The MONARCA Self-assessment System

Persuasive Personal Monitoring for Bipolar Patients

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Abstract - **An increasing number of persuasive personal healthcare monitoring systems are being researched, designed and tested, many of them being based on Smartphone technology. These systems could help patients and clinicians monitor and manage mental illness. Mental illness is complex, difficult to treat, and carries social stigma. We describe our setup to support the treatment of bipolar patients using a persuasive mobile phone monitoring system and a web portal.**

Keywords - bipolar disorder; mental illness management; personal monitoring systems; Android ; web portal; self-assessment

I.   INTRODUCTION

Persuasive personal monitoring systems have been suggested for the management of a wide range of health-related issues. These types of systems help users by enabling them to monitor and visualize their behaviors, keeping them informed about their physical states, reminding them to perform behaviors or tasks, providing feedback on the effectiveness of their behaviors, and recommending healthier behaviors or actions. In addition to numerous studies on general behavior change [1], research has also targeted health-related behavior change such as physical activity [2, 3], healthy eating habits [4], cardiac rehabilitation [5, 6], and the management of chronic illnesses like diabetes [7, 8], chronic kidney disease [9], and asthma [10].

Persuasive monitoring systems also have the potential to help with the management of mental illnesses such as depression, bipolar disorder, and schizophrenia. These systems can monitor data on mood, behaviors, and activities, providing timely feedback to patients in order to help them adjust their behaviors. Review of data by patients and clinicians can support illness management in many ways. For example, patients and their clinicians can use the data to determine the effectiveness of medications, find illness patterns and identify warning signs, or test potentially beneficial behavior changes. Data collected could be used to predict and prevent the relapse of critical episodes. Through monitoring and persuasive feedback, systems can help patients implement preventative long-term habits and effective short-term responses to warning signs.

In addition to the complexity of an illness and its symptoms, the treatment process is also complicated. There is no singular treatment regimen or set of medications that will work for all patients. Treatment of mental illness therefore requires an ongoing process of experimenting with different combinations of medications, and learning how to cope with and reduce symptoms through healthy behaviors (e.g., good sleeping habits, daily routines, avoidance of alcohol, etc.).

In this demo, we are presenting a system to help with the treatment of patients suffering from bi-polar disorder, which aims for both the patients, the clinicians and the relatives. The system consists of two parts; (1) An Android application, for patients, to enter self-assessment data (Figure 1), obtain objective data for analysis, coaching and self-treatment. This will be shown live on a HTC Desire phone where data is stored in Couch DB and replicated to a MONARCA server. (2) A web portal, for patients, clinicians and relatives, where users can get an historical overview of data (Figure 2) and customize the system to adapt to the individual patient. Clinicians can also get a quick overview of their patients (Figure 3), enabling them to focus on the patients in need of immediate attention. The web portal will be displayed in a web browser, handling the data from the Couch DB on the server. We will present the technical aspects of the system as well as the functionality from both a patient, a clinician and a relatives perspective, and provide an insight to how this is proposed to integrate into users daily life, through a user scenario (see section V).

II.   SYSTEM DESCRIPTION

The system consists of two parts; an Android app and a web portal. Both applications share the following key features.

A. Self-assessment

Subjective data collection is done on a mobile phone through a simple self-assessment form (Figure 1, left). The patient enters less than 10 items on a daily basis, including mood, sleep, level of activity, and medication. Some items are customizable to accommodate patient differences, while others are consistent to provide aggregate data for statistical analysis. A daily alarm reminds the patient to fill out the form.

B. Activity monitoring

Using the phone's sensors, objective data is collected to monitor level of engagement in daily activities (based on accelerometer data), and amount of social activity (based on phone calls and text messages). This data is abstracted for analysis, to protect the patient's privacy while still supporting self-assessment using objective data.

C. Historical overview of data

The patient and clinician will both have access to the data through a web interface. This will give them the means to explore the data in depth by going back and forth in time, and focusing on specific sets of variables at a time (Figure 2 & 3).

An extract tailored for the phone's screen can be viewed on the phone (Figure 1, right).

