Rehab Tracker: Physiotherapy Progress Management Mobile Application

Yiren Zheng,
University of Toronto,
Department of Computer Science,
yiren.zheng@mail.utoronto.ca

Tom Choi,
University of Toronto,
Department of Computer Science,
jtchoiboy@gmail.com

Brian Cheung,
University of Toronto,
Department of Computer Science,
brianps.cheung@mail.utoronto.ca

Hui Lu,
University of Toronto,
Department of Computer Science,
hui.lu@mail.utoronto.ca

Ruoting Liang,
University of Toronto,
Department of Computer Science,
ruoting.liang@mail.utoronto.ca

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the Owner/Author. Copyright is held by the author/ owner(s).

Abstract
Physiotherapy is one of the largest components in the healthcare industry. However, there are problems existing in the current rehabilitation system. Specifically, long working time, heavy workload, medical record management burden and clinical administrative burden are rated as top concerns of physiotherapists. On the other hand, it has been noticed that patients undergoing physiotherapy are facing inefficient out-clinic recovery exercise, poor patient-therapist communication and inefficient appointment scheduling. Based on industry research, literature review and user research, Rehab Tracker, a rehabilitation progress management system, has been designed and a high fidelity prototype of it has been developed. Based on different user needs, a patient version and a therapist versions of the system has been delivered. Providing three well-designed modules, including rehabilitation progress management, patient-therapist communication platform and appointment management, Rehab Tracker offers effective solutions to the problems encountered in the rehabilitation as well as improves the user experience of the rehabilitation.

Author Keywords : Interface Design, Healthcare, Physiotherapy, Rehabilitation, Management
ACM Classification Keywords : H.5.2. [Information Interfaces and Presentation]: User Interfaces; J.3. [Health].

Introduction

Physiotherapy is an important factor of the Canadian health care industry. According to a recently-released IBISWorld Industry report, the industry revenue in the past five years has grown at an average annual rate of 4.1% to $1.3 billion, including a 6.1% jump in 2013.[1] However, there are problems existing in the current rehabilitation system, such as staff shortages, inactive patient participation and inefficient patient-therapist communication. Specifically, long working time, large workload, medical record management burden and clinical administrative burden are rated as top concerns of physiotherapists. On the other hand, it has been noticed that patients undergoing physiotherapy are facing inefficient out-clinic recovery exercise,

poor patient-therapist communication and inefficient appointment scheduling. However, based on the background research, there is not a product which offers effective solution to these problems.

On the other hand, since early 2000, because of the technology development, portable devices such as smartphones and tablets, are becoming increasingly closely related to people's daily lives. Many high-tech health care products have been developed and delivered in the form of mobile/web applications. For example, *myfitnesspal*, which is a diet tracking application, helps people manage their weight in a health way.

Thus, we believe that with the help of information technology, the current physiotherapy system as well as participants' experience can be improved. According to user research and applicability evaluation, we consider rehabilitation progress management, medical record management, patient-therapist communication and therapy appointment management as target problems for our project. By conducting thorough research and agile testing, we design our product Rehab Tracker, a mobile application, which provides effective solutions to our target problems.

2. Design Goals

The project is designed to act as a complement to current rehabilitation process and it addresses the needs of stakeholders including, but not limit to health professionals (physiotherapists, nurses and caregivers), patients and their families, and clinic managers and owners. Our project defines patients and physiotherapists as primary users and two versions of the product are provided for the two groups of users to meet different user needs. Generally, the project is designed to improve the efficiency of the current rehabilitation system as well as offer better experience for all the participants. Specifically, we seek to foster the patients' rehabilitation experience and improve the efficiency of the physiotherapy, especially the efficiency of the out-clinic movement exercise. Moreover, reducing the therapists' workload, especially the management and administrative work, as well as improving the therapists' working experience.

