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### Management Of Opioid Tapering With A Mobile App Among Veterans

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# **Management of Opioid Tapering with a Mobile App Among Veterans**

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A thesis submitted in partial fulfillment of the requirement for the degree of

Master of Public Health

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## **Abstract**

**Objective:** The goal of this project is to better understand the Veterans' perspectives on the facilitators and barriers of using a mobile app for opioid tapering.

**Methods:** Semi-structured interviews were conducted with nine Veteran patients who have experienced opioid tapering at the VA Connecticut Healthcare System in West Haven, CT. Interviews were conducted in-person at the VA Opioid Renewal Clinic (ORC). Each interview lasted approximately 55 to 70 minutes and participants were compensated with \$25. Data analysis was conducted using Grounded Theory to generate findings for this research project.

**Results:** Findings identified a total of 11 codes, which were categorized as facilitators or barriers for mobile app use on opioid tapering. Qualitative codes that emerged as facilitators included sense of control, interest in novel interventions, communication with provider, support systems, mobile literacy, and personalization. Barriers identified were lack of mobile literacy, lack of knowledge, app malfunctions, privacy concerns, and lack of accessibility functions.

**Discussion:** Majority of these Veterans are willing to try something novel that will help them with their opioid tapering and pain management. The development of mobile apps focused on opioid tapering should consider these facilitators and barriers to increase the likelihood of future intention to use the app.

**Keywords:** mHealth, mobile app, opioid tapering, facilitators and barriers, and veterans

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## **Introduction**

Earlier treatments had resulted in routine use of opioid analgesics. In 2015, it was estimated that almost 40% of US civilian, noninstitutionalized adults used prescription opioids and as a result misuse and opioid use disorder (OUD) became common (Wood, Simel, & Klimas, 2019). The opioid crisis has claimed the lives of 47,600 in 2017, a 90% increase from 2013, where there was an estimate 25,052 deaths from opioid-involved overdose deaths (Gladden, O'Donnell, Mattson, & Seth, 2019). There is a current drive to expand treatment options to patients with opioid use disorder. Low treatment uptake for opioid use disorder is thought to be due to a lack of access to buprenorphine prescribers (Lagisetty & Bohnert, 2019). As a potential resolution in 2000, the Drug Addiction Treatment Act (2016) was passed to permit clinicians to receive a waiver to prescribe buprenorphine in non-specialty settings. Several factors presented themselves as barriers to providing specialized treatments to patients such as staff training, access to counseling and alternate treatment, and pain medication concerns that affect the willingness for providers to prescribe this treatment (Netherland et al., 2009).

Mobile health technologies (mHealth) may provide the opportunity to address the barriers of access to evidence-based treatment for patients. It has proven useful in other health issues such as adherence to antiretroviral therapy among HIV-positive patients in Kenya and a smoking cessation intervention in the UK (Free et al., 2013). Similarly, other mHealth technologies, such as mobile apps can be used by patients during their opioid tapering process. It can also be implemented as an adjunct to their care from their provider, which may alleviate some of the burden that providers may be experiencing with patients' opioid tapering plans.

Currently, there is limited research on mHealth apps focused on opioid tapering. One such study on a mobile app, MySafeRx, assisted with OUD treatment adherence among young adults. Results indicated the mobile app was acceptable and feasibly implemented in treatment settings but determined that long-term duration of the mobile app would be necessary for its impact to continue (Schuman-Olivier et al., 2018). In a Veteran population it has been postulated that older Veterans may be less likely to have access to or interest in apps. In a study looking at mHealth apps for Veterans with post-traumatic stress disorder (PTSD), where the subject population had a mean age of 52.35 years, 85% of participants indicated interest in using an mHealth app (Erbes et al., 2014). Similarly, another qualitative study suggested older adults with chronic pain are interested and willing to use mHealth to help with their pain management (Parker, Jessel, Richardson, & Reid, 2013). Thus, app designers should consider a diverse group of potential users, and not assume that older Veterans will be uninterested.

These results have shown that there is potential in the use of mobile apps to further enhance a patient's health care experience, not only with what has been studied before with HIV-treatment adherence, smoking cessation, and even mental health-related disorders such as PTSD amongst Veterans, but can also be extended to opioid tapering in a Veteran population. The goal of this research project is to expand and distribute the findings and experiences from the Veteran perspective who have experience with opioid tapering. The facilitators and barriers towards using a mobile app for opioid tapering management amongst a Veteran population is yet to be expanded on and thus, this study will be able to highlight these perspectives for researchers and mobile app developers to consider in the future.

