consistency

Consistency refers to using similar elements and operations to complete similar tasks. A consistent design interface follows a set of rules decided for that type of operations. An example is the operation to highlight a graphical object in an interface, which is done by clicking the left mouse button. If an interface suddenly wanted the user to right click to highlight the object, this would be considered inconsistent, as it breaks with the ordinary rules, and users would be more prone to making mistakes. Having a consistent design interface makes it easier for the user to learn and remember, thereby making it easier to use [24].

Affordance

The term "affordance" refers to an attribute of an object that allows a user to understand and know how to use it. When the affordance of a certain object or setting is perceptually obvious, it is easy to know how to interact with it. In interaction design the term is used to describe how interfaces should make their possible actions as obvious as possible [24]. An example of this is how the button of a computer mouse invites to pushing it, therefore making it obvious how to use it.

3.4.4 Usability goals

Usability is about ensuring that an interactive product is easy to learn, effective to use and enjoyable from a users point of view [24]. This means that it focuses on optimizing the different interactions that users have with interactive products, and thereby enable them to carry out the tasks then need in any given setting. Usability can be broken down in six more specific goals:

- **Effectiveness**, which focuses on how good a product does what it is supposed to do [24]. A pen make without ink is not effective, as it cant write, which is what a pen is supposed to do.
- **Efficiancy**, which refers to the how a product supports a user in carrying out the given task [24].
- **Safety**, which revolves around protecting a user from dangerous conditions and undesirable situations [24]. This covers both wanted and accidental actions, which can lead to unwanted consequences.
- **Utility**, which refers to how a product provides the right kind of functionality so that a user can do what they need or want to do [24]. Products with high utility can be computer software that can calculate massive amounts of numbers for a statistician to help them create graphics.
- **Learnability**, which is about how easy it is to learn how to use a system in the intended way. Users want to jump right into completing their tasks without putting in to much effort to learn about a new product [24].

- **Memorability**, which refers to how easy it is to remember how to use a product once you have learned it. This means that if a user has not used a system in a while, he should still be able to remember how to use it without relearning the primary functions of the system [24].

3.5 Evaluation methods

3.5.1 The System Usability Scale

The System Usability Scale (SUS) is a scale for quickly measuring how a user assesses the usability of a computer system. It consists of ten questions' that have five point scale answers, ranging from strongly disagree to strongly agree [26].

There is a total of ten question, where five of them are selected so that there would be a common response of strong agreement, and the other five were selected for responding with strong disagreement. This is done to prevent response biases. Half of the questions' are also positively worded and the other half is negatively worded, which adds one more level of complexity. This reinforces the answers that a user is giving, since a user who strongly disagrees with a negative question, will strongly agree with the equivalent positive question [27].

A SUS score is shown as a single number that represents a collective measurement of the usability of a system. The score is calculated using the answer from each question and a provided set of values and rules, and the answer will range from 0 to 100. A system with a SUS score above 65 is considered as a system with good/acceptable usability, while 100 represents best imaginable, as shown in Figure 3.1 [27].

A SUS evaluation was conducted to measure the prototype during the development. Even though a SUS does not give any specific feedback, a good measure of the usability was collected and showed how users experienced the platform.

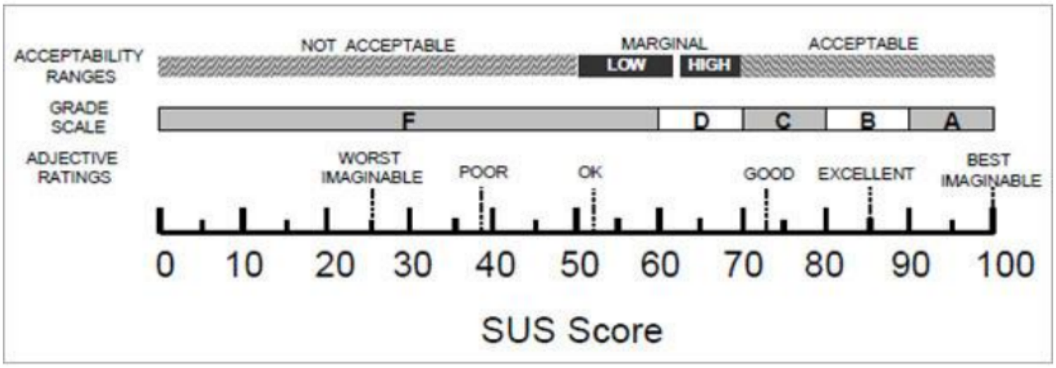

Figure 3.1: System Usability Score overview

3.5.2 Heuristic evaluation

A heuristic evaluation is a method that is developed to help designers create a good and fitting User Interface based on user evaluations. The goal for a heuristic evaluation is to identify any problems regarding the design of a user interface. Jakob Nielsen's heuristic evaluation consists of ten general principles for Interaction and User Interface design, and its potential is maxed when there are between three and five participants [28]. These principles were developed in collaboration with Rolf Monlich in 1990, and has since been refined over the years, resulting in the following ten main principles [28]:

- **Visibility of system status**
  The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

- **Match between system and the real world**
  The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

- **User control and freedom**
  Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

- **Consistency and standards**
  Users should not have to wonder whether different words, situations, or actions mean the same thing.

- **Error prevention**
  Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

- **Recognition rather than recall**
  Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

- **Flexibility and efficiency of use**
  Accelerators, unseen by the novice user, may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

- **Aesthetic and minimalist design**
  Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

- **Help users recognize, diagnose, and recover from errors**
  Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

- **Help and documentation**
  Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

3.5.3 Individual Expert Review

An individual expert review in HCI is conducted to assess the platforms design and its compliance with heuristics and other known usability guidelines. To goal is to uncover possible usability issues and highlight them [29]. The expert reviewer is picked based on the knowledge of real user behaviour and expertise.

3.6 Research ethics

Throughout the research process it is utmost important to make sure that all included parts are treated with respect and honesty. This includes informing about rights and opportunities when agreeing to participate in the study, and inform participants their right to anonymity and confidentiality. To ensure that all participants were aware of their rights, they were asked to sign read and sign an informed consent form, which is provided in Appendix B.

This research project has been approved by the Norwegian Centre for Research, in the section of Data Protection for Research purposes. This means that appropriate measures have been taken for both the process of data collection and the safekeeping of the data. All data material will be deleted or be edited to remove any identifiable information to provide anonymity for all participants.

Table 3.1: Design Science Research Guidelines

Guideline	**Description**
1: Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
2: Problem relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
3: Design evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
4: Research contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
5: Research rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
6: Design as a search process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
7: Communication of research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

Chapter 4

Establishing Requirements

This chapter will present the different requirements that has been established through the use of methodology defined in chapter 3.

4.1 Establish requirements

According to Preece [24], a requirement is "a statement about an intended product that specifies what it should do or how it should preform". When establishing requirements you often want to make the requirements as specific, unambiguous and clear as possible, as this is on of the aims of the acitvity. [24].

Requirements for the prototype were established through discussion with experts and with the use of an interview process with patients that are approved and confirmed for a full hip replacement surgery. The goal of conducting these interviews was to get an understanding of the situation that these patients were in, how they perceived and received information and their relation to IT tools and interfaces. Discussions with experts gave insight in important factual information and methods relevant to the e-learning platform.

The established requirements were identified in the two primary kinds on requirements which are functional and non-functional requirements.

4.1.1 Functional

A functional requirement explains what the system is supposed to do [24]. These are the functional requirements for the e-learning platform:

1. The platform should inform users on the normal basic criteria for being accepted for surgery.
2. The platform should provide guidelines for how to psychically prepare for surgery.
3. The Platform should provide information about the use of medication.
4. The platform should inform the patient about risk factors connected to the surgery, and also inform on how to avoid them.
5. The platform should inform users of possible risks such as depression etc.
6. The platform should provide a easy detailed description on how the procedure is conducted.
7. The platform should provide information about acquiring equipment that is useful or necessary for proper post surgical recovery.
8. The platform should present the different methods used for sedation, and information regarding how and why they use them.
9. The Platform should inform the patient about what limitations they have after the surgery. For example, driving a car, crossing your legs, cycling, hiking etc.
10. The platform should provide general information regarding the hospital-stay post surgery. How long do you have to stay at the hospital. What do you normally need to bring etc.
11. The platform should allow users to read about experiences from other people who have gone trough the same procedure.
12. The platform should allow users explore a small database of questions' regarding the procedure. Like a "FAQ" for arthroplasty patients.

13. The platform should be able to show instructional videos and pictures on training exercises for rehabilitation, crutch walking, showering etc.

14. The platform should allow users to report their quality of life using a questionnaire, both before and after the surgery. This form should be collected in a database.

4.1.2 Non-functional Requirements

A non-functional requirement explains the constraints for a system and its development [24].

1. The platform will be designed for web-browsers.

2. The platform has to be very intuitive and easy to use for all users, especially older and inexperienced users.

4.1.3 Persona

Personas are used for bringing user profiles to life. A persona is a rich and detailed description of the typical user of a product that is under development. It contains characteristics of a typical user and by using this a designer can design a product for a specific type of user. A persona is not a description of a real life specific individual, but are based on a generally realistic image. A persona should include information about the users goals, skills, attitudes, task and their environment, such as age, work and interests.

Usually a product will require more than one persona, but it some cases it may be more helpful to choose one primary persona who represents a larger section of the intended user group [24]. For this research project a persona, shown in Figure 4.1, was created to present the primary user group, which is patients.

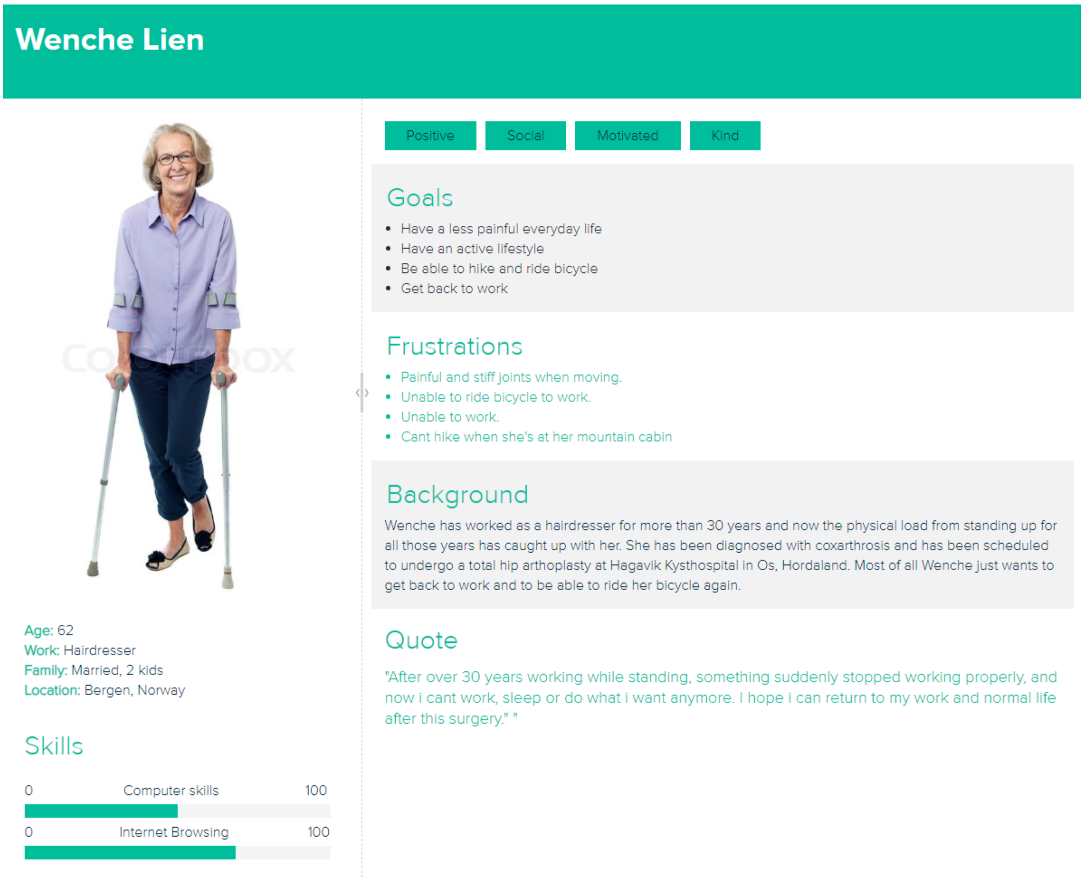

Figure 4.1: Persona of "Wenche Lien"

Chapter 5

Prototype development

5.1 Iterations during development

For the development of the prototype there was a total of 4 iterations. Each iteration had its own goal and purpose, which is elaborated upon below.

5.2 Iteration 1 - Concept evaluation and validation

To evaluate and investigate the concept on an e-learning platform for this field, a literature review and and discussion was conducted. After talks, discussion, and interviews with healthcare personnel and patients, a simple overview of 3 modules for the platform was suggested; one module for patients preparing for surgery. That would help patients to access important and valuable information addressing future challenges such as equipment, restrictions, sick-leave and other specific issues. Secondly, a module that can show patients detailed information regarding the actual arthroplasty procedure, allowing them to understand what they are going to go through, how everything works, and make them feel safer in the hands of the physicians. Last, a third module that supplies advice and guidance about rehabilitation exercises, how to handle adverse events, pain management and how to act during the rehabilitation period. The platform will be designed for web browsers, as this is the best fit for the user group according the the conducted interviews.

5.2.1 Proof of concept

A conversation and discussion regarding the concept was held with a chief surgeon and an specialized nurse at the Hagavik Coastal Hospital, and trough this the concept of an e-learning platform was was evaluated and assessed. Both the surgeon and nurse assessed the concept as feasible and that an e-learning platform like this would be a positive contribution to securing the safety and rehabilitation of patients undergoing total hip arthroplasty.

5.2.2 Interview with patients that underwent surgery

During the semi-structured interviews at Hagavik Coastal Hospital, two patients that had undergone total hip arthroplasty at Hagavik between 2015 and 2017, were interviewed. Both of these patients had returned to Hagavik to have a total hip arthoplastic surgery on their second, previously healthy hip. The purpose of this interview was to acquire the patients opinions regarding the structure, access and usefulness of the information and rehabilitation process that is available for the patients.

The questions' in the interview included questions' similar to the following:

1. What were the most useful sources of information before being admitted to the hospital?
2. What do you think is the most important things to prepare for, both post and pre-surgery?
3. What do you think is the most important thing to have access to pre and post-surgery?
4. Did you feel like you had sufficient information about rehabilitation?
5. Do you think you could benefit from an e-learning platform such as the one presented to you today?
6. If you were to join the creation of such a platform, what would be the most important for you?