3. Background Research and Literature Review

Executive Summary

Considering the primary users and stakeholders of our project, six health care professionals, including four physiotherapists and two physiotherapists assistants, and twelve patients, including patients currently undertaking physiotherapy and patients who ever obtained physiotherapy, were involved in the user research. All the participants, except one physiotherapist and one patient who are residing in P.R.China, are residing in Canada. By utilizing various research instruments, including questionnaires, interview (Skype interview and in-person interview) and observation, we have obtained valuable feedbacks and suggestions from our targeted users and stakeholders. Generally, the research results indicated that the project is applicable and target users are willing to use the product.

Research Instruments

Questionnaires, interview and observation were taken as instruments to conduct the user research. All participants except the two physiotherapist assistants (16 people in total) were asked to fill in the questionnaires designed according to their identities. Both paper questionnaires and electronic questionnaires were used. All participants (18 people in total) were interviewed either in-person interview or via Skype/telephone. Interview questions were designed according to the participants' identities. Observation was also taken as a method to collect data from health care professionals. Since the medical practice is under the protection of the patient-physician confidentiality, the working environment of a physiotherapist residing in Vancouver B.C. is observed via Skype.

Results

According to the user research, we have found that the physiotherapy professionals are facing a few problems including large workload, administrative inefficiency and patients' no-show at reserved appointment. Meanwhile, the results showed that patients found that aggregated travelling time to the clinic and waiting time inside the clinic negatively affect their therapy experience.Moreover, the patient reported that they would like to have an application/device which can help them with therapy appointments management and rehabilitation progress management. On the other hand, all participants found that the physiotherapy session with guidance from the accredited physiotherapist provided better experiences for the users and had shown more significant impact on the patients' condition in perspective of the physiotherapist. Although a physiotherapist reported that he does not use the technology often during therapy sessions as it proved to be distracting, most of our participants obtained a positive attitude towards the implementation of the system.

4. Design Guideline

Key User Needs and Requirements

According to the user research results, it shows that the user would like to have a product which can store patient's' medical records, track patients' ongoing therapy progress, record detailed at-home movement exercise assignments, remind the patients about the at-home movement exercise, provide precise instruction of the at-home movement exercise, enhance the therapist-patient communication, schedule therapy appointment and notice upcoming therapy appointment. Moreover, the system is required to be simple to use and provide stable performance.

Additionally, the information (including records and instructions) provided by the system (Rehab Tracker) and the data stored in the system is required to be accurate and credible. Moreover, the system is required to have security settings to guarantee the confidentiality and privacy.

Testing Standards

The successfulness of the project is measured on three levels, which are completeness, outcomes and quality. More specifically, the system will be considered as successful if it can meet all the design principles, fulfill all the user needs and provide stable performance in the clinical practice.

5. Product Design

Product Framework

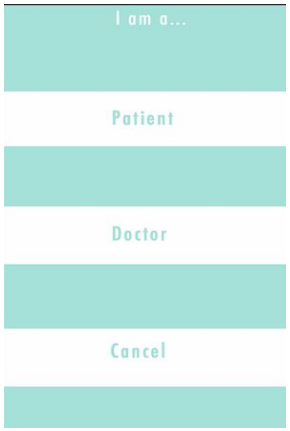
Provided the background research results, user research results and key user needs, rehabilitation progress management, patient-therapist communication and therapy appointment management are considered to be the target problems of our project. Generally, the project is delivered in two versions. Specifically, for different end users, different aspects of the problems are stressed.

The patient version consists four modules in general, which are rehab progress tracking, at-home movement exercise, patient-therapist communication platform and therapy appointment scheduling. In the rehab progress tracking module, the patient can check and update the current rehabilitation progress. Also, the patient can view, learn and participate in the movement exercise. In the communication module, the patient can chat or send a message to his/her therapist. The focus of the therapy appointment management module is put on appointment booking as well as upcoming appointment reminding.

The therapist version consists three modules. The communication platform is same. However, the focus of the rehabilitation progress management module is put on the progress tracking and record management. In terms of the appointment module, the focus is put on management and reminding.