## **Methods**

### *Study Design*

A qualitative study was conducted using in-person, semi-structured interviews with patients who have experience with opioid tapering. A qualitative approach was chosen to facilitate a deeper exploration of patients' perspectives when it comes to managing opioid tapering with a mobile app. For the last five questions of the interview, the participants were presented with a preliminary design of a mobile app on an iPad to provide their perspective on mobile app use. The mobile app previewed was designed to enable Veterans to safely taper opioids through various modules, which included menu items such as *Get Help Tapering*, *Manage Pain*, *Improve Sleep*, *Manage Stress*, *My Plan*, and *Connect with a Peer Specialist*. The study was approved by the Institutional Review Board at the VA CT Healthcare System in West Haven, CT. Written informed consent was obtained from all study participants.

### *Setting and Participants*

Participants were recruited from the VA Opioid Renewal Clinic (ORC) at the VA Connecticut Healthcare System in West Haven, CT. The ORC program assists primary care providers in the management of chronic pain patients with a history of abusing opioids or are at risk for abusing opioids or other substances during pain treatment (Becker et al., 2009). Participants were referred by their ORC clinician if they have had a history of chronic opioid use and are currently on a tapering schedule. Purposive sampling was used to capture a diverse subject pool. The study contained 8 males and 1 female; 8 White and 1 African American. Participants were included if they were English-speaking and able to provide informed consent. The study coordinator reached the patients by phone to schedule an in-person interview during

the same day as their appointment at the VA ORC to facilitate attendance. Their appointments were typically held on a Friday between the hours of 9:00am and 12:00pm. Each participant was compensated \$25 in the form of a gift card. Between late December 2019 and February 2020, nine interviews were conducted.

### *Data Collection*

The interview guide was composed of 12 broad, open-ended questions with probes to elicit personal experiences regarding their opioid tapering and pain management and thoughts regarding mobile app utilization for opioid tapering management (see Appendix). The semi-structured approach to these interviews determined the order of the questions to be shifted around based on the participants responses, which allowed them to construct their own narrative of their experiences with tapering and pain management. The first seven questions were used as a general inquiry to get the participants to reflect on their current treatment plans for pain management and on their tapering process. This would help to build rapport and increase their engagement to discuss their thoughts on mobile app use. Then a preliminary design of a mobile app for opioid tapering was presented on an iPad for the participant to view on their own. The last five questions were based on their initial reaction and thoughts on the mobile app for opioid tapering and relating it back to their opioid tapering and pain management experiences.

Interviews were led by a study coordinator with qualitative research experience and whose experience working with the Veteran population for the past six years gave her familiarity with being able to navigate the interviews. The study coordinator conducted the in-person, semi-structured interviews in a private room lasting 55 to 70

minutes. Interviews were recorded, transcribed verbatim, and entered into Dedoose version 8.3.17 for coding.

### *Data Analysis*

Data from the transcribed interviews were analyzed using Grounded Theory described by Strauss and Corbin (1994). Due to limited funding and time constraints, the study coordinator was solely engaged in coding the nine transcripts by systematically applying codes to words and passages in the text. The Principal Investigator, an expert in the field of addiction medicine and pain management training, met weekly with the study coordinator to discuss the data collection process and emerging themes from the interviews allowing for data collection and analysis to occur simultaneously and iteratively from the very beginning. This iterative process allowed the study coordinator to construct a finalized set of codes to reapply to all nine transcripts to produce findings for this project.

## **Findings**

Analysis of the interview transcripts will initially highlight four codes from the Veterans' experiences with opioid tapering and pain management. Following will include an analysis of four codes categorized as facilitators for mobile app use. Identified codes from the Veterans' experiences will later be merged with the codes categorized as facilitators for mobile app use because of their level of connectedness and similarity in context to sum to a total of six codes identified as facilitators. Lastly, five identified barriers for mobile app use will be described.

## 1. Experiences with Opioid Tapering and Pain Management

Participants shared their lived experiences, beliefs, and understandings related to opioid tapering at the VA ORC, which set the scene for how they would use or not use a mobile app for opioid tapering.

