

Integrated Platform for the Management of Chronic Low Back Pain

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Abstract. Background: Chronic low back pain is a global health problem having a tremendous effect on the quality of life of patients. Objectives: An online therapy management system (TMS) is developed for comprehensive management of chronic low back pain patients. Methods: A smartphone and a web app are built based on the Keep-In-Touch Telehealth Platform. The smartphone app allows entering patient reported outcomes and connection to third party devices to monitor physiological data and parameters of therapy. Results: The TMS has been realized and a wearable auricular vagus nerve stimulation device has been integrated. The TMS is currently evaluated in a randomized clinical trial.

Keywords. Telemedicine, Chronic Pain, Vagus Nerve Stimulation

1. Introduction

Chronic pain is one of today's major global health problems [1]. Engaging patients in actively managing their pain is known to improve therapeutic outcome and patient satisfaction [2]. In recent years, several applications have been developed implementing diaries, physical training, or psychoeducation [3]. There is an increasing demand of solutions to improve the access to pain management and allow for effective therapies.

However, to our knowledge, there is no TMS available, allowing for the integration of patient reported outcomes, objective biomarkers, and treatment related parameters for comprehensive pain management, advanced insights, and optimization of therapy.

2. Methods

We established an integrated online TMS for chronic low back pain, based on the Keep-In-Touch Telehealth Platform [4]. The TMS consists of two components: a modular mobile pain diary app and a web-based system for patient management. The mobile app enables patients to collect (a) subjective patient reported outcomes through standardized questionnaires, (b) objective data from devices through standardized BLE interfaces [5] or APIs of 3rd party providers [6]. Data collected in the smartphone app is synchronized with the web app, where data are visualized for each patient. As a first use-case, we implemented an interface to a wearable auricular vagus nerve stimulation (aVNS) device as used for chronic low back pain treatment.

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3. Results

Patients are equipped with a mobile phone and connected devices, i.e., a Bluetooth blood pressure monitor and an aVNS device. Patients use the diary app to collect information on pain on a Visual Analog Scale, subjective well-being, pain medication, as well as blood pressure and heart rate from the connected blood pressure monitor (Figure 1). In addition, the diary app collects information from the aVNS device, including electrode impedances of stimulation electrodes, stimulation intensity, its duty cycle, and battery voltage. The web-based system provides an overview on treatment outcomes for clinicians and a possibility to configure data that should be collected in the diary app on an individual basis. An international multi-centric randomized clinical trial has been initiated to evaluate the performance of the platform in 60 chronic low back pain patients.

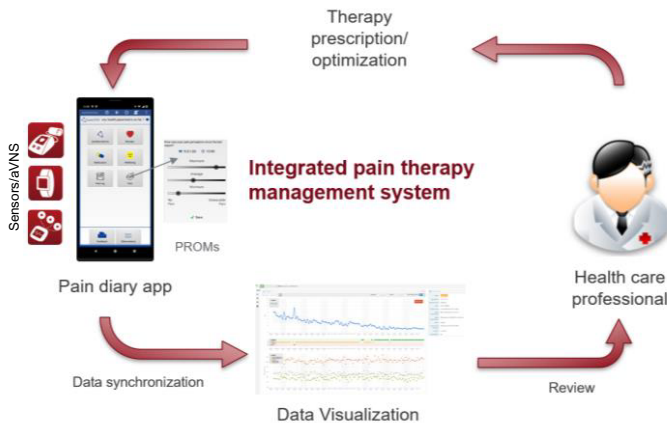


Figure 1. Integrated pain management system with pain diary app and connected devices – technical implementation and workflow.

4. Discussion and outlook

To our knowledge, this is the first implementation of a TMS, allowing for a comprehensive pain management including not only patient reported outcome measures, but also objective biomarkers, and information on the applied therapeutic intervention. The modular structure of the developed platform allows an easy integration into available infrastructures in hospitals and thus novel insights into the progression of treatment, with the aim of optimizing pain management. The approach is currently evaluated in a randomized clinical trial.

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