D. Coaching & self-treatment

Psychotherapy will be supported through everyday reinforcement in two ways. Customizable triggers can be set to have the system notify both patient and clinician when the data potentially indicates a warning sign or critical state. Second, after patients are advised by their clinicians about which actions to take in response to warning signs, they can keep track of and review them through the system.

E. Data sharing

In order to strengthen the psychotherapy relationship data and treatment decisions are shared between the patient and his/her clinician, users can chose to share date on the web portal with family members or other caregivers. The aim is to empower them to support the treatment process.
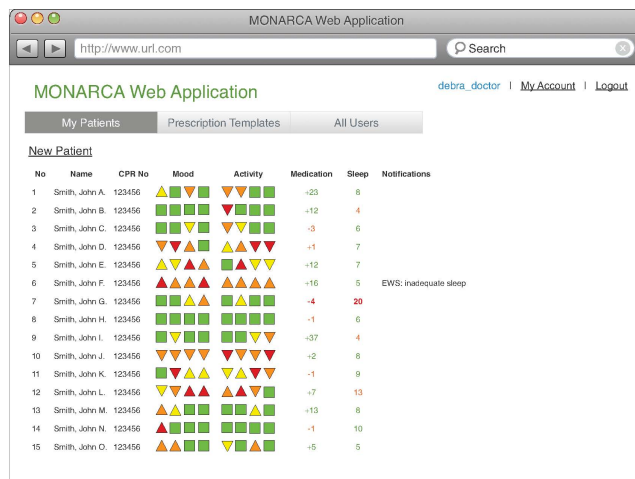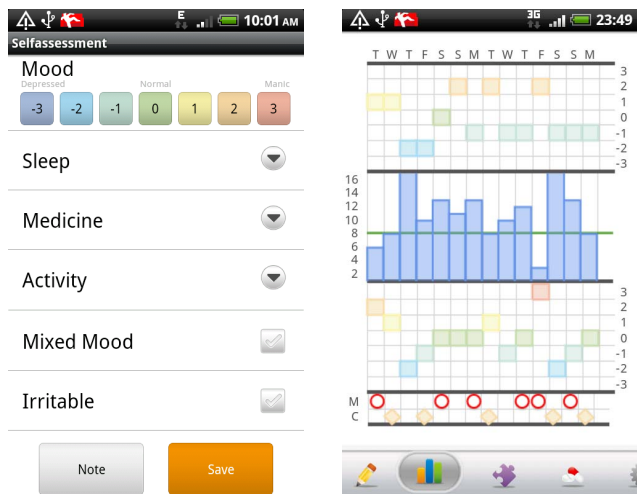

Figure 1. The MONARCA application on an Android phone.
Left: The self-assessment form. Right: A graph showing data collected over two weeks on mood, sleep, activity, and medication.
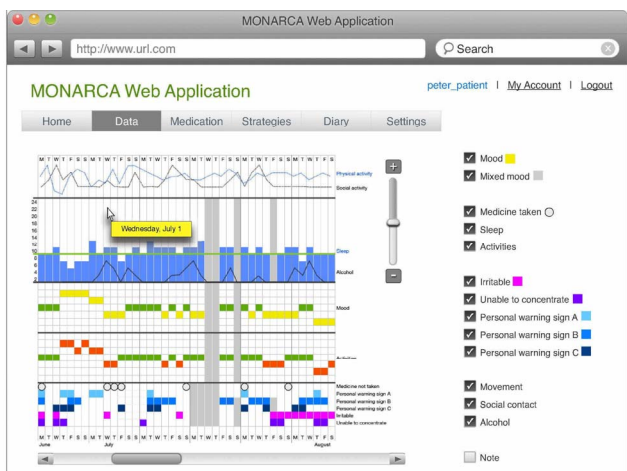

Figure 2. The MONARCA web portal showing the patient's data visualization.

Figure 3. The MONARCA web portal showing the clinician's patient overview.

III. USER SENARIO

The scenario have been documented in the MONARCA introductory movie available at YouTube at

http://www.youtube.com/watch?v=UVS0cAxlQxM

Note that the background sensing and activity inferring is not (yet) part of this scenario.

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