5.2.3 Low fidelity Prototype

A low fidelity prototype is a visual representation of a product that often does not provide a similar visual representation or functionality like the given final product. These prototypes are not kept or integrated in the final products, as they are for exploration only. A low-fidelity prototype often uses simple materials and methods, such as pen and paper drawings, and the prototype will often only preform a limited set of functions, or only represent the functions instead of preforming them. Its useful for product development as they are simple, cheap and easily modified, as well as cheap to produce, which allows quick cheap exploration of different design ideas [24].

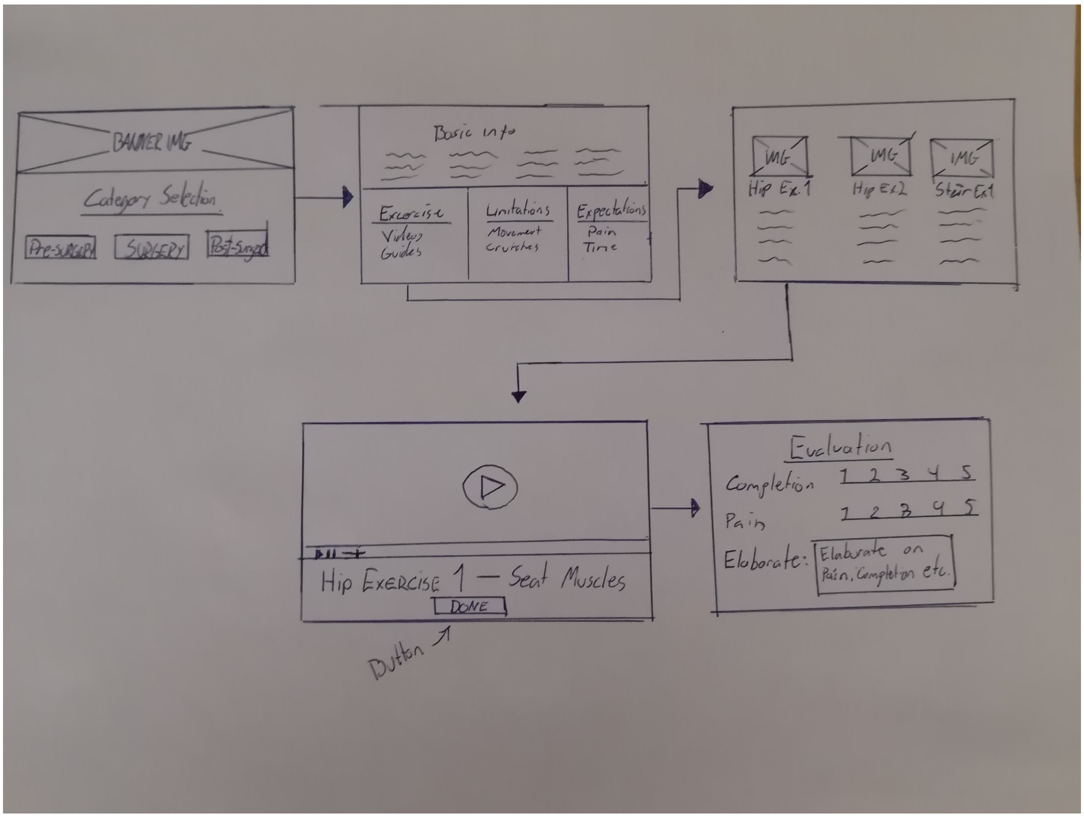

Figure 5.1: A Low-Fidelity sketch providing a basic design suggestion

Sketching a low-fidelity prototype

Low-fidelity prototypes are often made with hand-drawn sketches. The sketches do not have to be visual masterpieces, but focus on design with simple drawings like boxes, stick Figures and arrows. It is quick, cheap and effective, as the work you put in to illustrate and demonstrate an idea is minimal, and therefore its no problems to start over again [24].

The sketch shown in Figure 5.1 presents the different steps for the usage of the Post-surgery exercise module. At the first frame the user is shown the main page of the platform, which presents three different modules which are pre-surgery, surgery and post surgery. These modules were selected based on the requirements collected in the semi-structured interviews with patients. Each module would consist of several subsections that elaborates on different subjects that patients has wished for.

The sketch in Figure 5.1 shows the basic step process for finding and completing a video exercise, and to give a status report afterwards where data will be collected for future use.

The next frame shows the content of the "post-Surgery" module where the user is met with a text-box that gives basic information about the post surgery situation that a patient will find themselves in. Below this text, there will be three categories available: Exercise, limitations and expectations, all of which are picked based on the data collected from patients in the semi-structured interviews. When selecting one of these categories the user is presented with information and guidance connected to the subcategories. In the third frame, the Exercise category has been selected and now the user has an organized library of exercise video-guides presented for them. According to the data collected, video guides are preferred to image guides, as they leave less room for mistakes.

The fourth frame is the next step after selecting the "Video" subsection in "Exercise", and consists of a media-player with basic and simple controls such as play, pause, sound control and a bar for forwarding and rewinding. The simplicity of these controllers and the layout of the different sites is based on the wishes for easy maneuverable and intuitive design fronted by the user group in the interviews. The last step in the exercise module appears when pressing a button beneath the media-player, which takes the user to an evaluation and reporting site. This page serves as a small form that a user can fill out, reporting how the completion of the exercise was and if they experienced any pain during it. There is also a text-box where the user can add a comment regarding the completion or pain.

5.2.4 Evaluation

Feedback regarding the concept and its feasibility was positive, both from healthcare personnel and from patients. The patients that previously had underwent arthroplastic surgery expressed that this was a product that they would have had good use of if, had it been available at the time of their surgeries. Two patients that had total hip replacement earlier, commented on how the concept was trustworthy, educational and useful compared to other available resources, and that they deemed it necessary to have a platform like this in the time of 2018 to improve patient safety.

New patients awaiting surgery suggested that the content in the different modules could be more specific with easy subcategories with plain titles instead of general titles to make it easier to find information in the fewest possible steps. The general categories of pre-surgery, surgery and post-surgery were positively received, but patients came with a lot of suggestions for the content in subcategories such as: *necessary and useful equipment, different types of procedure or surgery, information regarding anesthesia, medication guidelines, length of hospital stay and when they could drive a car again.*

Two previously operated patients suggested a module that they thought would be useful for future users, based on their experience. The suggestion was to allow previous patients to write about their experiences with the procedure, so that future patients could read about relate able experiences, rather than standard procedure information. They both said that in the world of medicine, physicians and complicated procedures, it could be calming to read about other "ordinary" people's experiences.

The patients that were interviewed were all current patients at the Hagavik Coastal Hospital in Os, Norway, where most of the information were given vocally from physicians, surgeons, physiotherapists and nurses at the hospital. Each patient was also handed two small leaflets. One leaflet was "General information" for the hospital that covered general preparations for surgeries, what to bring, and basic information about a patient stay at Hagavik. A second leaflet contained more specific information about "Hip Arthroplasty" with information that covered what hip arthroplasty is, which aids that are useful, some sentences about anesthesia and the prosthesis, possible complications, activity, training and some short useful tips regarding driving, airport security and sick leave. Lastly, there were some illustrated training exercises. Even thought these leaflets contains good and useful information, patients stated that it was to easy to either loose the leaflets or actually break it before coming into surgery months later, or over the 6 week long rehabilitation period, as it was only a basic 8 page paper. The leaflet could be found and downloaded on Hagaviks website, but none of the patients knew this. All of the patients were happy with the information that they were given at their admission, and made sure to compliment physicians and nurses they had talked to, but it was stated that even though the information given vocally as well as on paper, the access to information outside the hospital could be improved a lot.

5.3 Iteration Two

A second low fidelity prototype was created in design iteration two. This prototype was made in the wire-framing tool Balsamiq Mockup, which made it more detailed and closer to an actual product than the previous sketch. Along with the prototype, an essential use case was presented that correlated with the prototype. After finishing the prototype, a discussion regarding its content with a previously operated patient took place.

5.3.1 Essential Use case

An essential use case represent abstractions from different scenarios which are concrete stories that focus on realistic and very specific activities. it is formalized as a structured narrative made from three different parts: a name or title that describes the overall user intention, a stepped description of the user actions, and a stepped description of the systems responsibilities [24]. Table 5.1 is a use case created to represent the interaction between a patient and the platform when exploring different rehabilitation exercises.

Table 5.1: Essential Use case - Patient exercise module

USER INTENTION	SYSTEM RESPONSIBILITY
Complete training exercise for hip	Offer selection of exercise videos
Learn how to do exercise	Provide video guide for given exersise
Log and report completion of exercise	Request and register pain levels and completion plus additional comments.

5.3.2 Wireframes

A wireframe is a schematic of a products skeletal structure and framework that illustrates its content and controls [24]. Numerous wireframes were made in Balsamiq Mockup to illustrate several of the possible modules and scenarios that could be useful. In Figure 5.2 wireframes for the exercise module are presented.

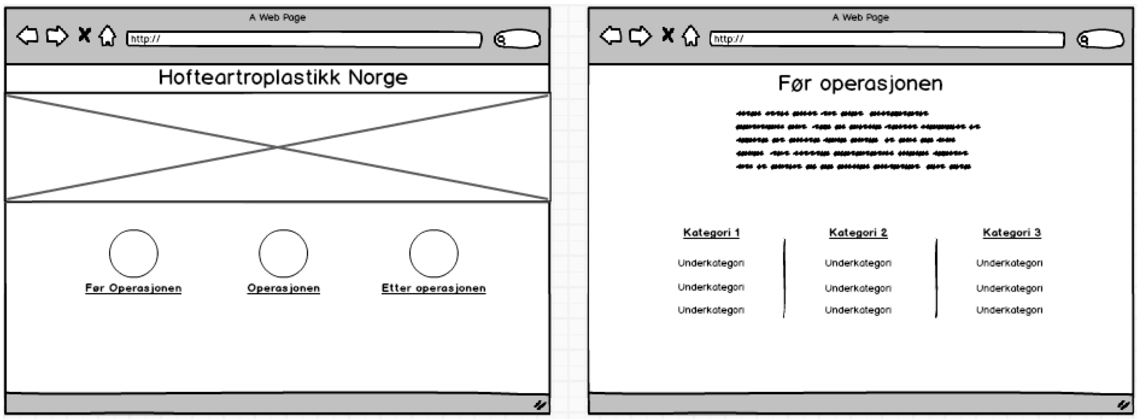

Figure 5.2: Wireframe of the main page and wireframe for the category selection made for each subsection

The different wireframes illustrate a web-platform with some of the same steps that were elaborated on in the first iteration. Some options and text has been added to create a more wholesome experience based on the feedback and evaluation from patients and medical personnel in iteration one. The first screen shows how the first step is the main-page, screen 2 presents patients with a more specialized and broader category selection than earlier. An overview of different training exercises are shown in the third screen, and in the second last screen a mediaplayer is shown. Lastly, the user is presented with the short form for registering the pain and completion of an exercise.

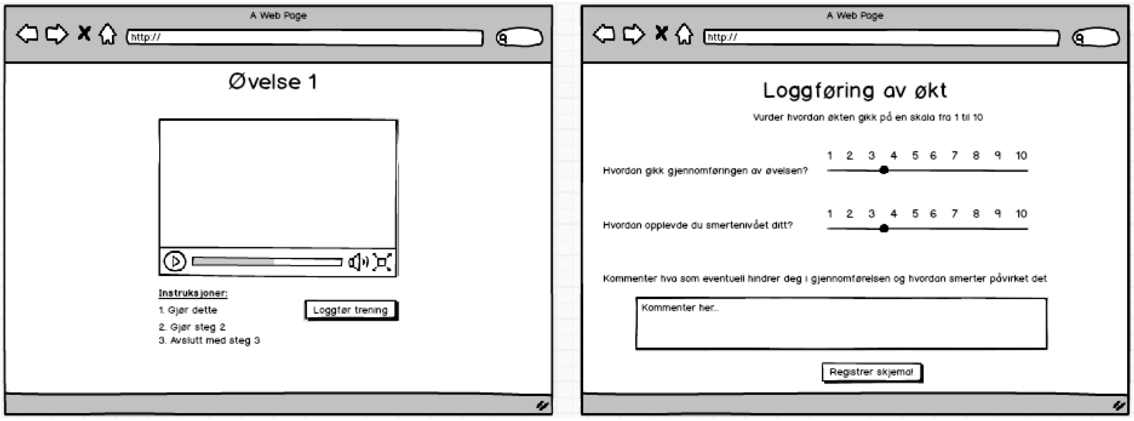

Figure 5.3: Wireframe of the media player providing video guides, as well as wireframe for exercise evaluation and registration.

5.3.3 Evaluation

A previous patient that had undergone total hip replacement surgery, discussed the look and impressions from the wireframes made in Balsamiq. The patient was positive and happy with the look of the module. The simplicity, and what seemed like an easy user interface, was what she liked the most. A comment was made about the navigation and the ability to move back using a button, as the browser navigation can be confusing. Opinions about the color and future design was also voiced, and bright clear colors were wanted for highlighting the important elements, making them easier to find.

5.4 Iteration three

In iteration three the design for a mid-fidelity prototype was created. A mid-fidelity prototype is a prototype with very limited functionality, but with enough to add the ability for maneuvering and interaction. A prototyping software called Adobe XD was used to design a prototype in a web-page format and add clickable elements such as buttons and text. Just like the earlier wireframes, the prototype is designed for internet browsers such as Internet explorer, Google Chrome or Mozilla Firefox. All the main elements from earlier design iterations have been kept, and some elements have been added, for example, a navigation button for moving backwards. This was done based on reviews and feedback from previous evaluations.

5.4.1 Colors, name and visual content

The colors used for creating the theme of the platform was selected based on the data collected in the semi-structured interviews. One of the questions' in the interview specifically asked the patient what they would have focused on if they were to design such a platform. Several of the patients said that the use of bright colors and a slick and simple look as the way to go, since it would easily separate design and content, and make navigation easier. The importance of easy navigation with little possibility for making mistakes was emphasized in the feedback. Most of the patients going through total hip replacement surgery are above 60 years old, which can be seen in Figure 2.2. And even though most of the interview subjects answered they they had decent computer knowledge, it was empathized in the design phases that tools like large buttons and limited options were important to ensure a good design.

The name "Norsk Senter for Hofteprotese" (Norwegian centre of Hip Replacement) for the platform was also selected based on the data from patients collected through interviews. Patients wanted to have a strong name, which could be connected to other renowned web-resources such as "Norwegian Healthinformatics" (Norsk Helseinformatikk), which was mentioned as a trustworthy source of health information that patients use. Patient feedback suggested that this name would be fitting. A logo was also put together to provide a more professional image to the website.