### *Sense of Control*

Veterans described their opioid tapering experience as regaining a sense of control and autonomy stemming from internal and external sources. Internally, each Veteran made the decision to move forward with tapering off opioids. This decision was described in a variety of ways such as, “driven, what works for me, the paddler of the boat, the driver of the bus, empowered.” Externally, this was a shared decision-making effort with providers who informed the Veteran that this choice was there for them to make. Almost all Veterans would make the final decisions for themselves regarding their medication intake but with the guidance from their providers. As Participant 3 described,

*I honestly think the [doctor] looked at me. I think he looks at everyone individually...when he first put me on the Suboxone, of course it was the minimum amount it wasn't really helping. I was looking for something that would help with the pain and get me off the opioids and he slowly brought me up to an amount that kind of did both. The Suboxone isn't really a pain reliever but maybe it's in my mind, I don't know, but it does work a little bit and he allows me to control [it] ...you know like he'll say take two of them three times a day. Well in the morning I might need three and late in the afternoon I might need one but as long as I stick to that, 6 pills a day let's say. I told him what I was doing and he said if it works for me, go with it. Most months, I think I've*

*only run out a couple times in a few years that I've been on them. More often than not I have a few left. So, he'll just smile and say do what you're doing.*

Many Veterans who had experienced opioid tapering identified a sense of empowerment after gaining a sense of control. Many of them have felt out of control for many years on opioids. On opioids, they focused solely on the attainment of making sure they have enough medications to last them the month, when their next appointment was, which would dictate how they felt that day. Participants 3, 4, 6, and 8 described their experiences, respectively.

*I made a decision that I wasn't going to let it control me anymore and with help it doesn't. Simple as that.*

*I mean everybody has a different story but it's the same story if that makes sense. We're all on the same boat, it's how we choose to paddle that boat.*

*One has to have the desire to do it...the desire to change. Empowered. Giving myself the control over myself, my thinking, my health. You have control over your total man. I think a lot of times people sometimes feel like they're not in control and it's based on the situation that they're in.*

*If something has to change then I call it in or leave a message through the VA app and the provider makes the change. The way I see it is you're the bus driver in your pain management.*

For one Veteran, he was not pleasant to be around when he was on opioids and he described having lost valuable years with his children. Off opioids, he is now taking advantage of his time with grandchildren and spouse. Participant 3 described it as,

*I still have the pain but now that I'm off everything it's not as bad, I can control it by doing other things. I can have my grandkids around me and they make me forget about it because I'll be playing with them or I help my wife with gardening.*

### ***Interest in Novel Interventions***

Almost all Veterans were able to describe multiple interventions that they tried as a patient in the pain clinic. They described physical therapy, aquatic therapy, yoga, stretches, deep breathing exercises, meditation, injections of all kinds, acupuncture, neurostimulators, sleep aides, and peer-to-peer groups. They also described various hobbies that they find personal enjoyment, which includes journaling, reading, studying the bible, and spending time with family. Their willingness to try many of these interventions for the first time demonstrates their determination behind their decision to pursue opioid tapering even with discomforts involved with withdrawals and living with chronic pain. As Participant 4 expressed,

*I am still on medication...I do physical therapy, aquatic therapy, I go usually every three months for Botox injections but they've been so good that I've been going every six months and I also get injections in my spine like usually every 3 to 6 months depending. So, I do that and try to walk, and exercise, and eat right. Do everything I'm supposed to do... I'm happy, they're happy, we're all happy. They've been so accommodating to my needs that we've worked together and we've come to a great solution...I went from*

*120mg of morphine a day to 0 in less than a year so I don't know what's contributing to it but the VA is helping me to do that.*

### ***Communication with Provider***

When asked about their current mode of communication with their healthcare provider related to pain control, Veterans identified a positive relationship with their provider. In another study, it increased their willingness to continue with their opioid tapering (Frank et al., 2016). Over the years the VA has expanded on virtual modalities to improve access to care, which include but not limited to VA Mobile Health apps, VA Video Connect, and VA Secure Messaging (Schiller, 2019). A few Veterans described their communication with their provider as gaining clarity and reducing any concern over expectations with tapering. As Participants 3 and 4 explained,

*[My provider] talked about it with me. He was very clear with what I was to expect. How I would feel. It was his input that probably helped the most.*

