Towards the use of semantic rules to prioritize patient input requests in ePRO systems

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Abstract

Patient-reported outcomes (PROs) via eHealth tools (ePROs) are an emerging paradigm in the context of decentralized clinical research and healthcare, enabling the collection of patient's self-assessed health status in order to gauge efficacy of treatment from their perspective. Typically, ePRO systems engage the use of well-defined questionnaires which have been validated in the clinical context, deployed in mobile app, using reminders/calendars to pop up the respective questions. The main benefit of ePROs is that they can (at least in principle) increase information flow from the patient to the healthcare professionals (HCPs), while also reducing the burden of recurrent in person visits or telephone communication. In order to reduce burden and increase the efficiency of this communication paradigm, the questions asked need to be as well-targeted as possible, adapted on personal requirements, previous answers and delivered at patient-deemed appropriate times. To this end, we envisage the use of a semantically enhanced knowledge scheme which could be used to facilitate the modelling of rules enabling the prioritization of the most relevant questions.

Keywords

Patient Reported Outcomes, eHealth, semantic rules

1. Introduction

Patient-reported outcomes (PROs) are an emerging paradigm of communication enabling patient reporting his/her health status. eHealth tools (ePROs) are also used to facilitate this kind of communication between patients and Health Care Professionals (HCPs), typically via mobile apps. In [1] 24 relevant publications are reviewed, concluding that such eHealth tools are well accepted by end-users and could have a significant positive impact on health outcomes. Typically, ePRO systems are based on well-defined questionnaires which are not flexible as they have been clinically validated in a very specific format, and thus, if the questions are not asked with the specific order, the score calculated based on the given answers cannot be considered valid. Along these lines, ePRO systems are typically designed so that they would repeatedly ask the whole questionnaire each time, leading to unnecessary end-user fatigue and potential end-user drop-outs.

Based on the authors' recent experience in the context of MyPal project[2], there is a clear need to move towards intelligent ways to collect data in a personalized manner, focusing on critical issues for the patient, e.g., on already reported symptoms. The MyPal ePRO platform is presented in [2,3][3]. This poster outlines the need to use "intelligent" ways to personalize the way questions are asked in the context of ePRO systems.

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[2] MyPal was a Horizon 2020 European project aiming to support palliative care for cancer patients via the electronic PROs (ePROs) paradigm, building upon modern eHealth technologies. https://mypal-project.eu/

[3] A demo video can also be seen in the https://youtu.be/K32nGL2R7sk

2. Methods

We argue that Semantic Web technologies could be used to provide contextual rules defined by the relevant HCPs, which along with Machine Learning (ML) approaches fed by real usage data could be used to personalize the way reminders in ePRO mobile apps are setup. This section outlines the architecture of such an "intelligent" software module.

- Semantic Rules Module (SRM): The SRM would support the use of semantic rules (e.g., via the Semantic Web Rule Language) which prioritize questions of high importance according to clinical tacit knowledge (e.g., reporting of pain levels might be of the utmost importance)
- Answers Analysis Module (AAM): The DIM would analyze previous responses to collect information and adapt accordingly. For example, questions which have already been answered and indicate that a specific symptom, or a specific Adverse Drug Reaction occur, should be prioritized compared to other questions with no useful answers.
- Lifestyle Data Module (LDM): The LDM would collect and exploit data regarding the use of the mobile phone, activity etc. (e.g., identify sleeping hours) to improve reminder timings.

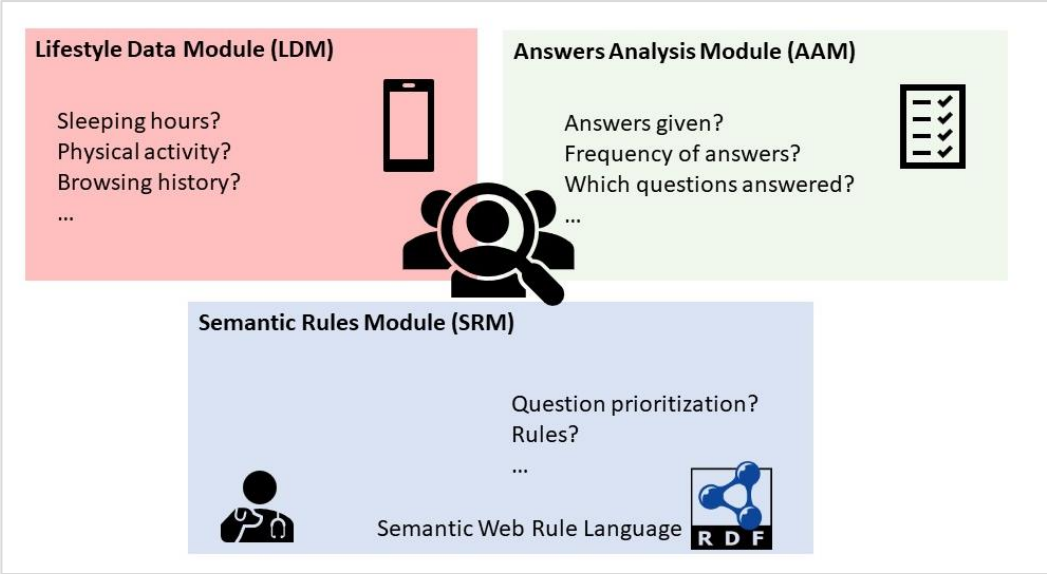

Figure 1: Conceptual architecture of personalization scheme

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