Figure 5.4: Main page of the web platform. Only a small amount of select-able options to provide easy navigation

5.4.2 Evaluation with experts

The content of the platform was discussed and assessed with experts through the use of different evaluation methods. Experts navigated through the different modules in the prototype and engaged in a discussion, providing feedback.

The experts were positive on how the design had been implemented in the prototype, and thought that the platform could be very useful for patients in the future. They agreed that the design was simple and easy to use, and that most of their patients would be able to fully utilize the functions the platform provides.

Comments were made on how the completion of exercises could be used to collect data for for further clinical use or research. Firstly, the formulation of the text in this page had to be formulated in an easier and lighter way, providing the user with enough information to understand the setting. Examples of text that could be used were provided by the experts. Lastly there was an agreement that the level of "Completion" and "Pain" was the most relevant points for data collection, as this could easily be useful in a patients future clinical situations. The selection of "Completion" and "Pain" had been discussed with both patient's and experts earlier, and this new evaluation confirmed the selection.

Small changes to definitions and names for different categories were also discussed, such as naming the different subcategories in each module, making the different options more obvious for a user.

Figure 5.5: Evaluation and registration of completed exercise. Large, highlighted buttons ensure that a user can see their options

5.5 Iteration four

In Iteration four, a High-fidelity prototype was produced in Adobe XD. This would be the final prototype for this project. The main alterations in this prototype were based on feedback and evaluations provided from earlier iterations and conducted evaluations. A System Usability Scale evaluation, and a Heuristic Evaluation were completed with expert users and personnel, providing important and valuable feedback.

5.5.1 Changes in content

A SUS evaluation was conducted with a physiotherapist which is specialized in hip athroplasty, and a discussion was also initiated. During the discussion, the content of the platform was explored to get into the details of the design, and some useful opinions were suggested. Overall, the physiotherapist agreed on the focus for the different modules, but said that the main focus should be the post-surgery module, as this is the most important part for ensuring proper rehabilitation. This opinion is coherent with the opinions mentioned in the earlier patient interviews. The physiotherapist suggested to add written instructions for training videos, so that patients would not need sound to get instructions, or that they could complete them without watching the videos. She also commented on the text in the exercise-reporting module, suggesting different formulations that she thought would be better fitting. Putting some categories, such as information regarding medicine or useful equipment, into more than one module, could be relevant in several settings and not only one.

5.5.2 Compliance with Design Principles

A set of design principles were presented in section 3.7.3, and were followed throughout the design process creating the high fidelity prototype.This section is about how the different design principles were used in the design phase.

Visibility, which is the first design principle, was very much in focus throughout the development. As mentioned earlier, the use of large and attention grabbing buttons were implemented to guide users through the platform. All buttons also have short explanatory description in them, in Norwegian, describing the action they provide. No distracting elements, such as background images, logos or unnecessary images have been used, removing any confusion that a user might get.

The second principle, **feedback**, was given througout clearly stating where a user was located by using informative titles and text. Also, when hovering over an element, the cursor changes into a pointing hand, using a well known feedback-trick to inform users that the element is clickable. Lastly, there is implemented a small animation when changing page, making it more clear that a step has been taken.

Constraints, the third principle, was applied, but not much, as there was little need for constraints in the platform. The only constraint put into the prototype is a dialog box that pops up if a user tries to send in an exercises-evaluation without filling out all of the required fields.

Consistency, which is the fourth principle, was focused upon throughout all phases. A set of selected colors were used on all pages, the same buttons were used all over and the same design layout was used everywhere.

Lastly, **affordance** was achieved through the use of simple and logical elements, such as large buttons with bright colors and a explanatory text. Buttons also provide visual feedback when hovering a cursor on it, informing the user that its intractable. All of the elements used in the platform require only very basic technical knowledge to interact with, and stands out as obvious intractable options compared to non-intractable options.

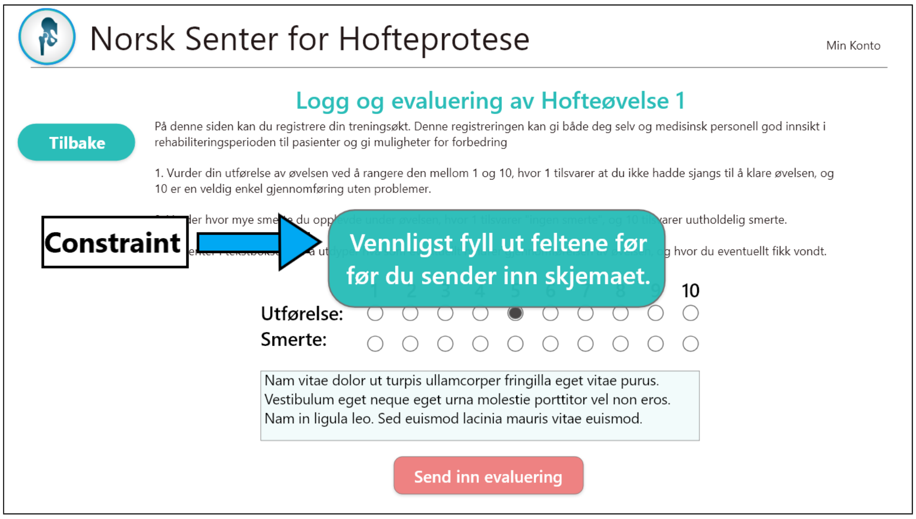

Figure 5.6: A modal dialog box with the text "Please fill out all fields before you register your form" providing constraint in the prototype.

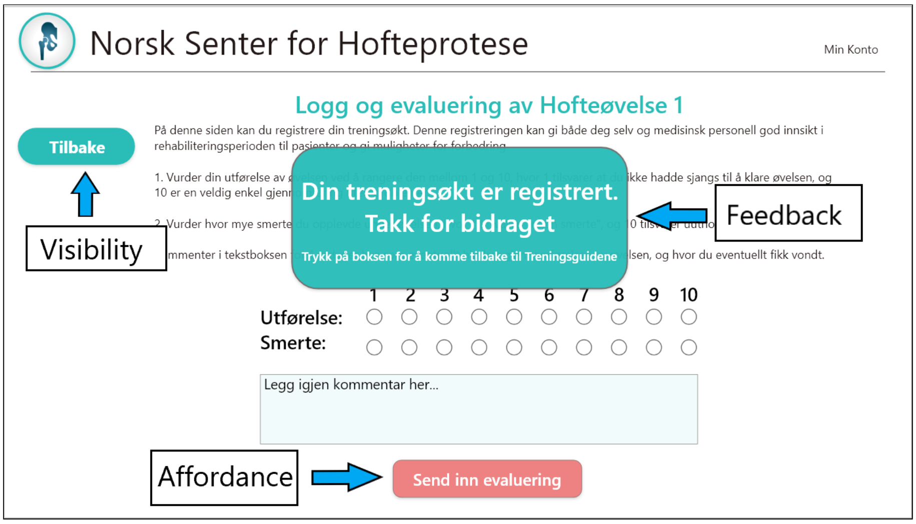

Figure 5.7: Button-design providing both affordance and visibility, and a modal dialog box containing the text "Your workout has been registered. Thank you! Click on the box to return to exercises" providing feedback.

Chapter 6

Implementation

This section will present all the different applications and tools that were used to design and create the prototype for the thesis.

6.1 Adobe XD

Adobe XD is a user experience design tool that is created and published by Adobe Studios. It is a tool used for developing wireframes, graphical user interfaces and functioning prototypes in the form of mobile applications or websites. With Adobe XD, a designer can draw, shape and arrange widgets, buttons and functions easily as a static wireframe and quickly change it into an interactive prototype [30].

6.2 Adobe Photoshop

Adobe Photoshop is a photo raster graphic application that is created and published by Adobe Studios. With Adobe Photoshop you can crate and edit images, edit and render text, and work with 3D graphics and vectors. [31]

6.3 Adobe Illustrator

Adobe illustrator is a vector graphics editor that is created and published by Adobe Studios. It is used for creating, managing and editing of vector graphics. [32]

6.4 Balmsamiq Mockup

Balsamiq Mockups is a software created by Balsamiq Studios. The desktop software used in this project is made for building low-fidelity wireframes for mobile or web platforms [33].

Chapter 7

Evaluation

The results presented in this chapter are from the usability evaluation, namely Nielsen's Heuristic Evaluation, and the results collected from the System Usability Scale evaluation.

7.1 Participants in evaluation

There were several groups represented in the evaluation of the platform: six masters students studying Information Science, a specialized nurse and a specialized physiotherapist, all considered experts in the field of HCI or Arthoplasty, respectively.

7.1.1 Expert users for Usability testing

The six students from Information Science at the University of Bergen have expertise in system development, Human-computer Interaction and Interactions Design through courses in their curriculum, and were therefore considered as experts in the field of usability. All six students participated in both the usability evaluation and the heuristic evaluation. Table 7.1 provides an overview of the student expert evaluators.

7.1.2 Medical expert evaluators overview

A few healthcare professionals from Hagavik Coastal Hospital participated in the evaluation using the System Usability Scale. One of the participants is a nurse specialized in the field of arthroplastic surgery, while the second participant is a

Table 7.1: Student expert evaluators

Participant ID	Age	Gender	Educational level
P1	26	Male	Master student, 4th semester
P2	24	Male	Master student, 3rd semester
P3	27	Male	Master student, 4th semester
P4	27	Male	Master student, 4th semester
P5	24	Male	Master student, 4th semester
P6	29	Male	Master student, 4th semester

physiotherapist with the same specialization. Table 7.2 provides an overview of these two evaluators.

Table 7.2: Helathcare evaluators overview

Participant ID	Age	Gender	Position/Profession
P7	28	Female	Nurse
P8	37	Female	Physiotherapist

7.2 System Usability Testing

The testing was conducted on a Microsoft Surface Book Laptop with a 14 inch display, with touchscreen, allowing the users to physically interact with the prototype, like on a tablet. All participants are identifiable with their unique Participant ID provided in table 7.1 and 7.2.

7.3 Tasks for evaluation

For the evaluation of the e-platform, each participant needed to get to know the platform, which was achieved by completing a set of given tasks. The tasks cover accessing all modules and areas of the platform. None of the participants were informed on how to complete the tasks beforehand. They were allowed to ask questions' and ask for help.

Here are the tasks:

1. Find a way to log in
2. Navigate through the Post-surgery module.
3. Access a training exercise video.
4. How do you find the display of exercises? Easy, moderately, difficult?
5. Report random result in the status report.
6. Explore and familiarize yourself with the pre-surgery and Surgery module. Do you find what you need?

7.3.1 Direct observing of task completion

Observation was discussed in a section 3.5, and using this observation of task completion is appropriate for collecting both qualitative and quantitative data. Each participant was accompanied by an observer throughout all of the evaluation.

7.3.2 Metrics

Metrics are used preform effective measurements in an suitable scale, and they provide measures that can be analyzed and utilized when developing web platforms [34]. In this project two different metrics were recorded: task completion time, and task completion success.

7.3.3 Evaluation results

The qualitative and quantitative results from all of the SUS evaluations are presented as graphs in Figure 7.1 and 7.2, respectively. The data is presented in two groups, one for the usability experts, and one for the medical experts. Originally, both groups were to be measured in both task completion time and task completion success, but as none of the participants were in need of assistance to complete any of the tasks, data for the task success is not included.

A contributing factor for time consummation during the usability testing was limitations in the prototyping software Adobe XD, which does not allow text or value input. This lack of functionality staggered the progress of all participants when they were supposed to complete Task 1 and Task 4, which requires a user to input something. All participants were informed about the limitation.

Task completion time - Usability experts

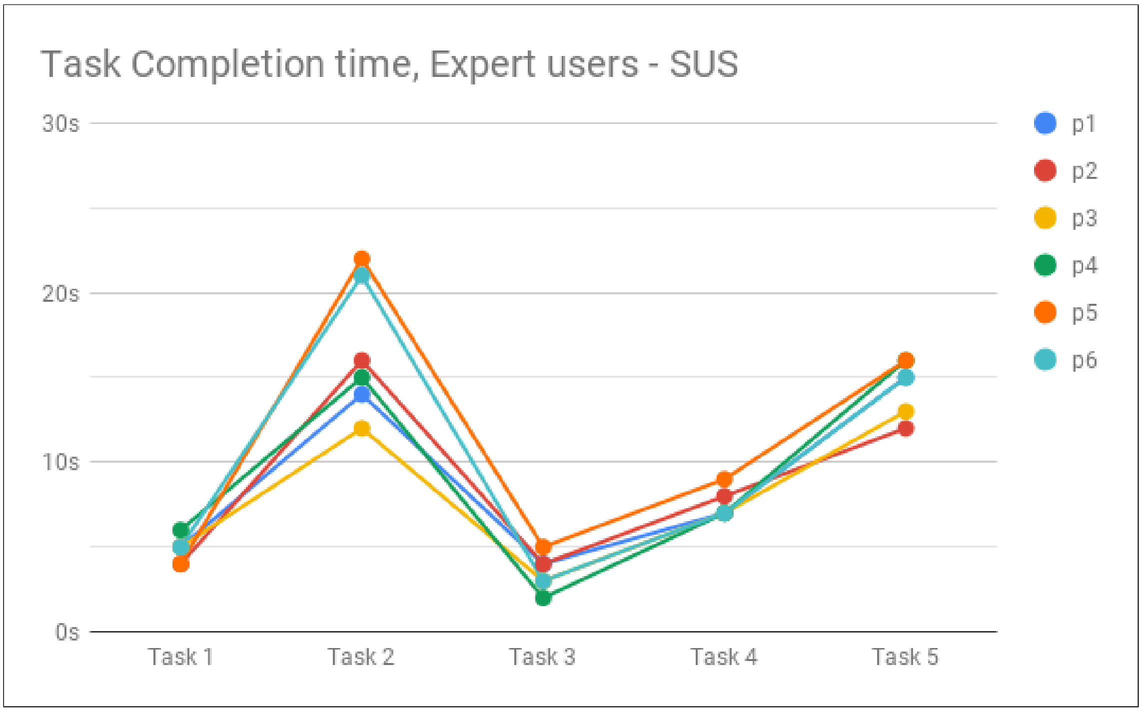

Figure 7.1: Task completion time - Usability experts

Task completion time, which is the amount of time used to complete a given task was measured in seconds for each participant during the SUS evaluation. As seen in Figure 7.2, there is little difference in the time spent for all expert participants on Task 1. On Task 2, there is some variations in the time spent, where the P5 and P6 have spent more time to get around the module than the others. The explanation for this might be that P5 and P6 seemed to use more time reading than the others. For the next tasks there is little to no difference between the different participants,

