Warfarin Guide: Co-Design of a Mobile Computer-Assisted Anticoagulant Therapy

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Abstract

Patients with some types of cardiovascular disease are prescribed anticoagulation therapy with Warfarin in order to control the ability of blood clotting. This work presents a co-desgined mobile application, called Warfarin Guide, for a computer-assisted anticoagulant therapy. The application addresses the challenges that unexperienced patients may find when having to remember to regularly check their INR values and make temporary adjustments for INR value fluctuations that are not easy to interpret without direct medical advice.

Keywords:

International Normalized Ratio, Computer–Assisted Drug Therapy, Medical Informatics

Introduction

Patients with some cardiovascular disease types, e.g., mechanical heart valves, are prescribed lifelong anticoagulation therapy with Warfarin to prevent thromboembolic complications. The intensity of the anticoagulation therapy is based on the International Normalized Ratio (INR) value. A low INR value indicates a risk of increased blood clotting which can cause life-threatening conditions, while a high value of INR indicates a high risk of bleeding. Food intake (especially vitamin K-rich vegetables), alcohol consumption, physical exercise, illness and stress may also influence the INR values. Patients treated with Warfarin are recommended to self-monitor their INR values with a portable coagulometer device that samples whole blood obtained by fingerprick, and self-management of the Warfarin therapy. It might be difficult, in particular for unexperienced patients, to regularly check their INR values and make necessary changes in warfarin dosing based on the measured values, in light of previous studies which have reported low time within therapeutic INR range.

The aim of this project is to develop an easy-to-use mobile application for computer assisted anticoagulation therapy. The project is divided in two phases: 1) a co-design, 2) a usability test of the application and 3) a randomised control trial. This work presents the results of the first phase.

Methods

The co-design process was carried out with 8 students of the Master of Health and Social Informatics' at the University of Agder (UiA), Norway and iteratively tested in the Usability laboratory at UiA with patients who were prescribed an anticoagulant therapy.

The Master students co-designed a non-functional prototype of the Warfarin Guide application (WGA), and the explanation of their prototype was recorded on camera. The application developers watched the recordings and implemented a working prototype. The prototype was iterated through 2 usability tests with 5 anticoagulant therapy patients. The first test included a cognitive walkthrough process with an individual interview after using the application. The second test targeted specific tasks of the refined user interface.

Results

The co-design process allowed the Master students to create a non-functional prototype of the application, including different features based on their experience of working with patients prescribed with an anticoagulant therapy. The co-design provided developers with a useful insight about what was important for end-users, prioritising meaningfulness of messages and user friendliness of the user interface (UI). The cognitive walkthrough was useful to understand, step by step, how patients interacted with the application in order to obtain the exact dose, keep track of their INR values and set up a reminder for next dosage intake. The usability tests helped to iteratively improve the UI. The individual interviews allowed the research team to understand the way that the WGA could address users' needs.

Conclusions

Self-management medication for anticoagulation therapy presents two challenges to unexperienced patients: remember and maintain a regular monitoring of their INR values; and calculate an exact dosage intake adjusted to the nonuniform fluctuations of INR values. The co-designed WGA tested in the laboratory provided an up-to-date monitoring of INR values and an individualised calculation of dosage adjustment, including a valuable reminder function for medication intake and upcoming measurements. The adherence, effectiveness and benefits of the computer-assisted anticoagulant therapy will be clinically verified in a clinical randomised control trial.

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