*I literally would go to my primary care with any type of issue and within 24 to 72 hours somebody was calling me with an appointment for whatever I needed. I never had to wait...I never had to worry about anything. They were there.*

Some Veterans described their experiences with communication to be timely in addressing any questions or concerns while they were tapering through VA's Secure Messaging application. Thus, Veterans' perception of their care at the VA made them feel acknowledged. As Participants 1 and 9 described,

*Every single time I text, I send him a message through the VA Secure Messaging app. That's how I do it and he's very good at responding. He's quick. He gets back to me within 12 hours. Sometimes almost instantaneous because he'll check his email constantly through the day. So, if I don't hear from him, I'll hear from someone else. So, I always hear from someone, I'm never ignored. Any problems I have are always addressed. We have a good clinic here.*

*It's so quick. Sometimes they get back to me in 3 minutes through VA's Secure Messaging...definitely by day of.*

### ***Support Systems***

In the same sentiment of feeling acknowledged during their opioid tapering experience, Veterans expressed their gratitude towards support systems, which included their team of providers, other Veterans, and family. One Veteran acknowledged his faith in a higher being as his support system. Before and after opioid tapering were also defined by how they were perceived by others. The constant reminder from the stigma surrounding addiction, such as being called an addict or a liar, has been associated with poorer quality of care and reduced intention to seek treatment (Richards, Goetter, Wojtowicz, & Simon, 2016). As Participants 1 and 8 described,

*Everything has to be taken into consideration. This clinic does that. If you need counseling, they've got everything you need when it comes to pain treatment. Pain is a really serious problem especially for people like me. My discs were bad, I had spinal stenosis, and I have an arthritic condition. All three of these things presented different symptoms and sometimes one was more predominant than the other. If a clinician doesn't*

*pay attention to what you're saying you're going to have a really bad experience and the person is going to resort to other means and that's not going to help anybody. Especially someone who is feeling like they have been thrown to the side, not neglected but ignored but basically told that they're a faker. And that really does a lot of psychological damage because then the person starts to believe that nobody cares and that nobody is going to listen.*

*I do feel listened to by my provider and respected. Before, I was looked as a drug seeker.*

Another Veteran attributed her success in tapering to the support she received from her providers. It increased her willingness to work with her providers and with the recommendations they gave her to establish a working plan. As Participant 4 described,

*The VA gave me my life back. They gave me something. They'd say, 'well we can't do this but maybe we can do this'. They gave me options. Not just let's throw pills at her. They'd say, 'let's try an injection and see how that works or let's try Botox.' And so I was on board with anything they had to offer and I think that's the best thing when you have someone believing in you and helping you, you'll do anything to help them help you...I mean, you got to do what is right for you. If I could do it, anybody can do it. Pain sucks and a lot of people that don't have pain don't understand pain. But like I said, and I can't reiterate enough with the right people behind you and the VA has been nothing but accommodating they will not let you flounder, they will take care of you and they did for me and they've saved my life...who knew that the VA was the one that was going to give me my life back and it's kind of fitting because it comes full circle. I mean I left and I gave them my life so to speak and now they gave it back to me.*

Every Veteran's experience with pain is unique, which includes areas of the body that were most affected, including the different areas of pain that they continue to live with on a daily basis after tapering. These experiences with pain did not lessen their overall experience with opioid tapering. Some who have tapered expressed that they are still in pain but along their journey with pain management they have learned how to cope using a variety of interventions that align with their physical and emotional needs and interests.

## **2. Facilitators to mobile app use**

Majority of the Veterans described strategies that would facilitate use of a mobile app for opioid tapering. It included mobile literacy, connection to provider, personalization, and willingness. Given their experiences with opioid tapering, many of the themes discussed earlier also came up during their discussion for mobile app use and will subsequently be merged to be included as facilitators of mobile app use. Communication with provider and connection to provider were discussed in similar contexts and will be merged as a final code to be identified as communication with provider. Similarly, interest in novel interventions and willingness were also merged as a final code to be identified as interest in novel interventions.

### ***Mobile Literacy***

All Veterans had a smartphone during their interview that came up as an interruption from a text message or a phone call or when they discussed their communication with their provider. In addition, some Veterans will use it to conduct their own research regarding their medications or using it on a daily basis for work. Participants 3 and 5 referenced their literacy.