Task completion time - Healthcare professionals

The healthcare professionals spent a bit more time to complete the tasks, compared to the usability experts. The reason for this is that the usability experts were aware

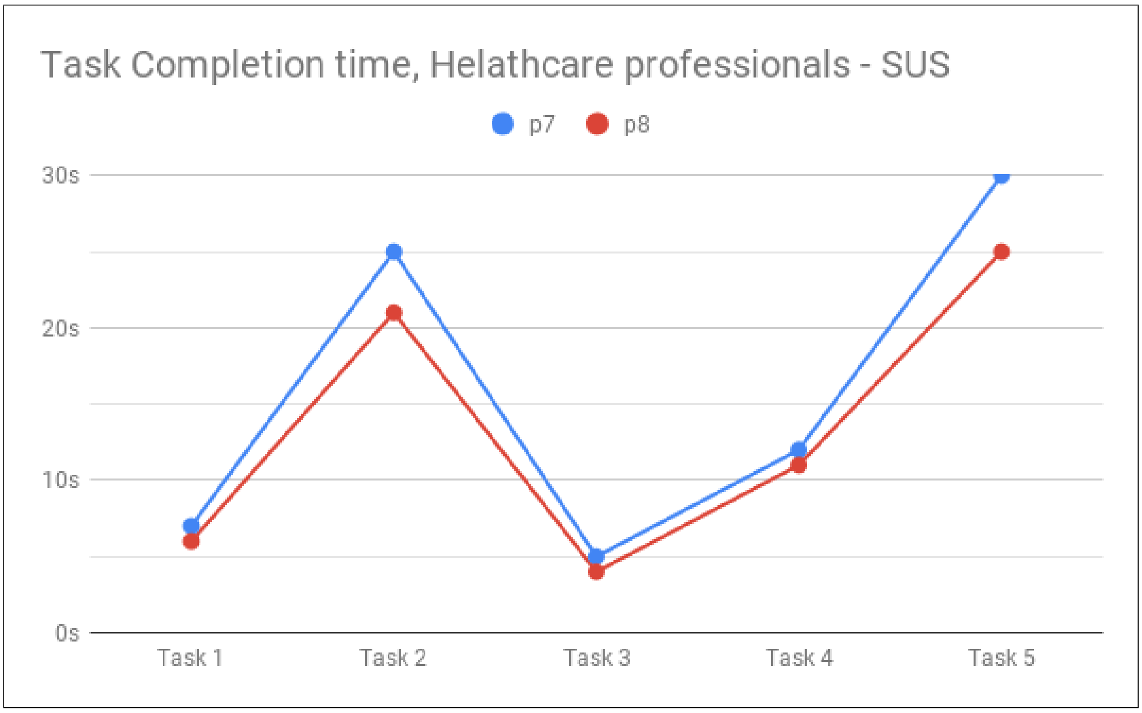

Figure 7.2: Task completion time - Healthcare professionals

of the input-limitations mentioned earlier in the prototyping software, which allowed them to skip the input options faster than those unaware of it. P7 and P8 also spent longer time studying and reading the text content in Task 2 and Task 5 than the others.

7.3.4 Comparing evaluation outcomes

Table 7.3: Task completion time comparison

Avg. time spent in seconds	Task 1	Task 2	Task 3	Task 4	Task 5
Usability experts	4.8	16.7	3.5	7.5	14.5
Healthcare professionals	6.5	23	4.5	11.5	27.5

When comparing data from both expert groups there are no obvious differences in the time spent on each task. The usability experts are faster, but this is logical as they have IT background.

7.3.5 SUS results and metrics

This section will present results from the System Usability Scale evaluation conducted with HCI experts and Medical personnel. Along with these metrics, comments on the prototypes design and functionality will be included, both from usability experts and medical personnel.

SUS - Usability Experts

As seen in Figure 7.3 the SUS scores from all the usability experts are above 85, which is considered a very good result. A score above 55 is considered "OK" and a pass for usability, while a score of 85 or above is considered "excellent" according to Brooke [27]. This shows that the usability experts consider the design of the platform as a highly usable.

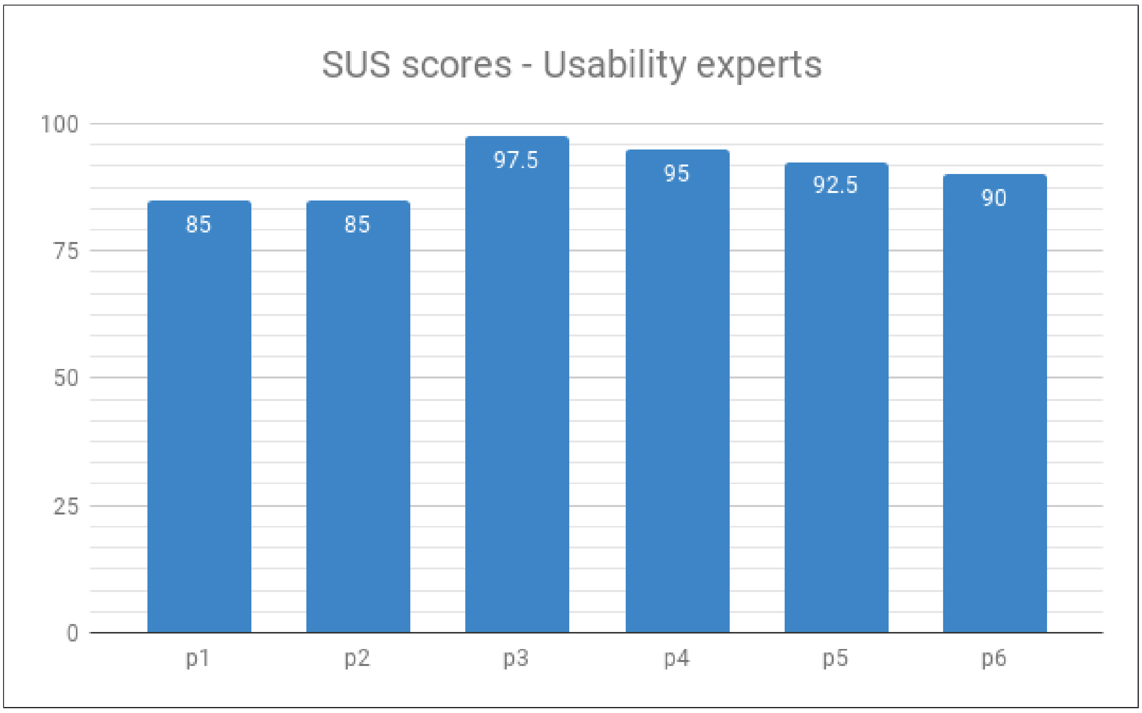

Figure 7.3: SUS scores from all expert evaluators

SUS - Healthcare professionals

The healthcare professionals reported a usability score that was even higher than the usability experts, with both the specialized nurse and physiotherapist giving a SUS score of 95. This is close to whats considered "best imaginable" in the SUS scale, shown in Figure 7.4. Both P7 and P8 said that a platform like this, which collects all information in one place for the patient, is highly asked for, and that they would like to have a product like this in the future. They both said that this could help improve patient safety in the future. It was also mentioned that there is an increase in younger patients requiring hip replacement surgery, and that it was obvious for them to expect that a web-platform would available to modernize the information flow for future patients. Comments were made about the design and how user friendly it was towards their patient group, which primarily is people above 60 years of age, and they were very satisfied with the simplicity of the design features.

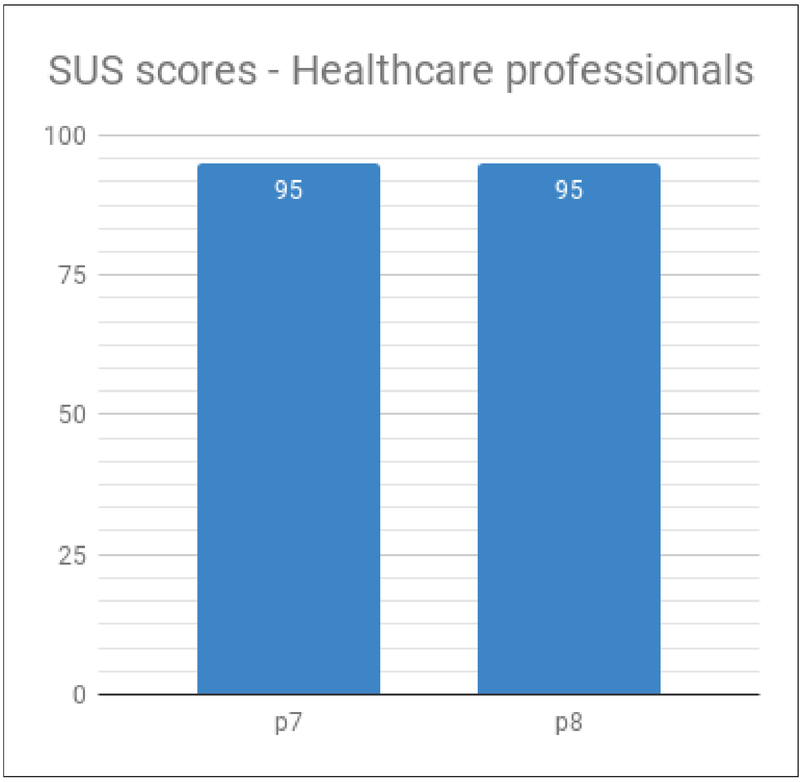

Figure 7.4: SUS scores from both healthcare professional evaluators

7.3.6 SUS summary

A total of 8 participants were used to measure the usability of the platform, which is a fitting number for a SUS evaluation according to Brooke [27] and the total average of the results was 91,875, which is considered "Excellent" usability [27], which is a score that one can be satisfied with.

Table 7.4: Average Heuristic scores

Heuristics	Average score 1-10
1. Visibility of system status	8.5
2. Match between the system and the real world	9.25
3. User control and freedom	9
4. Consistency and standards	9.75
5. Error prevention	10
6. Recognition rather than recall	9.5
7. Flexibility and efficiency of use	7.75
8. Aesthetic and minimalist design	9
9. Help users recognize, diagnose, and recover from errors	9
10. Help and documentation	9

7.3.7 Heuristic Evaluation results

After HCI experts had completed the SUS evaluation, some of them were asked to preform a heuristic evaluation of the prototype. The heuristic evaluation consisted of ten heuristics, provided in section 3.8.2, which each participant could rate from one to ten, where one signals worst possible, and ten signals best possible score. Each heuristic was presented in detail for the participant in order to avoid misunderstandings and misinterpretations. Each heuristic is presented in the next section, where table 7.4 shows the average score for each heuristic.

7.3.8 Heuristic Evaluation Summary

The collective results in the evaluation is regarded as good, but there were uncovered possibilities for improvements and change to achieve a better evaluation.

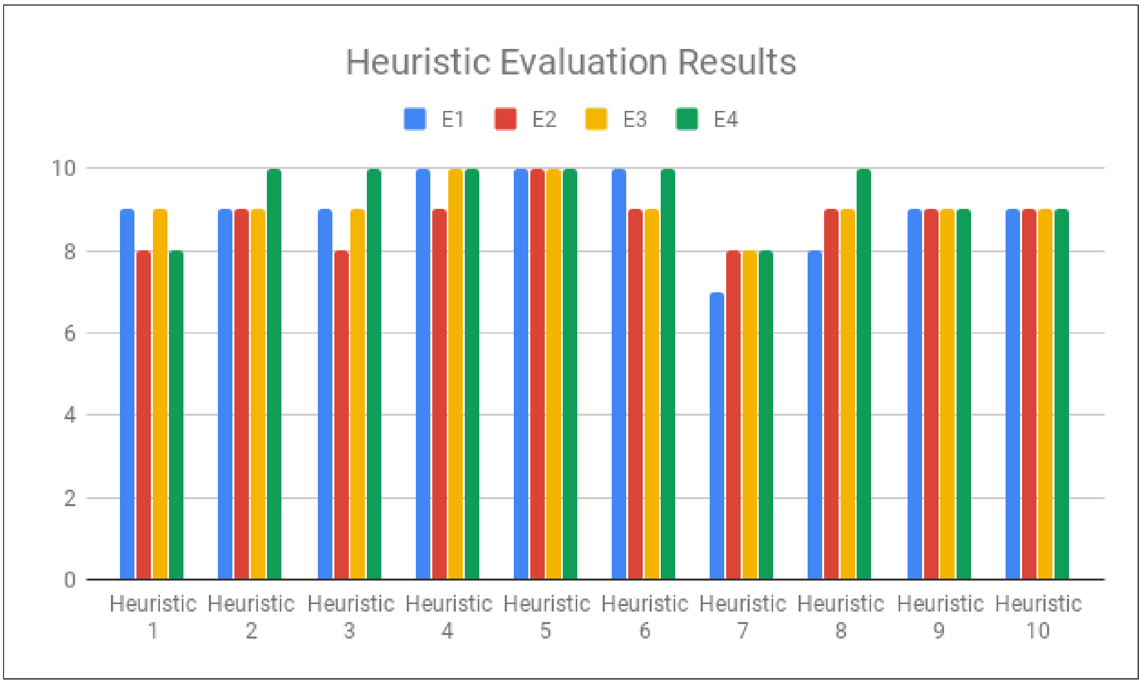

Figure 7.5: Heuristic evaluation results from all four participants

Chapter 8

Discussion

This chapter will discuss how the prototype, different methodology and research was completed overall. At the end, the answers for all the research questions', which are stated in section 1.2, will be given.

8.1 Methods and Methodologies

8.1.1 Design Science research

Throughout the project the Design Science research framework was applied to conduct proper research by using fitting methods for the problem at hand. Each of the seven guidelines has been included in the development at some level, to ensure that the artifact has been developed to solve an actual existing challenge, which is elaborated upon in section 3.4.

8.1.2 Usability goals

To develop the prototype, all five usability goals that were presented in Section 3.7.4, became relevant.

Effectiveness was proved through the evaluations conducted in Section 5.4, where the SUS score was "excellent", proving that the system was effective for the intended purpose. The same argument goes for the second usability goal, which is efficiency.

Safety is a usability goal that is covered through the design of the e-platform, where there are no known errors that can put a user in a dangerous or undesirable situation.

Utility is provided in the prototype, as it covers all the functions and information that a patient might need to meet his/her needs. These needs were mapped out and explored through the research methods applied in the design phase of the platform, and where it was discussed with both patients, as well as with a specialized nurse and a specialized physiotherapist in the final design iteration.