Product: *Rehab Tracker*

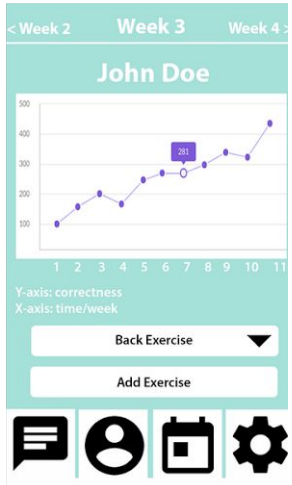
As stated above, the system provides customized functionalities according to the end users' identity. To guarantee the privacy and security, the patients have to provide a reference number offered by the therapist when they sign up.



Rehabilitation Progress Management

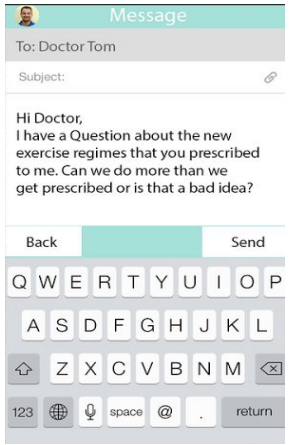
This module is provided in both versions. The patient can view and update their rehabilitation status, while the physiotherapist can view patient's recovery status and assign further movement exercise to them.

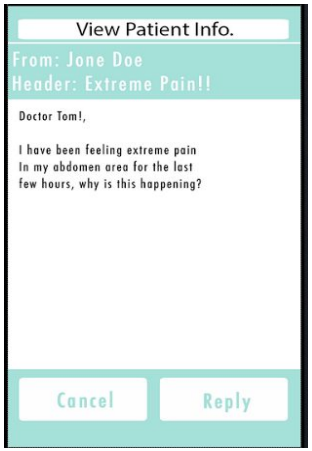
Patient Version Therapist Version I Therapist Version II



Patient-therapist Communication Platform

Via the platform, the patient can view the therapist's contact information and send messages to them when there is a need. The therapist can store, view and respond to the messages.





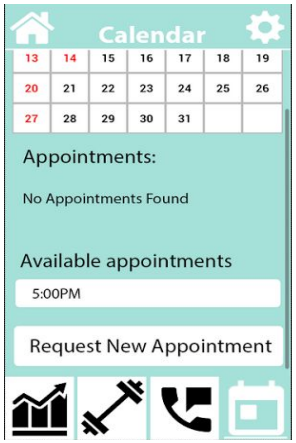
Patient: At-home Exercise

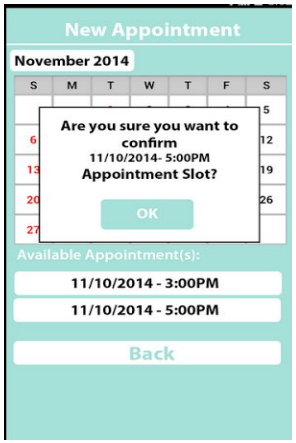
In the at-home exercise module, the patient can select specific exercise they would like to do. After entering the relative section, the patient can obtain a video demonstration of the exercise as well as precise instructions. When patient is ready to practice, they can participate in it in the form of game.

Appointment Management

In the module, the therapist can check their appointment schedule.On the other hand, the patient can view dates which are available for appointments and schedule an appointment. The patient can also check the upcoming appointments.

6. Process and Evaluation





Iteration

Alternatives were first discussed and sketched. Then, low-fidelity prototypes of the system were designed and printed individually and used for usability testing. Modules and functionalities of the system were refined and modified based on the usability testing results. High-fidelity prototype was designed based on the low-fidelity prototypes and modifications made after the usability testing.

Usability Testing

We conducted usability tests on the system (*Rehab Tracker*) with 10 students from an HCI course and 5 target users (four patients and one therapist) who was involved in the user research. All the users succeeded in completing the following tasks on an interactive version of the high-fidelity prototype: viewing rehabilitation progress, participating in movement exercise, communicating via the communication module, managing medical records and scheduling appointments. Refinements on icons and wordings were made based on the users' feedback.