*And I am computer literate so I had gone on to the computer and I read about Suboxone, its benefits, its negatives because I know it's just as difficult to get off of Suboxone because it is an opioid but it works differently in the system so I did a lot of research and found that...if I was going to be on an opioid it was going to be one that wasn't going to kill me. It was going to help me and it did.*

*Today, I work in an office. I sit in a chair, look at a computer, talk on the phone all day long. I even have a raised desk to have different ways to do work just to deal with the pain while I do my work. When you're busy doing something, you're not focused on the pain.*

### **Connection to Provider**

Almost all Veterans referenced their providers as a support system and who they communicated with the most. In order to cope with the initial discomforts of tapering along with managing their pain, they built a trusting and open relationship with their provider, which helped with their maintenance of tapering off opioids and their pain. A feature to be able to connect to a provider was highly suggested to be a component of the app for opioid tapering. As Participant 8 described,

*VA Video Connect can be accessible through the app for someone who lives an hour away...it would help Veterans to connect with their doctor through the app for pain questions, medication questions...having the provider view the Veteran's progress using this program can help them to understand what the vet wants to accomplish as far as goals go.*

They seek the provider's consensus in their progress with opioid tapering and how they manage their pain with interventions such as stretches or physical therapy, for example. If they misstep and take more pain medications than is recommended they also communicate that with their providers. Thus, any activity accomplished with using a mobile app on opioid tapering would become a facet to their medical appointments with their provider as Participant 7 noted,

*My Plan should be at the top because it all has to start with the plan. It shows everything that I have put in, notes, goals and can help my doctor to see if there are patterns in my pain or how to improve or change my pain treatment. My provider should have access to this plan like a contact provider button or something.*

### **Personalization**

When asked about their thoughts regarding using a mobile app for opioid tapering and pain management and how they would navigate on their own, they expressed similar sentiments of being in control of their pain management. It might include not going through all of the menu items but the activities that make the most sense for their individual pain. Participant 2 noted having the ability to choose was favorable as opposed to going through a forced linear approach where they would have to complete one module before being able to continue to the next module.

*I like the fact that I have the ability to choose where I want to navigate even if I might not go through all of the topics. Going through that I felt more in control rather than some prescriptive treatment that somebody thinks is best but every Veteran feels like they're unique.*

Most Veterans suggested personalization of their progress to be important in an app for opioid tapering. When they experienced opioid tapering, they described that it could take months or years before they can fully taper off since it is a gradual process in some cases. Throughout the process they start to see more changes in their dose and how they are feeling. Some Veterans expressed if they had severe pain one day, they would take more pain medication than recommended but adjust accordingly afterwards. It is an experience of discovering what works for their body and their pain. A mobile app on opioid tapering and pain management should have options to track this progress as described by Participants 7 and 8.

*An app can help Veterans to find out what is behind the pain. It's a psychological trick. It would be good to have tools that can track your mood, what made you that way if you know and can take these notes to my provider to help me find a solution...My go-to is to journal in my notebook, to jot notes down. A feature on the app to collect notes on my pain would be very useful. There are benefits to journaling you know. People can react to stressors differently and it would be a good idea to log that on an app.*

*A neat component of this app could be that I can track my medication management if I'm on track or if I did it wrong one day. This can also track if I am keeping up with the goals that I set for myself like pacing activities...like Monday I did, Tuesday and Wednesday I didn't with red or green colors that tell me...I would like there to be more personalized progress summaries rather than a single entry. Or if I wanted to, I can add multiple pacing activities...More progress tracking would be useful.*

## ***Willingness***

Lastly, several Veterans expressed a willingness to try using a mobile app if it were made available for them. Based on their experience with pain, it was the similar mindset of having to attempt multiple interventions such as aquatic therapy, physical therapy, occupational therapy, acupuncture, various sleep aides, deep breathing exercises, meditation and many more to achieve a recipe of interventions that works for their them and their pain. If a mobile app on opioid tapering becomes available, the Veterans will make it a part of their pain management to track their progress.