Learnability is also deemed as achieved, as feedback provided through interviews, discussions and the SUS scores was positive, suggesting that this platform is easy to use in its intended way. If one is to look at the results from question 4, 7 and 10 in the SUS evaluation, there is a consensus that the system is perceived as easy to learn and requires little to no support from a technical person. Taking this feedback into account, one can assume that the principle of learnability is fulfilled.

Memorability was a more difficult principle to prove as fulfilled, as it requires a user to use a system, and then not use it for a longer period of time, and then again use the system to prove whether its is memorable or not. But as none of the participants in the SUS evaluation had troubles in learning the platform right away, as it is shown in Figure 7.3. One can assume that a user would not have a problem using the platform after a longer break.

8.1.3 User-centered design

User centered design was chosen as it is one of the most common methods to use when designing a platform in the healthcare domain according to Mival [25]. User-centered design is concerned with providing an engaging and enjoyable design by focusing on real end users, which opened up for a cooperative design process with both patients and healthcare professionals that gave important and valuable feedback over several iterations. Important insight in users needs and requirements were acquired through User-centered design approach, which again increased the likelihood of achieving a high quality UX design.

8.2 Prototyping

A selection of software and tools has been used to develop the different wireframes and prototypes. Blasamiq was used to create wireframes and present a basic design, while Adobe XD was the main software, and it was used for creating a high-fidelity prototype for testing and evaluation.

The development of low, mid and high-fidelity prototypes provided important feedback through the four iterations. The low-fidelity sketches allowed fast and easy presentation of plausible concepts and important discussions with relevant users and personnel for establishing requirements. Through the use of wireframes created in Balsamiq Mockup, important opinions and comments were collected about the platform's design, content and usability. Lastly, the prototypes created in Adobe XD opened up for user interaction and evaluations, providing important data and feedback, which was invaluable for the for the final usability evaluation.

8.3 Data gathering

8.3.1 Semi-structured interviews

Semi-structured interviews were completed with patients and healthcare professionals in order to collect qualitative data for the project. It was a very useful tool for gathering user experiences that played a big role in the design of the platform. The interviews opened up for engaging conversations and discussions which resulted in a collection of data that would be hard to attain through other means.

A total of 10 patients were interviewed, where two of the patients have had hip replacement surgery before, and they provided useful insight regarding how patients themselves experienced their own future safety when thinking of hip replacement. The two patients that were in for their second surgery contributed with many experiences and opinions regarding existing information sources and products that are used to secure patient safety, which was very valuable in the design phases. The opinions collected about potential design solutions were also a big contribution to design an artifact that fitted the usability goals.

The interviews with the specialized nurse and the specialized physiotherapist provided important feedback and opinions regarding the prototype and its content. Comments regarding the importance of certain sections and the usability of its content covered the aspects that patients had little knowledge of, but wanted to know more about.

Even though there was a wide selection of interviewees participating in the data gathering, there are some aspects of the data gathering that could be improved. More patients could have been interviewed, especially post-surgery and over a longer period of time to follow up progress and use. Ideally more male patients would be included, as eight out of the total 10 patients were female. A broader age range would be good to consider as well.

8.3.2 Direct observation

During the System Usability Score evaluation all participants were observed while completing a set of tasks. This allowed collection of data that could be used to evaluate the usability and learnability. During the evaluation, the observer could also collect reactions and comments that a participant might not notice as they were expressing themselves. By observing two different expert groups, one could also see small differences in the usage of the prototype, giving a variation in reactions that was useful for data collection.

8.3.3 Evaluation methods

In order to evaluate the prototype different evaluation methods were used. Both were used to gather more insight into the prototype.

SUS

A System Usability Score evaluation was conducted with 8 participants. Six of the participants were defined as usability experts, and the latter two were healthcare professionals in the field of hip replacement. Each participant was given the same set of tasks to complete with little information and limited help provided. Overall a score of above 90 points of a total 100 was a very good result to achieve.

There are some improvements that could have been done in order to make the SUS evaluation better. Both new and previous patients could have participated in the testing, but time and location set some limitations that made this rather difficult. Moreover, participants could have been better informed on how a SUS evaluation worked, and in what manner they were to evaluate the prototype before starting the test, allowing everyone to start with the same knowledge. One example of this was how some participants knew about the touch screen abilities of the test-computer, while others did not, which might have affected how participants perceived the platform differently from each other.

Heuristic evaluation

A Heuristic Evaluation was completed using the Nielsen Heuristics [28], with a total of four participants. The heuristic evaluation was carried out to identify potential errors in the user interface on the platform, with a maximum of ten heuristics available for evaluation. All ten heuristics were included, even though number 7 and number 10, which covers flexibility and efficiency of use, and help and documentation, are not that relevant for the platform. This is because the platform is created with a very intuitive and simple design, making it very easy to use, which means it does not emphasize on the access for either help and documentation or flexibility and efficiency.

8.4 Prototype

In this section there will be a discussion regarding the final prototype and its different challenges and limitations. The prototype has been designed and created through several iterations in cooperation with users and experts. Even though the prototype has been tested and evaluated by several groups of experts, it is probable that further testing should be conducted with patients and other plausible future users to ensure its usability and utility.

Technical aspects

The artifact is not a fully implemented product as the software used for its creation is limited to creating functioning prototypes, and not complete systems. The software Adobe XD, which the prototype is created in, holds some limitations that hinders a complete experience, like the lack of input options and navigational buttons and functions that are available in an ordinary internet browser. This means that the platform does not function as an actual web platform in the current state, which could have affected the way it was evaluated.

Design aspects

The design of the platform was well received during testing, and it was developed based on opinions and feedback given by patients during design iterations. Smaller corrections or comments on weaknesses were given resulting some changes to elements as suggested. Visual aids, to provide information about options to scroll further down would be useful, as some of the pages did not have visual signals that promoted this option.

8.5 Limitations

There are several limitations present in the conducted research. As mentioned earlier, the availability of patients that were up for participating in the research was somewhat limited, mostly because of time limitation and the location of both patients and Hagavik Coastal Hospital. Ideally, more patients with a wider range of age, background and experience should have been interviewed to expand the pool of potential insight and information. Another limitation is connected to the process of collecting patient data which requires ethical approval from both the hospital and Norwegian Centre of Data. Approval for data collection was obtained eventually by both instances, but further approval is required to go beyond whats done in this project. Technical limitations were also present, as it is not a complete system, but a prototype constructed in Adobe XD.

8.6 Answering the research questions'

RQ1: Can patient safety be improved by designing an e-learning platform for hip arthroplasty patients?

To answer this research question, data has been gathered from both healthcare professionals and patients whose evaluations are taken into consideration. Firstly, all of the healthcare professionals, including a specialized nurse, a specialized physiotherapist, a surgeon and a bio-engineer were all positive to the development of such an e-learning platform for patients(see section 5.2 and 5.4.2). Throughout the research process, repeated confirmations came from these healthcare experts, stating that this is something that it would help patients prepare for their surgery and the life that awaits them with postoperative rehabilitation and limitations, which again will improve patient safety.

All of the ten interviewed patients were eager to hear that an e-learning platform for hip arthroplasty surgery was in the works, and voiced only positive opinions (See section 5.2). Two of the interviewees, which had gone through a total hip replacement before, were asked if they though access to a platform like this could have had any positive effect on their previous (and future) situation. Both of them said that it definitely would be a positive addition for patient during the hip replacement process (See section 5.2.2). Based on feedback and data collected throughout interviews, as well as evaluations, patients are motivated to use an e-learning platform to prepare themselves for surgery and rehabilitation. They want to access information regarding subjects that are vital to ensure that they to stay as safe as possible.

There was a general consensus in the collection of data, discussions and conversations, that there ought to be a web platform dedicated to education of hip arthroplasty patients available online in 2018. All of the patients that contributed to the research stated that they had average or above average competence with technology and the internet. Most of them had spent time locating and made use of different web-resources, but missed a trustworthy and complete information platform. Therefore it is clearly relevant to initiate the creation of a platform providing this information.

Based on the these results one can say that it is possible that the design and creation of an e-learning platform can help improve patient safety for hip arthroplasty. All relevant stakeholders are positive and think that an e-learning platform can contribute to patient safety through education and access to information that is tailored for patients.

RQ2: Can involvement and education of patients through an e-learning platform improve the rehabilitation process for hip arthroplasty patients, according to healthcare professionals?

To obtain an answer to this, several discussions and evaluations with healthcare professionals were conducted, gathering data and opinions through several iterations (see chapter 5).

Through discussion and evaluations with a physiotherapist, a specialized nurse and a bio-engineer, as well as a conversation with a surgeon, it has been stated that engaging patients in the rehabilitation process through an e-learning platform can contribute to improving the rehabilitation process. As said by Charles Safran "When patients participate more actively in the process in medical care, we can create a new healthcare system with higher quality services, better outcomes, lower costs, fewer medical mistakes, and happier, healthier patients" [35].

RQ3: Can useful web platforms in the healthcare domain be developed through involvement of patients in a User Centered Design process?
The question was was answered positively in chapter 5. To create a successful and useful e-learning platform for the user group, which in this case was elderly patients in their late years, the simplicity in the design is important. To be able to meet this, the project made use of the design principles in section 3.7.3, and a set of usability goals from section 3.7.4.

Patients were included in the design phase in order to facilitate the five usability goals, which were adopted in the design to make a highly usable platform for its user group. As the evaluation results shows, there were still some issues that needed to be addressed. However, both the heuristic and SUS evaluations have suggested that design principles, according to the UX design requirements, were met. The evaluation implies that patients were valuable participants in the design.

With these results and data in hand, one can assume that the involvement of patients had a positive impact on the development of the platform design. These findings are however somewhat limited as there has been no clinical testing and the prototype is not a finished product. Therefore the prototype should be further explored and tested in the future to provide a more complete answer. A full development should be completed before a comprehensive evaluation could be conducted in a clinical setting over a longer period of time.

Chapter 9

Conclusions and Future work

9.1 Conclusions

The goal of this thesis was to investigate whether patient safety could be improved through the use of an e-learning platform by providing information and education to hip arthroplasty patients. As there is an increase in the use of technology and eHealth in the healthcare sector, UX design could be utilized to develop an e-learning platform providing easy access to information online in order to improve patient safety. Data was collected from healthcare professionals in the field of arthroplasty, as we as from arthroplasty patients, to establish the requirements necessary to define content of the platform, as well as UX goals. Based on this, a prototype was designed through four iterations involving users in evaluations and by following design principles.

Evaluations were carried out to measure usability with usability experts and healthcare professionals. All of the study participants were asked questions' regarding the prototype, its design and whether they would assess it as a useful and relevant artifact. Collectively, the results indicated that an e-learning platform that was made to improve patient safety and access to information was deemed helpful for patients going through total hip arthroplasty. Patients were particularly positive and eager to make use of the platform. Healthcare professionals agreed that it could improve both the preparation and rehabilitation process for future patients, thereby improving patient safety.

To conclude, the thesis has provided a good foundation for future development of an e-learning platform and found clear indications that there is a need and want for such an information source in the future.

9.2 Future development

Future development of the platform will revolve around providing solutions to limitations in the current prototype, and the actual development of a complete live product. The next step would be to conduct a clinical evaluation to evaluate more than the perceived impact in patient safety. As discussed with a physiotherapist and a specialized nurse, the information and content of the platform will need a professional upgrade, making it more coherent with healthcare approaches, leaving less room for mistakes and misinterpretation. Content should be expanded to cover a broader specter of information and guidelines.

Development of the platform for actual web browsers is also a natural step to take in future development. Only an interactive design prototype has been presented and tested in this thesis. For wider usage, the platform should be developed to support the most popular web browsers for both computers and hand-held devices, such as tablets and phones. During evaluation of the prototype, touch-screen usage was available, allowing users to interact with the prototype as if it was on a tablet, showing that users enjoyed using it in a tablet-mode as well. This gives an idea on where to direct future technical development.

Testing the prototype with patients in a clinical setting is of great interest to identify the actual impact on rehabilitation and patient safety that the platform could have in the long term. Further exploration of design alternatives and outstanding issues also remains.

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Appendix A

NSD approval for data collection

Ankica Babic
Fosswinckelsgate 6
5007 BERGEN

Vår dato: 22.03.2018 Vår ref: 59338 / 3 / HJT Deres dato: Deres ref:

Tilrådning fra NSD Personvernombudet for forskning § 7-27

Personvernombudet for forskning viser til meldeskjema mottatt 20.02.2018 for prosjektet:

59338	*Designing an E-learning platform for patients undergoing hip and knee replacement surgery.*
Behandlingsansvarlig	*Universitetet i Bergen, ved institusjonens øverste leder*
Daglig ansvarlig	*Ankica Babic*
Student	*Tor Aimar Carlsen*

Vurdering

Etter gjennomgang av opplysningene i meldeskjemaet og øvrig dokumentasjon finner vi at prosjektet er unntatt konsesjonsplikt og at personopplysningene som blir samlet inn i dette prosjektet er regulert av § 7-27 i personopplysningsforskriften. På den neste siden er vår vurdering av prosjektopplegget slik det er meldt til oss. Du kan nå gå i gang med å behandle personopplysninger.

Vilkår for vår anbefaling

Vår anbefaling forutsetter at du gjennomfører prosjektet i tråd med:

- opplysningene gitt i meldeskjemaet og øvrig dokumentasjon
- vår prosjektvurdering, se side 2
- eventuell korrespondanse med oss

Meld fra hvis du gjør vesentlige endringer i prosjektet

Dersom prosjektet endrer seg, kan det være nødvendig å sende inn endringsmelding. På våre nettsider finner du svar på hvilke endringer du må melde, samt endringsskjema.

Opplysninger om prosjektet blir lagt ut på våre nettsider og i Meldingsarkivet

Vi har lagt ut opplysninger om prosjektet på nettsidene våre. Alle våre institusjoner har også tilgang til egne prosjekter i Meldingsarkivet.

Vi tar kontakt om status for behandling av personopplysninger ved prosjektslutt

Ved prosjektslutt 20.12.2018 vil vi ta kontakt for å avklare status for behandlingen av personopplysninger.

Se våre nettsider eller ta kontakt dersom du har spørsmål. Vi ønsker lykke til med prosjektet!

Vennlig hilsen

Marianne Høgetveit Myhren

Håkon Jørgen Tranvåg

Kontaktperson: Håkon Jørgen Tranvåg tlf: 55 58 20 43 / Hakon.Tranvag@nsd.no
Vedlegg: Prosjektvurdering
Kopi: Tor Aimar Carlsen, tor.carlsen@uib.no

Personvernombudet for forskning

Prosjektvurdering - Kommentar

Prosjektnr: 59338

FORMÅL
Formålet er å kartlegge informasjonsflyt og informasjonsbehov for pasienter som skal gjennom en arthroplastyoperasjon slik at det kan designes og utvikles en e-læringsplattform. Denne plattformen vil bli i form av en nettside, som kan bistå med å forbrede pasienter på operasjon og livet etter operasjonen, og bedre informasjonstilgangen til pasienter.

