Virtual Counselor for Patients in Medication-Assisted Treatment for Opioid Use

Work in Progress and Preliminary Results

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ABSTRACT

In recent years, the opioid overdose death rates have increased at an alarming rate. The cost and lack of availability of effective opioid use disorder (OUD) treatment are barriers for patients in need of care. Relational agents that engage patients in simulated face-to-face counseling could be used to address these barriers. We describe an ongoing pilot study, designed to assess the feasibility of using a relational agent to counsel and support patients in medication-assisted treatment (MAT) for OUD. The preliminary results show that participants in MAT in Iceland were highly satisfied with the agent encounter, had high trust in the agent, and were willing to reveal sensitive personal information to the agent. Preliminary results indicate that providing support to people with OUD in MAT is feasible.

KEYWORDS

Relational agent, pilot study, opioids, counseling, medication-assisted therapy

1 Introduction

Death as a result of overdosing on prescription opioids has increased globally over the past few years. In 2015, about 118,000 people with opioid use disorder (OUD) died from overdose [1]. In the United States, specifically, there has been a 21% increase in drug overdose, with most deaths involving the use of opioids [1].

In 2015, the percentage of drug-related deaths in the U.S.

was about 2% (up from roughly 0.75% in the year 2000), with Iceland in second place with 1.4% of all deaths [2]. In 2016, opioid prescriptions in Iceland accounted for 26% of all daily medication prescriptions, the highest among the Scandinavian countries, and approximately 70% of all drug-related deaths in Iceland were attributed to opioid overdose [3].

Less than 10% of patients with opioid use disorder (OUD) receive effective treatment [1]. The most common treatment is a combination of behavioral therapy and medication-assisted treatment (MAT) [4] and the lack of affordable treatment options is a barrier to treatment access. The cost of MAT at a certified opiate treatment facility in the United States is estimated to range from $6,552 to $14,122 per person per year, depending on the type of medication used and frequency of clinic visits [5].

Relational agents offer a potential solution to the issues of availability and cost of the behavioral therapy. Relational agents are embodied computer artifacts that simulate face-to-face conversations [6] and may act as behavioral adjuvants to medication assisted therapies. Recent studies have successfully featured relational agents in applications that assist patients with chronic diseases management for a variety of health conditions [5–7].

We have developed a prototype relational agent that plays the role of a counselor for patients in MAT for opioids, that is able to provide safe and efficacious counseling and support. In this paper we describe preliminary results from an ongoing pilot study being conducted at two sites: Reykjavik and Boston. We seek to assess the acceptability of this agent by the patient population and the feasibility of delivering behavioral counseling using this medium. Specifically, we are interested in assessing patient trust in and general satisfaction with the virtual counselor to guide our next steps in development and help form hypotheses for future research.

2 Virtual Counselor

The relational agent speaks using synthetic voice, driven by a dialogue system and template-based text generation. User inputs are made via constrained user selection of utterances. The agent program is built using the game engine Unity3D and the agent's speech is synthesized using the IVONA Sally voice for the English-speaking agent and IVONA Dora for the Icelandic agent.

To our knowledge, this is the first conversational agent evaluated in a health care setting using the Icelandic language.

The initial counseling conversation between the agent and patient includes a greeting and some social chat at the beginning of the interaction. After this, the agent leads the patient through two evidence-based skills that have been shown to support recovery efforts among opioid addicted individuals. The interaction closes with the agent asking a few details about the patient's opioid use, to assess comfort discussing this information. In this pilot, we focused on two exercises commonly used in MATs, i.e., emotion recognition and mindfulness with deep-breathing, followed by an interactive session focusing on emotion regulation. The underlying concept was to have participants go through the motions of how to identify and cope with strong emotions, to fortify their resilience against relapse.

3   Pilot Acceptance Study

We recruited a convenience sample of participants enrolled in a MAT program at the addiction treatment hospital Vogur in Iceland. Participants were asked if they would like to participate in a half-hour study designed specifically for people in MAT, as they arrived at the hospital either to pick up their two-week medication dosage (Suboxone in this case) or for an interview with a treatment professional. If they consented, they were asked to fill out a demographics questionnaire, followed by a 15-minute conversation with a virtual agent on a laptop. Finally, the participants filled out questionnaires that assessed their level of trust in the agent and general satisfaction, followed by a semi-structured interview.

3.1   Measures

Participant demographics included age, sex, relationship status, housing status, education, occupation, how often they read books, how much experience they had with computers, and how they felt about using computers. Following the interaction with the agent, trust is measured using a 15 item 8-point scale composite questionnaire [REF] and general satisfaction is captured using a variety of single 7-point item questions.

During the conversation we capture whether participants self-disclosed personal information to the agent at the end of the conversation with questions like "how many times have you been in treatment?", "what is your drug(s) of choice?", and "what are some challenges to being in MAT?" The participants were always given the option to not answer the questions. We also capture their opinions on the deep-breathing exercise and whether they felt that these exercises would help them in their sobriety.

