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Shared Decision Making: Using Theories and Technology to Engage the Patient in Their Health Journey

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Abstract. Shared decision making is considered the cornerstone of patient-centred care but transpires in only 10% of face-to-face consultative encounters. Technology interventions have rampantly sought to fill the shared decision making gap but fall short in patient engagement. Recent studies indicate that combining multiple approaches could lead to greater commitment towards achieving positive health outcomes. Consequently, this study combines and embeds the I-Change behavioural theory with choice architecture within a technology-based aid to facilitate shared health decision making for hypertension reduction. An ontology knowledge model combining the behavioural and choice methods forms the core framework that will inform the technical solution. The model is both scalable and patient-centric. A pilot study will trial the solution, solicit feedback and propose refinements for future clinical use.

Keywords. Shared Decision Making, Patient Empowerment, Technology Intervention, I-Change Model, Behavioural Theory, Choice Architecture

Introduction

Shared decision making (SDM) empowers patients to be more informed and to actively participate in their own health. It is a meeting of the experts in which the physician is the expert in medicine and the patient is the expert in his or her own life, values and circumstances [1]. SDM can improve the patient's quality of life [2], quality of care and safety [3] while lowering healthcare costs [4].

Despite its benefits and being touted as the cornerstone of patient-centred care [5], literature shows that only 10% of face-to-face clinical consultations involve shared decision making [3]. Consequently, technology interventions (decision aids) are a well-studied method for filling the SDM gap [6]. Decision aids can improve decision quality; reduce decisional conflict and increase choices consistent with the patient's values [7].

Use of behavioural theories improves the success rate of health interventions [8]. For instance, theory-driven behavioural strategies can reduce the risk of cardiovascular disease through lifestyle change rather than increasing patient medication [9]. Choice architecture (CA) is recommended as a complimentary technique for improving health behaviour and decisions [10]. Reinforcement through multiple methods may increase

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motivation and adherence [11]. Hence, this research envisions a technology intervention employing behavioural theory and choice architecture to reduce a cardiovascular risk factor (hypertension) using SDM.

1. Methods

This research study develops a web-based technology application integrating behavioural theory and choice architecture to facilitate SDM. A conceptual process flow (Figure 1) and an ontology knowledge model (Figure 2) informs the computerization of the technology intervention.

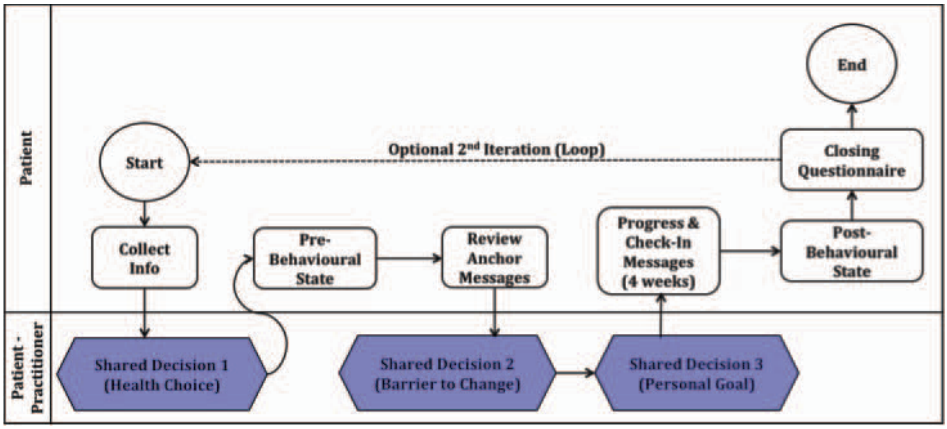

Figure 1. Process flow

The steps in the process flow are:

Information Collection: Demographics along with health markers for current exercise, smoking and sodium intake are collected for use in the subsequent choice architecture.

Shared Decision 1 (Health Choice): A health choice (lifestyle intervention) is the first shared decision towards reducing hypertension.

Pre-Behavioural State: A validated questionnaire captures the initial behavioural state using the Integrated Change (I-Change) behavioural model [12]. I-Change has three states: awareness, motivation and action.

Anchor Messages: CA anchor messages motivate behaviour change by framing the importance of the intervention and setting expectations without impacting preferences.

Shared Decision 2 (Identify Main Barrier to Change): Identifying and overcoming inhibiting psychological barriers is essential for altering lifestyles successfully [13].

Shared Decision 3 (Personal Goal Setting): A shared decision sets a realistic personal goal for the intervention.

Progress and Check-In Messages: Systolic and diastolic blood pressure measurements are entered in the system while receiving a concurrent motivational check-in message.

Post-Behavioural State: The behavioural state is measured again for comparison.
Closing Questionnaire: Evaluates the participant experience with the intervention.
Second Iteration (Optional Loop): A second iteration reduces the possibility that external factors interfered with the first attempt (if unsuccessful).

The theory and shared decision making steps from the conceptual process were represented in an ontology knowledge model using Protégé 3.5. The ontology model in Figure 2 contains the behavioural, choice and domain specific content.