INFORMASJON OG SAMTYKKE
Du har opplyst i meldeskjema at utvalget vil motta skriftlig informasjon om prosjektet, og samtykke skriftlig til å delta. Vår vurdering er at informasjonsskrivet til utvalget er godt utformet, men vi gjør oppmerksom på at NSD nå heter Norsk senter for forskningsdata, ikke Norsk samfunnsvitenskapelig datatjeneste.

UTVALG OG REKRUTTERING
Utvalget består av helsepersonell, og pasienter som skal gjennom en utskifning av kne- og hofteledd. Helsepersonellet rekrutteres via veileders nettverk. Pasientene kontaktes deretter av helsepersonellet med spørsmål om de ønsker å delta i undersøkelsen. Personvernombudet legger til grunn at taushetsplikten ikke er til hinder for denne rekrutteringen, og at forespørsel rettes på en slik måte at frivilligheten ved deltagelse ivaretas.

TAUSHETSPLIKT
Personvernombudet minner om helsepersonellet har taushetsplikt, og anbefaler at prosjektleder tar dette opp med informantene i forbindelse med intervjuet. Student og informant har et felles ansvar for at det ikke kommer taushetsbelagte opplysninger inn i datamaterialet. Student må stille spørsmål på en slik måte at taushetsplikten kan overholdes. Det må utvises varsomhet ved bruk av eksempler, og vær oppmerksom på at ikke bare navn, men også identifiserende bakgrunnsopplysninger må utelates, f.eks. alder, kjønn, tid, sted og eventuelle spesielle hendelser/saksopplysninger. Personvernombudet forutsetter at det ikke innhentes personopplysninger om noen av pasientene, og at taushetsplikten ikke er til hinder for den behandling av opplysninger som finner sted.

SENSITIVE PERSONOPPLYSNINGER
Det fremgår av meldeskjema at du vil behandle sensitive opplysninger om helseforhold.

INFORMASJONSSIKKERHET
Personvernombudet forutsetter at du behandler alle data i tråd med Universitetet i Bergen sine retningslinjer for datahåndtering og informasjonssikkerhet. Vi legger til grunn at bruk av privat pc/mobil lagringsenhet/skylagring er i samsvar med institusjonens retningslinjer.

PROSJEKTSLUTT OG ANONYMISERING
Prosjektslutt er oppgitt til 20.12.2018. Det fremgår av meldeskjema og informasjonsskriv at du vil anonymisere

datamaterialet ved prosjektslutt.
Anonymisering innebærer vanligvis å:
- slette direkte identifiserbare opplysninger som navn, fødselsnummer, koblingsnøkkel
- slette eller omskrive/gruppere indirekte identifiserbare opplysninger som bosted/arbeidssted, alder, kjønn
- slette lydopptak

For en utdypende beskrivelse av anonymisering av personopplysninger, se Datatilsynets veileder:
https://www.datatilsynet.no/globalassets/global/regelverk-skjema/veiledere/anonymisering-veileder-041115.pdf

Appendix B

Informed Conset Form

Designing an E-learning platform for patients undergoing hip and knee replacement surgery

Universitetet i Bergen
Institutt for informasjons- og medievitenskap 2018

Bakgrunn og formål med masteroppgaven

Jeg, Tor Aimar Carlsen, er en masterstudent i Informasjonsvitenskap ved Universitetet i Bergen som holder på med min avsluttende masteroppgave. Formålet med denne studien er å drive med innsamling av data for å skape en e-læringsplattform som skal bedre tilgangen og flyten av informasjon til pasienter som skal igjennom en total hofte artroplastikk. Målet med en slik e-læringsplattform er å forbedre informasjons tilgangen til pasienten, slik at pasienten kan ha bedre kunnskap og informasjon om hva han/hun har å vente, samt undersøke mulighetene for å forbedre rehabilitering. Din deltakelse i studien blir sett på som svært verdifull til å utvikle denne e-læringsplattformen.

Hva innebærer deltakelse i studien?

For å samle inn den aktuelle dataen, ønsker jeg å få intervjuet 6-10 personer i alderen 18-75 år, både pasienter og helsepersonell. Intervjuobjektene som er pasienter deles i 2 grupper; de som skal gjennomgå en total hofte artroplastikk etter konsultasjon med lege grunnet slitasje eller lignende, og de som er akuttpasienter som følge av ulykke eller lignende. Spørsmålene til pasienter vil omhandle hvordan pasientene tilegner seg informasjon angående inngrepet, og hva slags kunnskap de har rundt forberedelser, holdninger, forventninger og informasjonskanaler som angår inngrepet. Spørsmålene til helsepersonell vil ta for seg de forskjellige informasjonskanalene som en pasient kan bruke, informasjonsdeling, pasientoppfølging og forventninger til pasient. Til intervjuene vil jeg gjerne benytte båndopptaker og ta notater mens vi snakker sammen. I tilfeller hvor pasienten befinner seg langt fra Bergen, vil intervjuene kunnes tas over telefon, hvor telefonsamtalen blir tatt opp.

Hva skjer med informasjonen om deg?

Alle personopplysninger vil bli behandlet konfidensielt. Den eneste som vil ha tilgang til personopplysningene er student, Tor Aimar Carlsen og veileder, Ankica Babic. Deltakerne vil ikke kunne gjenkjennes i publikasjonen med mindre de ønsker dette. Prosjektet skal etter planen avsluttes 1. Desember, 2018. Etter denne datoen vil alle personopplysninger og eventuelle opptak anonymiseres. Det endelige tidspunktet for anonymisering er 20. Desember, 2018. Det endelige resultatet av informasjon som blir samlet inn i denne studien vil bli analysert og kan bli publisert i vitenskapelige journaler.

Frivillig deltakelse

Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli anonymisert øyeblikkelig.

Dersom du har spørsmål til studien kan du ringe meg på 47 32 60 48, eller sende en e-post til tor.carlsen@uib.no. Du kan også kontakte min veileder Ankica Babic ved institutt for informasjons- og medievitenskap på telefonnummer 55 58 91 39, eller på e-post: ankica.babic@uib.no.

Studien er meldt til Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste (NSD).

Samtykke til deltakelse i studien

Jeg har mottatt skriftlig informasjon om studien, og er villig til å delta

Signatur og dato ……………………………………………………………

Telefonnummer ………………………………………………………….....

Appendix C

Semi structured interview guide for patients

Navn:

Født:

Intervju 1 (Ved konsultasjon):

Eksempler på spørsmål:

Hvor mye kan pasienten fra før?

1. Hvor mye informasjon har du tidligere fått av ditt lokale sykehus/ din fastlege?
2. Hvordan var kunnskapen din om arthroplasty-operasjonen før du ble videresendt til kirurg/sykehuset/Hagavik?
3. Har du søkt informasjon rundt inngrepet på forhånd?
4. Hvilke informasjonskilder/kanaler har du oppsøkt på forhånd?
    a. Har du oppsøkt/tatt kontakt med venner/familie/kjente som har hatt et slikt inngrep?
    b. Internett?

5. Var det enkelt å få tak i god/nok informasjon før du ankom kirurg/sykehuset/Haukeland?

Hva forventer pasienten av sykehuset?

1. Hva slags informasjon forventet du å få når du ankom sykehuset?
2. Er det noen informasjon som var viktig for deg å få i dag?
3. Er det noen informasjon du ikke ville ha?

Hva føler pasienten etter besøket?

1. Tenker du at du har fått nok informasjon fra sykehuset?
2. Er det noe du vil ha mer informasjon som du ville ha mer av?
3. Er det noe du føler du fikk for lite informasjon om?
4. Er det noe av informasjonen du fikk som du ikke forstod?
    a. Evt hvorfor ikke?

5. Hvilke kilder ga deg mest informasjon?

Kompetanse rundt internett

1. Hvordan vil du si at din kompetanse er på en datamaskin / bruk av internett?
2. Hva tenker du om en nettside som gir deg generell informasjon om operasjonen du skal igjennom?
3. Hva tenker du om en nettside som kan forberede deg på informasjon, og gi deg svar på spørsmål?
4. Hva tenker du om å ha en nettside hvor du kan få opplæring i aktiviteter og øvelser
5. Hva er eventuelt viktig for deg å ha på en slik nettside?
6. Hva er viktig for deg med tanke på utformingen av en slik nettside?

Appendix D

Semi structured interview guide for healthcare personell

Dette er et utkast til en overordnet intervjuguide for helsepersonell

Spørsmål som skal stilles til helsepersonell som er involvert i arthroplasty operasjoner. Dette gjelder både leger, kirurger og sykepleiere. Intervjuet vil bli gjennomført i forkant eller etterkant av en leges konsultasjonstime for en pasient. Intervjuet kan også fortsette ved eventuelle møter med helsepersonellet over prosjektperioden.

Eksempler på spørsmål:

Hvilken informasjon er viktig i følge legen

1. Hva slags informasjon gis til en pasient før operasjonen?
2. Hva mener du er det viktigste at en pasient får informasjon om?
3. Hvilke faktorer tror du er viktigst for at en pasient skal føle at han/hun har fått all den informasjonen de trenger?

Informasjonskanaler og kilder

1. Hvilke måter kan en pasient få informasjon angående operasjonen, forberedelser og livet etter?
2. Hvor viktig er det at en pasient aktivt søker informasjon?
3. Føler du at pasienter søker informasjon før de kommer til konsultasjon/operasjon? Hvor god er denne informasjonen de evt har fått tak i?
4. Hvilke informasjonskanaler har en pasient muligheter for å bruke, som du vet om?
5. Tror du at en nettside som ga pasienter tilgang til nødvendig informasjon og opplæring hadde vært en god ide? Hvorfor, evt hvorfor ikke?

Erfaringer med pasienter

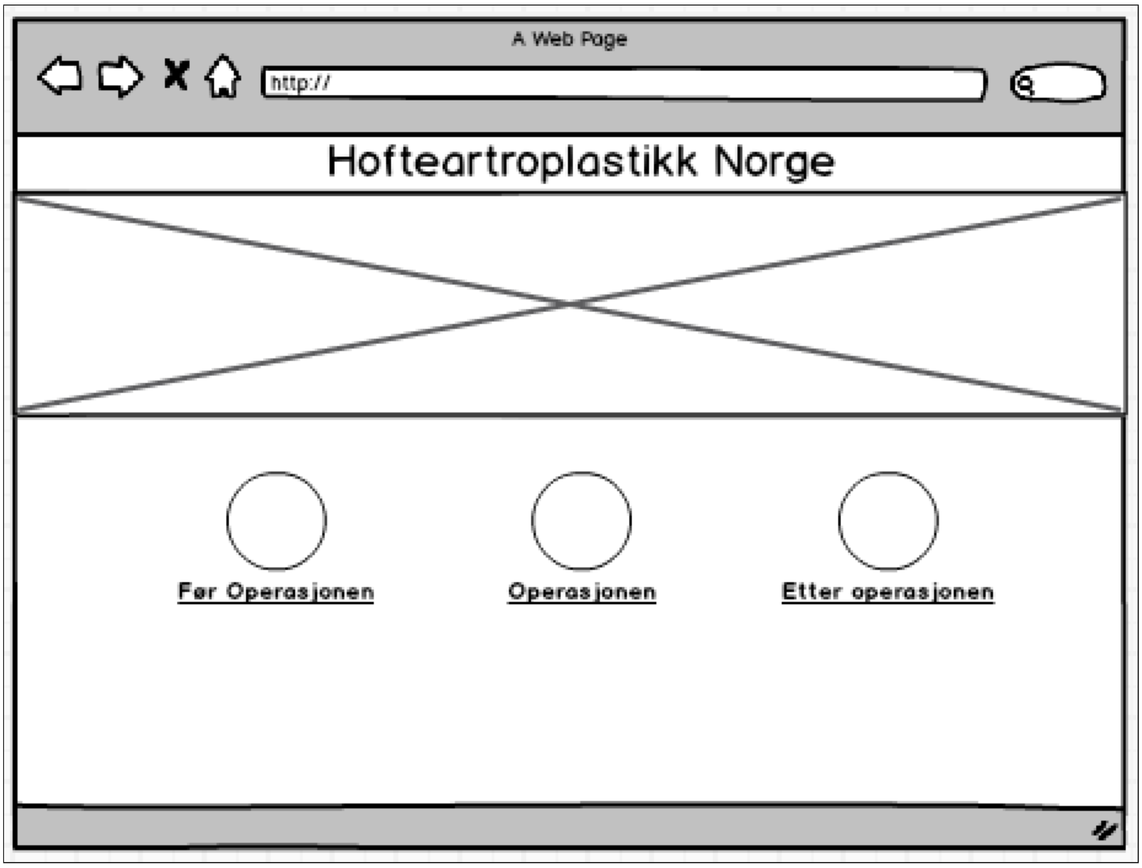
1. Er det enkelt å formidle informasjon til pasienter?
2. Har du erfaring med at det har vært vanskelig å få pasienter til å forstå informasjonen du gir?
3. Hvilke utfordringer mener du eksisterer med informasjonstilgangen knyttet til hofte- og kneleddsutskiftning?
4. Hvem har som oftest en pasient mest kontakt med for å få informasjon?
5. Skjer det ofte at det er familiemedlemmer eller verger som står for å hente inn informasjonen?