3.3   Results

To date, 19 participants completed our study. One participant did not answer the questionnaires; thus, the results below only reflect the responses of 18 participants. The average age of the cohort is 40.22 (SD 10.26), with the lowest age being 23 years and the highest 60. Only 28% were female, most were single, had stable housing, and had not graduated high school. Most participants had
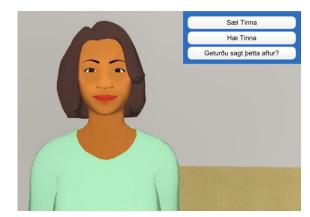

Figure 1: The Icelandic agent Tinna and example user options.

a positive opinion of computers, as rated on a 4-point scale ranging from "I don't like computers" to "I love using computers".

The participants' average trust in the agent was 6.98 (SD 1.44) on a scale from 1 to 8. The general satisfaction results, on a scale from 1 to 7, include a median satisfaction of 6.5 (IQR 2.5), willingness to continue working with the agent is 5.5 (IQR 2), how interesting they found the agent was a 7 (IQR 2), and trust in the agent as a single scale item is 6.5 (IQR 2).

On a scale from 1 to 7, participants rated their closeness to the agent with a median of 2.5 (IQR 2), how much they felt she cared about them was a 4.5 (IQR 3.25), and if they would prefer to talk to a human counselor rather than an agent with a median of 4 (IQR 1.75).

The assessments conducted via agent dialogue revealed that participants liked the deep breathing exercise (17 out of 18) and that most believe that this experience will help them in their recovery (17 out of 18). These measures also showed that all participants that finished the conversation (18 out of 19) were willing to self-disclose personal information about their drug use to the agent.

3.4   Qualitative Results

Following the interaction with the agent and filling out questionnaires, each participant was asked to describe various facets of their experience in their own words in a semi-structured interview. From these interviews we found that 14 out of 19 participants had a positive experience, feeling that virtual counseling for recovery support is generally a good idea.

> *"this kind of thing could help people in my shoes"* – P6, M

> *"I would definitely use something like this"* – P18, F

From the interviews, it was clear that there was a difference of opinion between those who are new to MATs and those who have

been in treatment for some time, regarding the relevance of the content of the conversation.

"Everything that happened during the interaction made sense and flowed" – P16, M (new to MAT)

"This is better suited for people who are getting started in treatment" – P9, M (experienced)

"the emotion recognition exercise was too simple and unnecessary for those who are further along in their treatment" – P4, M (experienced)

Furthermore, some participants seem to respond well to the fictional element of the interaction, i.e., that the agent was playing the role of a counselor that cared about you, while others just wanted the information without the pretense.

"Tinna was nice, human, and a courteous person" – P19, M

"I don't buy into the fiction of the whole thing" – P3, M

Participants were asked whether they thought a virtual human counselor would be beneficial and whether using technology in general would help them in their recovery. Approximately 15% said they would never use any technology, just show up to meetings and talk to people. Most of those had been in the program for more than a year. About 36% said they would definitely use technology like smart calendars for meeting schedules, systems with information relevant to their condition, apps for social support, etc. Finally, about 50% said they would like to use a conversational agent like Tinna. They want to be able to talk to her about their day, for her to be there when they are lonely, and to have someone to help when they're upset or want to use again.

4 Discussion

So far, our on-going pilot has demonstrated that people in MAT for opioid use disorder in Iceland have a generally positive reaction to a virtual agent discussing topics related to opioid use therapy with them. Patients felt the agent was interesting, easy to talk to, and was not repetitive, and expressed high levels of trust in the agent and desire to work with her again. Patients were largely satisfied with the overall experience. However, measures capturing the perceived relationship with the agent are relatively low. The interviews revealed that participants felt that one session was too early to talk about having any kind of relationship with the agent.

In MATs, it is important that patients honestly self-disclose sensitive information, such as how many times and how long they've been in treatment, what they think about MAT, what their drug(s) of choice was, etc. Just as in human-human counseling,

we found that most participants were willing to reveal personal information about their drug use and treatment history to the agent. This shows that in one approximately 15-minute session, patients can go from never having used a virtual counselor, to revealing sensitive treatment-relevant information, just as they would with a human counselor. Additionally, most participants thought that their conversation with the agent would help them in their recovery.

The interviews suggest that the content of the conversations should be tailored according to the patient's experience in MATs. We found that newcomers were more likely to want to use Tinna in their recovery, while more experienced participants were more reluctant. Moreover, the behavior of the agent should take into account the individual's preference for wanting the information directly and their wish for brevity. As patients progress in their treatment, the system could dynamically respond with modules relevant to the individual's recovery and it should have the ability to switch between different ways of mediating the information, e.g., displaying the information quickly in an image vs. having a long conversation about it.

These encouraging preliminary results will inform the next steps in our research efforts towards building a relational agent system capable of providing people with OUD support during MAT. Further pilot testing will be conducted with a MAT cohort in Boston this fall.

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