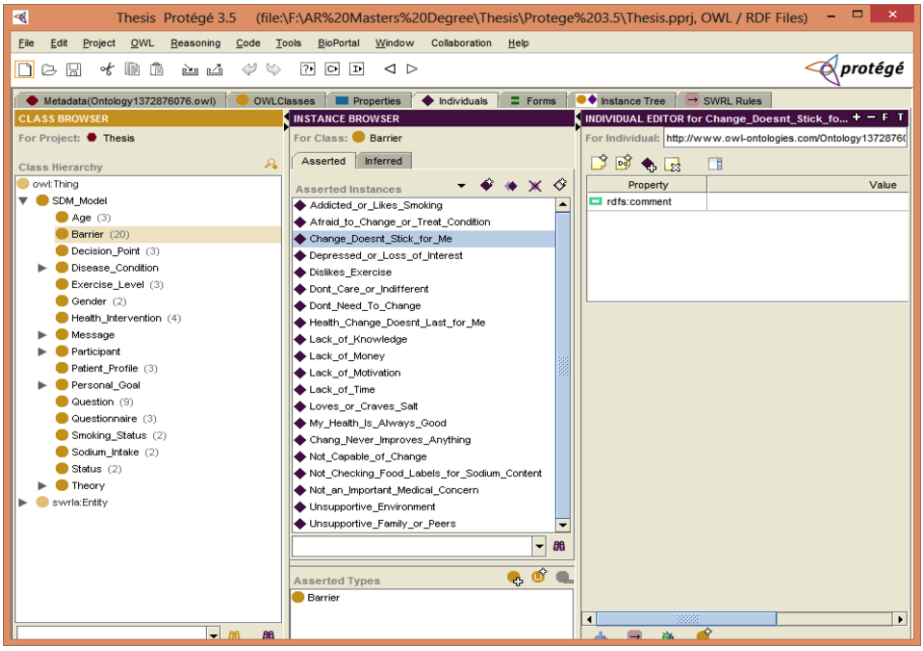

Figure 2. Ontology knowledge model

For instance, identifying the barrier to change is a behavioural construct and making the decision on how to overcome it is a shared decision. Thus, the ontology model contains a class for "barrier" with Protégé individuals representing the common obstacles for change derived from psychological evidence [13].

The model also contains a class for "messages" which contains the various CA message techniques that could be employed. Anchor messages and check-in messages are examples of sub-classes. Within each sub-class, the specific messages for display appear as Protégé individuals and the message content is captured using an "app_message" datatype property.

The model was built to be scalable and flexible and can accommodate any disease condition, multiple participants, the selection of different theories for behaviour change and also different choice architecture concepts. The ontology model is patient-centric and contains the core constructs, relationships, and description logic that form the foundation upon which the technical solution will draw its elements and processing logic.

The technology solution envisioned will be a web-based interface storing information on a centralized server within a secure relational database. The Vaadin open source web application framework will be used to produce a rich internet

application. Vaadin contains a plug-in for chat sessions to enable online shared decision making. The technical solution will utilize the ontology model constructs to present the behavioural theory, choice and domain content as a seamless process flow.

2. Evaluation and Results

The research design is a usability pilot study of 8-10 participants. Each participant will use the technology intervention for a minimum period of four weeks. The technology intervention has been validated by two domain experts in medicine and further reviewed by two individuals with hypertension for patient input.

Evaluation will be achieved by capturing both quantitative and qualitative information. Quantitative pre and post-behaviour states will be obtained by automated scoring of an embedded I-Change behavioural state questionnaire. Daily measures of systolic and diastolic blood pressure using digital monitors, along with the health intervention progress (i.e. quantity of cigarettes smoked) will be tracked for quantitative analysis. This information will be used to determine whether the lifestyle change was actualized.

A post-study questionnaire will solicit the usability and shared decision making experience of both participants and healthcare provider through questions scored using a 5-point Likert scale for quantitative analysis in conjunction with open ended questions for qualitative analysis. The post-study questionnaire will determine the value and success of the technology intervention.

Statistical software such as SAS or R will be used to calculate mean scores for blood pressure and health progress measures. Moreover, mean scores will be calculated within each section of the post-study survey. Chi-square will be used to evaluate both the question and section level information and Cronbach's alpha will be used to evaluate response consistency within each survey section. The combined study data and post-study questionnaire will be reported as general/aggregate findings.

3. Discussion

The research study will show whether a multi-faceted intervention based on an ontology model can be an effective tool to reduce hypertension.

3.1. Limitations

Finding hypertensive participants in the local area is a pragmatic challenge that impacts the study size. Hence, the evaluation will focus on the usability, benefits, challenges and value of the online shared decision making intervention.

3.2. Conclusion

This study contributes to new knowledge by assessing whether technology can be used as a successful medium for sharing decisions informed by an ontology model combining behavioural theory and choice architecture. The solution is designed to be

generalizable and can be used for any disease or condition. Hence, the SDM model could be expanded in future research for other specialties or disease conditions.

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