Toward IT-based Self-reporting Methods for Better Compliance to Computer-interpretable Guidelines

Position Paper

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Abstract. Patients’ compliance to guidelines is one of the main barriers to treatment success in general and to behavioral modification in particular. Self-reporting is often the only available method to measure patients’ compliance. Moreover, it is known that self-reporting may even increase guideline compliance. This makes both quality and quantity of self-reporting a crucial issue in a variety of healthcare settings. Recent advances in computer-based guidelines create a variety of new IT-based opportunities to implement self-reporting and there is an increasing number of works on the topic. In this study we will focus on self-reporting in the context of behavioral modification guidelines. Our goal is to investigate IT-based self-reporting methods and strategies to implement CIGs and increase compliance to them. As a case study, we focus on behavior modification for dogs through their owners.

Keywords: compliance of healthcare processes, self-reporting, computer-interpretable guidelines, behavior modification

1 Introduction

When people are faced with the need to resolve a clinical or behavior problem, one of the best instruments available to set appropriate goals and actions are clinical practice guidelines (CPGs) - tools that are intended to improve safety, quality of care, and cost-effectiveness [1]. Patients’ compliance to guideline-based treatment recommendations are of course essential for the treatment’s success. Hence, improving patients’ compliance has been investigated by many researchers [2], [3]. Compliance rate of short-term therapy has been estimated as 70%-80%, while the compliance with lifestyle changes is very low and reported to be 20%-30% [2].

Computerizing clinical guidelines increases the chances of impacting user behavior compared to using only the narrative guidelines [4]. This is due to the fact that their representation as a computer-interpretable guideline (CIG)-based decision-support systems (DSS) makes the relevant patient-specific recommendations available at the point of care at the right time [1].
A care provider needs to know her patient is compliant in order to decide on therapy change. Therefore, we need methods for measuring compliance. In non-clinically controlled environments, self-reporting is the way to collect data on patient’s behavior (including compliance), effort, and outcomes. This data is extremely important to the tracking and the success of behavioral change therapy; there is evidence that self-reporting can even increase the users’ compliance. Hollis found that weight loss was positively influenced by the amount of diary records per week [5]. The same conclusion was reached by Quinn et al. in an experiment with self-control strategies. They showed that self-monitoring leads to decreases in undesired behavior [6]. Therefore, self-reporting plays the following key roles in guideline compliance:

- Many guidelines contain recommendations whose conditions explicitly refer to self-reported behavior,
- Self reporting increases compliance,
- Self reporting can be utilized for personalizing a guideline to a particular patient.

Different strategies can be used to increase self-reporting [7]:

- Involving the healthcare team (remote coaching, remote symptom monitoring, automated feedback) [8];
- Leveraging social influence (among family and friends who share the same health goal, who have succeeding in accomplishing similar health goals);
- Utilizing entertainment (game, lottery);
- Psychological reinforcement (goal setting, cognitive restructuring (focus on successes), positive reinforcement, stealth interventions (target outcome is a side effect));
- Financial incentive.

IT provides a new means for self reporting (Fig. 1): web-questionnaires [3], SMS [3], [9], instant messaging service [10], self-monitoring of physical activity by means of fitness-gadgets [11] and tweeting through the sport mobile applications [12].

In this study we will focus on self-reporting in the context of behavioral modification guidelines. Our goal is to investigate IT-based self-reporting methods and strategies to implement CIGs and increase compliance to them.
2 Related Work

Modification of patient behavior according to domain knowledge sources via mobile phones, web-based and mobile applications was investigated in a number of recent works. Several of these works address specifically the issue of self-reporting using different intervention strategies [3]. For example, digital multi-media smoking cessation intervention in the project ‘Happy Ending’ [3] includes tunneling of information appropriate to the psychological stage of the patient. Participants of the controlled trial ‘TXT2STOP’ received individually tailored text messages according their interests and issues related to smoking quitting [9]. An instant messaging system was used as a platform for the bot that empowers users of the project ‘Nombot’ to self-reporting about daily nutrition [10].

Our proposed research aims to go beyond the state of the art by using combinations of strategies mentioned above together with a focus on user-personalization to improve users’ behavior in self-reporting and compliance to guidelines, using a CIG formalism.

3 Research Goal and Research Question

During the process of guideline implementation we usually make the assumption that accurate information about compliance and the patient’s state is provided at the right time for the CIG. However, in practice it is not always the case.

Fig. 2 describes how an expert using a CIG-based DSS accesses self-reported data in state of the art DSSs. Our idea is to go beyond the state of the art by adding an additional layer of the patient’s view, where different strategies for managing self-reporting can be recommended by a second DSS, intended to improve compliance, which interacts with the CIG-based DSS. The novelty of this approach is in putting intervention strategies in the context of CIGs, moreover, putting this knowledge in a DSS that can adjust these strategies to increase self-reporting and compliance, and adjusting therapy based on patient state, compliance state, and self-reporting state.

Our research question is, therefore, how to improve compliance and self-reporting in the context of DSS that can adjust therapy based on the patient state, compliance state, and self-reporting state?

4 Research methods

We plan to develop a library of CIGs containing behavioral change guidelines and a library of enactable behavioral change strategies (apps). We will also develop a DSS that activates the CIG engine and selected apps for increasing self-reporting and compliance to the CIG recommendations. The apps will be selected according to the user’s characteristics, her compliance to self-reporting and to CIG recommendations. Depending on the selected strategy, the user will get a behavioral change plan and links to the set of appropriate technological tools (e.g., Android mobile application, Facebook app, WhatsApp bot) for increasing self-reporting. The level of compliance by self-reporting data of every user will be estimated at regular time intervals. If the received level is assessed as insufficient, the
Fig. 2. Expert’s and patient’s views of CIG.
DSS will correct the intervention strategy. We are considering using the PROforma [13] CIG formalism and Tallis CIG engine (http://www.cossac.org/tallis).

We will develop three CIGs in order to evaluate our system by analysis of logged user activity and questionnaires. We have chosen to develop and evaluate our ideas within the domain of behavior modification for dogs and their owners. Behavioral problems of dogs can be resolved by veterinarians (via medication), dog trainers (via special training sessions), or by the dog owners (via change of routine, environment, food type, etc.). In our study we focus on the latter, as it provides an excellent opportunity of exploring people (dog owners) compliance to guidelines and its relation to self-reporting. We therefore think that we could generalize the methodologies and tools that we will develop and the results that we will obtain from the evaluation study to patients and their supporting persons (e.g., family members).

Other reasons for which we chose this domain are:

- Self-reporting is a crucial part of any guideline in this domain;
- Guidelines in this domain are usually short-term, containing recommendation that help achieve a behavioral change goal within a few days to several months. This allows us to evaluate our approach in relatively short time;
- The community of users is already active in online social networks and so is likely to respond to various types of online self-reporting tasks;
- There are no privacy issues with dogs’ data.

Our evaluation with users will show which types of self-reporting strategies are more effective at increasing guideline compliance.

5 Summary and Future Research

In this position paper we have presented our research agenda for investigating ways in which compliance to CIGs can be increased by using IT-based methods for qualitatively and quantitatively improving self-reporting. We are currently collaborating with an expert in dog behavior modification for elicitation of guidelines in our chosen domain of study. The next steps will include developing CIGs on the basis of the elicited guidelines, and creating the DSS environment for selecting intervention strategies as envisioned in Figure 2.

References