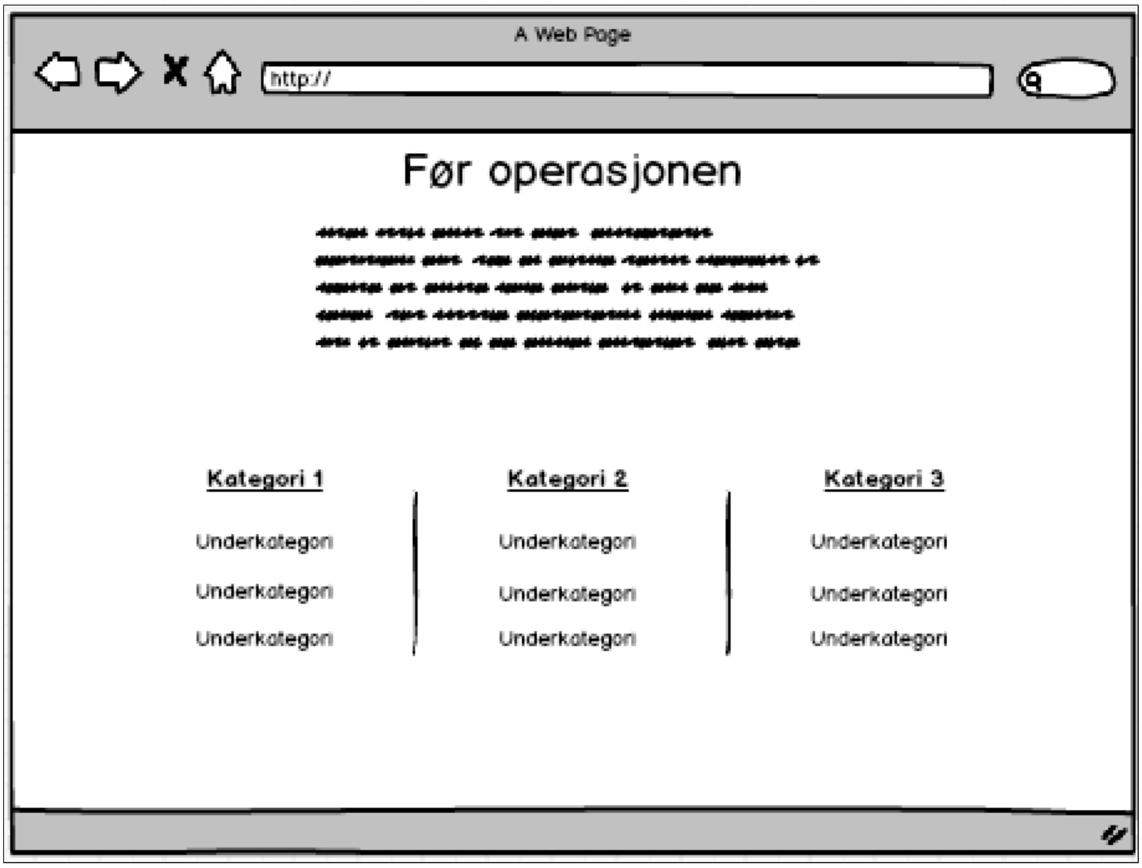
Oppfølging

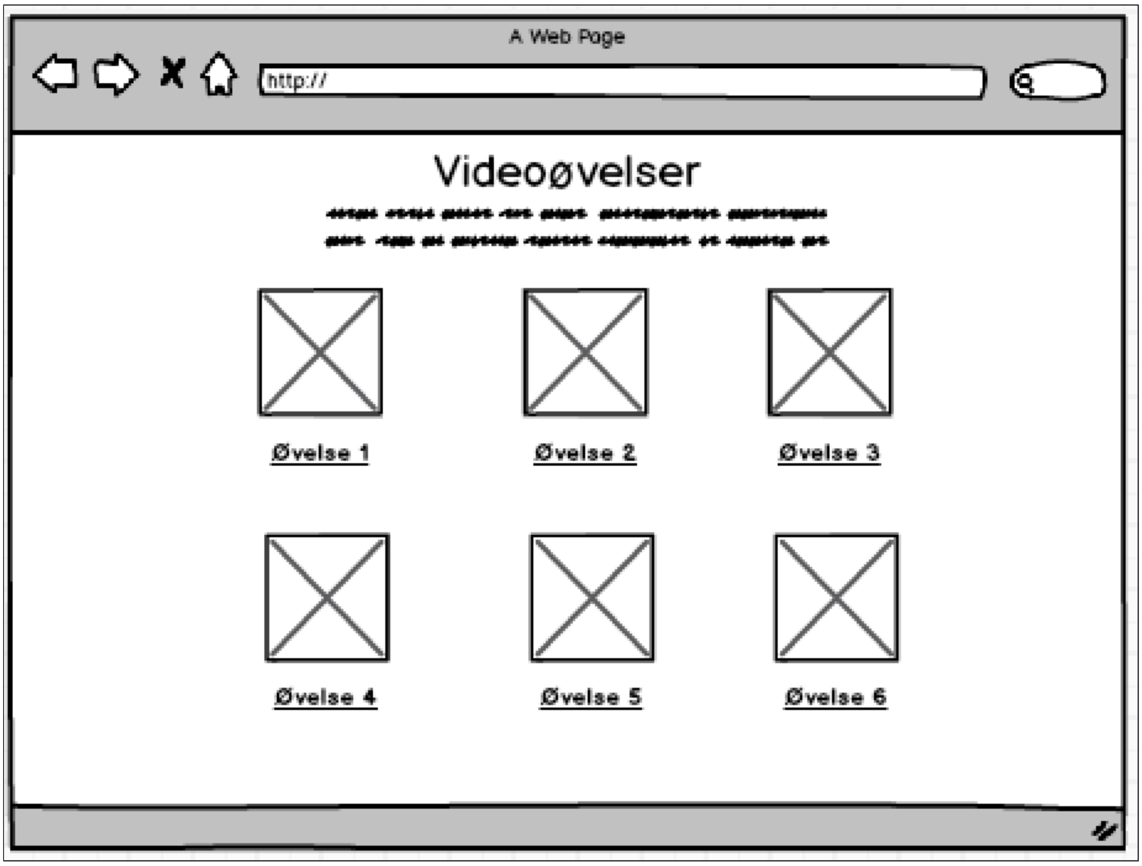
1. Erfarer du at pasienter søker informasjon i etterkant av en operasjon?
2. Har du hatt erfaring med at pasienter har blitt utsatt for uønskede konsekvenser som følge av mangel på informasjon og kompetanse? Evt hva?
3. Vil en allmennlege uten tilknytning til et sykehus kunne tilby like god informasjon som en kirurg eller sykepleier som jobber med arthroplasty?
4. Hvem forholder en pasient seg til i etterkant av en operasjon?
5. Hva mener du er den beste løsningen for oppfølging av en pasient?

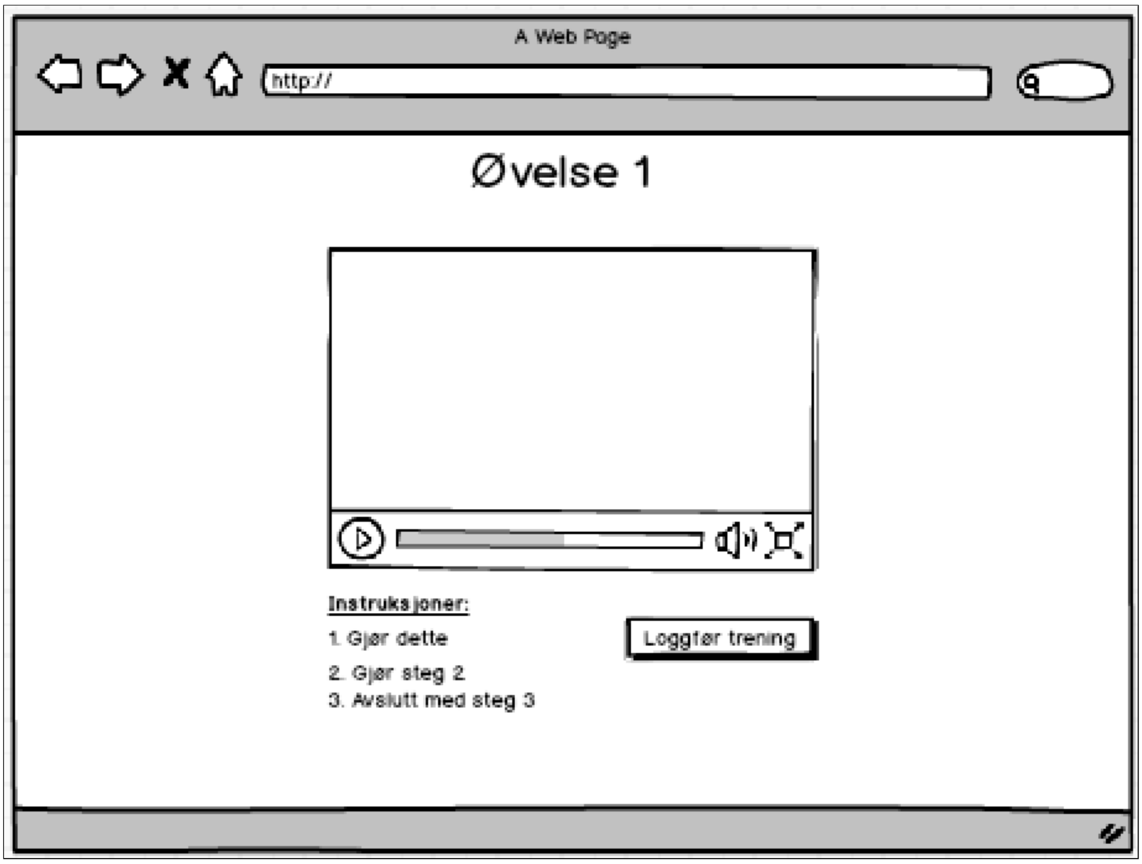
Appendix E

Low Fidelity Prototype




A Web Page
http://
Før operasjonen
Kategori 1
Underkategori
Underkategori
Underkategori
Kategori 2
Underkategori
Underkategori
Underkategori
Kategori 3
Underkategori
Underkategori
Underkategori

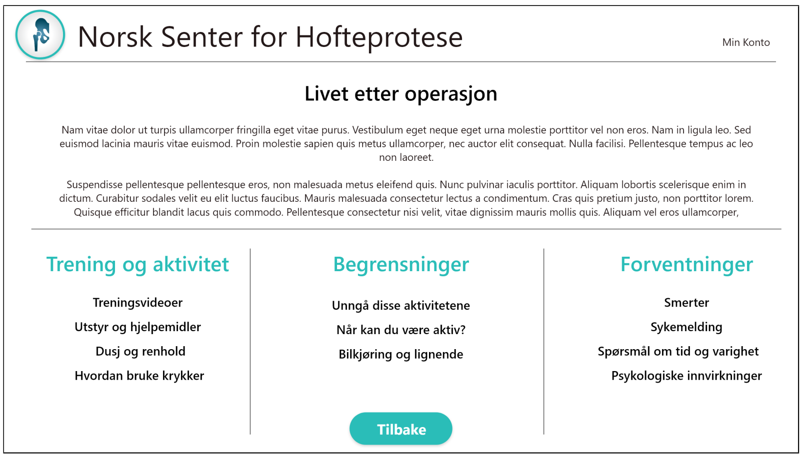

A Web Page
http://
Videoøvelser
Øvelse 1
Øvelse 2
Øvelse 3
Øvelse 4
Øvelse 5
Øvelse 6

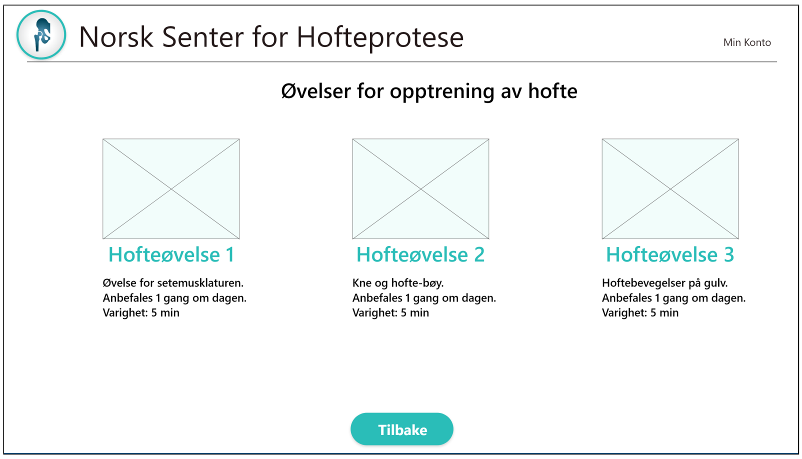

A Web Page
http://
Øvelse 1
Instruksjoner:
1. Gjør dette
2. Gjør steg 2
3. Avslutt med steg 3
Loggfør trening


A Web Page
http://
Loggføring av økt
Vurder hvordan økten gikk på en skala fra 1 til 10
1 2 3 4 5 6 7 8 9 10
Hvordan gikk gjennomføringen av øvelsen?
1 2 3 4 5 6 7 8 9 10
Hvordan opplevde du smertenivået ditt?
Kommenter hva som eventuell hindrer deg i gjennomførelsen og hvordan smerter påvirket det
Kommenter her...
Registrer skjema!

Appendix F

High-Fidelity Prototype selected screenshots




Norsk Senter for Hofteprotese
Min Konto
Øvelser for opptrening av hofte
Hofteøvelse 1
Øvelse for setemusklaturen.
Anbefales 1 gang om dagen.
Varighet: 5 min
Hofteøvelse 2
Kne og hofte-bøy.
Anbefales 1 gang om dagen.
Varighet: 5 min
Hofteøvelse 3
Hoftebevegelser på gulv.
Anbefales 1 gang om dagen.
Varighet: 5 min
Tilbake


Norsk Senter for Hofteprotese
Min Konto
Hofteøvelse 1
Tilbake
iStock
by Getty Images
1. Stram Setemusklene.
2. Press begge knær ned i underlaget.
3. Hold i noen sekunder
4. Slipp opp
Husk å loggfør treningen
Loggfør trening
Loggføring kan gi hjelpe deg med å se fremgangen din, og brukes i konsultasjoner.

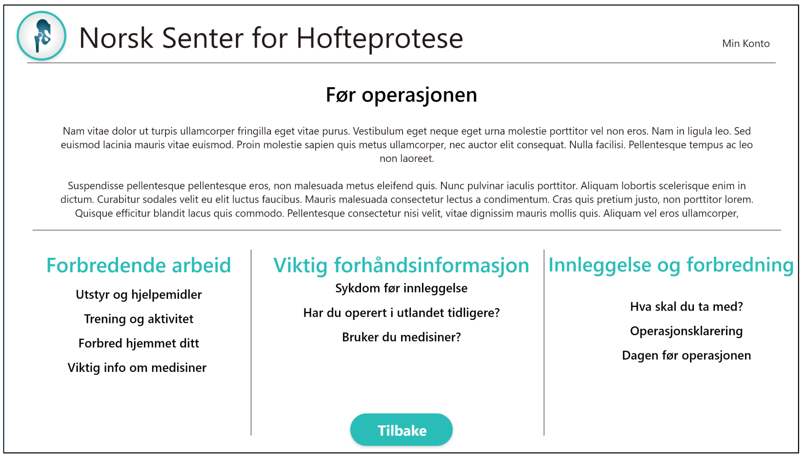

Norsk Senter for Hofteprotese
Min Konto
Logg og evaluering av Hofteøvelse 1
Tilbake
På denne siden kan du registrere din treningsøkt. Denne registreringen kan gi både deg selv og medisinsk personell god innsikt i rehabiliteringsperioden til pasienter og gi muligheter for forbedring
1. Vurder din utførelse av øvelsen ved å rangere den mellom 1 og 10, hvor 1 tilsvarer at du ikke hadde sjangs til å klare øvelsen, og 10 er en veldig enkel gjennomføring uten problemer.
2. Vurder hvor mye smerte du opplevde under øvelsen, hvor 1 tilsvarer "ingen smerte", og 10 tilsvarer uutholdelig smerte.
Kommenter i tekstboksen for å utdyper hva som eventuellt hindrer gjennomførelsen av øvelsen, og hvor du eventuellt fikk vondt.
1 2 3 4 5 6 7 8 9 10
Utførelse:
Smerte:
Legg igjen kommentar her...
Send inn evaluering


Norsk Senter for Hofteprotese
Min Konto
Utstyr og Hjelpemidler
Her finner du en oversikt over utstyr som er nyttig å skaffe seg for å lettest mulig kunne utføre daglige gjøremål og aktiviteter.
De fleste hjelpemidlene kan fås via Hjelpemiddelsentralen
Krykker
Sjekk med ditt sykehus om dette lånes ut.
Kan lånes fra Hjelpemiddelsentralen eller
kjøpes fra BedreLiv eller et Apotek
Toalettforhøyer
Nædvendig hjelpemiddel for toalettet
slik at man unngår uønske bevegleser
i hoften under toalettbesøk.
Kan lånes fra Hjelpemiddelsentralen eller
kjøpes fra BedreLiv eller et Apotek
Gripeklo
Dette verktøyet hjelper deg med å få tak
i ting som ellers vill vært vanskelig å få tak i
grunnet den begrensede mobiliteten etter
en operasjon. Kan kjøpes på BedreLiv
Treningsmatte
Anbefales å ha en treningsmatte tilgjengelig
slik at man utføre øvelser og aktiviteter
hjemme på et behagelig underlag.
Kan kjøpes på BedreLiv og sportsbutikker
Tilbake


Norsk Senter for Hofteprotese
Min Konto
Unngå disse tingene
I etterkant av operasjon er det flere typer bevegelser og aktiviteter som du bør unngå for å forhindre muligheten for uønskede konsekvenser.
Klarer du å unngå dette vil sannsynligheten for at du kommer deg raskere tilbake i form øke stort.
Krysse beinene
For å unngå økt sannsynlighet for at
protesen kan hoppe ut av ledd, er det
viktig at man unngår å krysse benene i
perioden etter operasjonen. Om dette
forekommer under søvn, legg en pute
mellom benene for å forhindre det.
Større belastninger
Unngå store belastninger som du kanskje
vanligvis kunne ha klart å bære. Dette gjelder
bruk av tyngre sekker, tung bæring, flytting
av møbler og lignende, til du er å anse som
100% frisk igjen.
Hurtige bevegelser
Selv etter at man er ferdig med krykker
er det viktig at man tar seg tid til å gjøre
ting ordentlig, istedenfor hurtig. Ta deg
derfor god tid med både gange og daglige
gjøremål.
Høye kneløft
Unngå unødvendig høye kneløft. Prøv
derfor å unngå å bevege deg på steder
som krever dette, blant annet fjellturer,
oppussing, stiger og lignende.
Sove på siden
Å sove på siden er noe man bør unngå, da
hoften enkelt kan få stor belastning. Det er
derfor anbefalt å sove på ryggen for å få
minst mulig belastning.
Høye kneløft
Nædvendig hjelpemiddel for toalettet
slik at man unngår uønske bevegleser
i hoften under toalettbesøk.
Kan lånes fra Hjelpemiddelsentralen eller
kjøpes fra BedreLiv eller et Apotek
Tilbake


Norsk Senter for Hofteprotese
Min Konto
Aktiviteter og bevegelse
I etterkant av operasjon er det flere typer bevegelser og aktiviteter som du bør unngå for å forhindre muligheten for uønskede konsekvenser.
Klarer du å unngå dette vil sannsynligheten for at du kommer deg raskere tilbake i form øke stort.
Tur i fjell og mark
Tur kan man begi seg ut på når man
begynner å nærme seg normal bevegelighet.
Men pass på å ikke overvurder din egen
situasjon. Fjellturer er ikke anbefalt før man
er tilbake til 100% bevegelighet, og ikke har
noen problemer med aktivitet.
Sykling
Ordinær sykling kan gjenopptas når
bevegeligheten er tilbake på 100%, men
aktiv sykling i høyt tempo over lang tid
er ikke anbefalt. El-sykkel er et flott
hjelpemiddel for deg som ønsker å sykle mye.
Styrketrening
Om du ønsker å drive med styrketrening
av hofte og bein er det anbefalt å ikke ha
store belastninger på hoften. Konsulter
gjerne med en fysioterapaut for å finne
passende øvelser.
Jogging
Det er ikke anbefalt å jogge i høyt tempo,
selv etter at man er tilbake til sin normale
form. Dette er på grunn av faren for økt
slitasje og at hofteleddet kan falle ut.
Dersom man ønsker å løpe eller jogge bør
man derfor ta det med ro, og ikke presse
seg opp i raskt tempo.
AKTIVITET 5
Om du ønsker å drive med styrketrening
av hofte og bein er det anbefalt å ikke ha
store belastninger på hoften. Konsulter
gjerne med en fysioterapaut for å finne
passende øvelser.
AKTIVITET 6
Om du ønsker å drive med styrketrening
av hofte og bein er det anbefalt å ikke ha
store belastninger på hoften. Konsulter
gjerne med en fysioterapaut for å finne
passende øvelser.
Tilbake


Norsk Senter for Hofteprotese
Min Konto
Operasjonen
Nam vitae dolor ut turpis ullamcorper fringilla eget vitae purus. Vestibulum eget neque eget urna molestie porttitor vel non eros. Nam in ligula leo. Sed euismod lacinia mauris vitae euismod. Proin molestie sapien quis metus ullamcorper, nec auctor elit consequat. Nulla facilisi. Pellentesque tempus ac leo non laoreet.
Suspendisse pellentesque pellentesque eros, non malesuada metus eleifend quis. Nunc pulvinar iaculis porttitor. Aliquam lobortis scelerisque enim in dictum. Curabitur sodales velit eu elit luctus faucibus. Mauris malesuada consectetur lectus a condimentum. Cras quis pretium justo, non porttitor lorem. Quisque efficitur blandit lacus quis commodo. Pellentesque consectetur nisi velit, vitae dignissim mauris mollis quis. Aliquam vel eros ullamcorper,
Om Operasjonen
Bedøvelse
Hofteprotese
Ulike typer operasjon
Komplikasjoner
Infeksjon
Nervepåvirkning
Blofpropp
Beinlengdeforskjell
Lukasjon
Tilbake


Norsk Senter for Hofteprotese
Min Konto
Før operasjonen
Nam vitae dolor ut turpis ullamcorper fringilla eget vitae purus. Vestibulum eget neque eget urna molestie porttitor vel non eros. Nam in ligula leo. Sed euismod lacinia mauris vitae euismod. Proin molestie sapien quis metus ullamcorper, nec auctor elit consequat. Nulla facilisi. Pellentesque tempus ac leo non laoreet.
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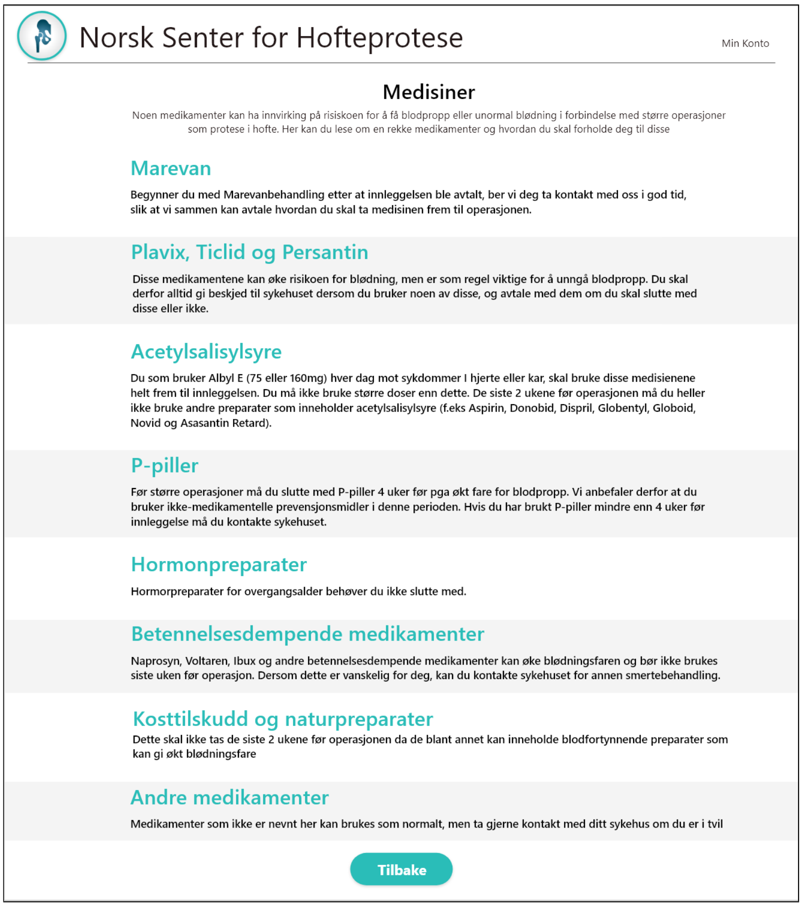
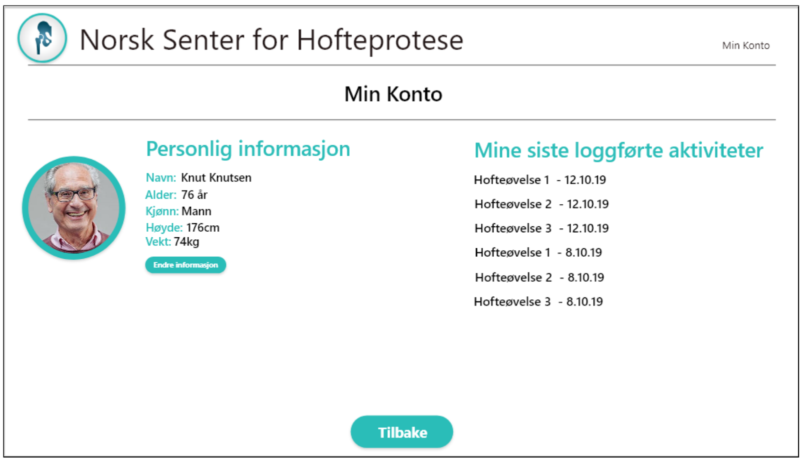
Forbredende arbeid
Utstyr og hjelpemidler
Trening og aktivitet
Forbred hjemmet ditt
Viktig info om medisiner
Viktig forhåndsinformasjon
Sykdom før innleggelse
Har du operert i utlandet tidligere?
Bruker du medisiner?
Innleggelse og forbredning
Hva skal du ta med?
Operasjonsklarering
Dagen før operasjonen
Tilbake


Norsk Senter for Hofteprotese
Min Konto
Medisiner
Noen medikamenter kan ha innvirking på risiskoen for å få blodpropp eller unormal blødning i forbindelse med større operasjoner som protese i hofte. Her kan du lese om en rekke medikamenter og hvordan du skal forholde deg til disse
Marevan
Begynner du med Marevanbehandling etter at innleggelsen ble avtalt, ber vi deg ta kontakt med oss i god tid, slik at vi sammen kan avtale hvordan du skal ta medisinen frem til operasjonen.
Plavix, Ticlid og Persantin
Disse medikamentene kan øke risikoen for blødning, men er som regel viktige for å unngå blodpropp. Du skal derfor alltid gi beskjed til sykehuset dersom du bruker noen av disse, og avtale med dem om du skal slutte med disse eller ikke.
Acetylsalisylsyre
Du som bruker Albyl E (75 eller 160mg) hver dag mot sykdommer I hjerte eller kar, skal bruke disse medisienene helt frem til innleggelsen. Du må ikke bruke større doser enn dette. De siste 2 ukene før operasjonen må du heller ikke bruke andre preparater som inneholder acetylsalisylsyre (f.eks Aspirin, Donobid, Dispril, Globentyl, Globoid, Novid og Asasantin Retard).
P-piller
Før større operasjoner må du slutte med P-piller 4 uker før pga økt fare for blodpropp. Vi anbefaler derfor at du bruker ikke-medikamentelle prevensjonsmidler i denne perioden. Hvis du har brukt P-piller mindre enn 4 uker før innleggelse må du kontakte sykehuset.
Hormonpreparater
Hormorpreparater for overgangsalder behøver du ikke slutte med.
Betennelsesdempende medikamenter
Naprosyn, Voltaren, Ibux og andre betennelsesdempende medikamenter kan øke blødningsfaren og bør ikke brukes siste uken før operasjon. Dersom dette er vanskelig for deg, kan du kontakte sykehuset for annen smertebehandling.
Kosttilskudd og naturpreparater
Dette skal ikke tas de siste 2 ukene før operasjonen da de blant annet kan inneholde blodfortynnende preparater som kan gi økt blødningsfare
Andre medikamenter
Medikamenter som ikke er nevnt her kan brukes som normalt, men ta gjerne kontakt med ditt sykehus om du er i tvil
Tilbake


Norsk Senter for Hofteprotese
Min Konto
Min Konto
Personlig informasjon
Navn: Knut Knutsen
Alder: 76 år
Kjønn: Mann
Høyde: 176cm
Vekt: 74kg
Endre informasjon
Mine siste loggførte aktiviteter
Hofteøvelse 1 - 12.10.19
Hofteøvelse 2 - 12.10.19
Hofteøvelse 3 - 12.10.19
Hofteøvelse 1 - 8.10.19
Hofteøvelse 2 - 8.10.19
Hofteøvelse 3 - 8.10.19
Tilbake

Appendix G

System Usability Scale form

See next page.

	Strongly disagree				Strongly agree
1. I think that I would like to use this system frequently	1	2	3	4	5
2. I found the system unnecessarily complex	1	2	3	4	5
3. I thought the system was easy to use	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system	1	2	3	4	5
5. I found the various functions in this system were well integrated	1	2	3	4	5
6. I thought there was too much inconsistency in this system	1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly	1	2	3	4	5
8. I found the system very cumbersome to use	1	2	3	4	5
9. I felt very confident using the system	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system	1	2	3	4	5