*Yes, I would love to use an app on this. I would be able to track my progress and track what I do on my own.*

For almost all of the Veterans, pain has been a part of their life story for many years and are determined to keep working on it because they have seen the improvements in their quality of life after tapering. Participants 2 and 9 summarized it well in their responses,

*If I'm already getting into this app, I'm looking for help tapering probably or at least understanding it better. And if you're mission focused you may just jump into coping strategies.*

*An app on my phone? That's a great idea. I am open for anything...It's what you do with web apps and if it makes you feel better than I'd do it...I'd try anything once to help me with pain.*

### **3. Barriers to mobile app use**

Veterans described potential barriers to mobile app use that they perceived other Veterans would encounter instead of what would personally prevent them from using a mobile app for opioid tapering. These include a lack of mobile literacy, a lack of knowledge regarding mobile apps available to them, app malfunctions, privacy concerns, and a lack of accessibility functions for people with disabilities.

#### ***Lack of Mobile Literacy***

Almost all Veterans expressed prior experience using a smart phone or a desktop computer. As previously discussed, many Veterans communicate with their providers through mobile apps that the VA has implemented, such as VA's Secure Messaging app where they are able to send a text message to their providers if they have a question or want to make an appointment. Since Veterans have been able to adjust to several forms of mHealth apps at this VA healthcare center for the past couple of years, they were still able to acknowledge the potential barriers that Veterans unfamiliar with mobile technology may experience. As Participant 8 explained,

*I know how to use my phone. It may have taken me a while at first but I can understand that other Veterans who do not use technology like me can be scared to learn how to use a smart phone.*

#### ***Lack of Knowledge***

Without prior exposure to a mobile app or specifically an app focused on opioid tapering, Veterans would not know to look for one or where to look unless explicit direction is given by

their provider or someone from their support system that can inform them of additional resources online. An example can be seen when Participant 9 stated,

*I don't know what is available so I don't know how an app can help me...I don't really know how it can help me with my pain until I see one.*

### ***App Malfunctions***

Similarly, Veterans require further instruction from somebody else if they did not know how to troubleshoot mobile apps in the event that there is a malfunction. Most of the Veterans rely on maintaining constant communication with their providers for any kind of concerns regarding their pain. For troubleshooting mobile apps, they may not have someone to turn to, potentially leading to disinterest in using the mobile app. Participants 1 and 9 explained,

*The only thing I can think of is if something doesn't work, I wouldn't know how to keep using it or who can help me.*

*Thinking about it this way. If someone is dealing with extreme pain at the moment and they're debating whether to take 1 or 2 pills, and they remember about the app but need help with logging in and aren't able to get in right away. Well then, that person can be like I can't do this, I can't use this app so I'll take 2 [pills].*

### ***Privacy Concerns***

One Veteran brought up a concern regarding confidentiality. Many Veterans expressed that the mobile app would be most useful when it is able to collect information and monitor progress directly on the opioid tapering app. Some Veterans will resort to paper and pencil if they do not confide in the privacy of mobile apps, which was explained by Participant 7.

*With technology nowadays, there are always concerns of hackers. If Veterans share personal information, we want to make sure there are security features to make any one using it comfortable to share their stuff. That's another reason why I like using my notebook to write notes that I can share with my doc later.*

### ***Lack of Accessibility Functions***

Another Veteran described a barrier such as viewing a mobile app while color blind. The app may use certain colors like blue to provide a calming presentation for viewers but in this case, it would not have the intended effect for someone who is color blind. He also discussed his cochlear implants, which raised another concern. He suggested different options for videos within the mobile app such as closed captioning for other Veterans who are hard of hearing. As Participant 9 noted,

*Colors are a little hard to see, like the blue-ish colors. I have slight color blindness that's why. I'd be able to use this app for 10 minutes max probably until my eyes get tired and vision blurry...on my desktop computer I can use this longer...I would want to see an option to read captions because at night sometimes I have a hard time sleeping because I can hear everything...air like sounds because of my cochlear implants.*

## **Discussion**

This study explored Veterans' experiences with opioid tapering and pain management. From their experiences, findings identified facilitators and barriers to mobile app use for opioid tapering. Facilitators were: sense of control, interest in novel interventions, communication with provider, support system, mobile literacy, and personalization. Barriers were: lack of mobile

literacy, lack of knowledge, app malfunctions, privacy concerns, and lack of accessibility functions. According to the literature, there are very few studies that explore facilitators and barriers for mobile app use on opioid tapering, specifically. This study is able to expand on the limited knowledge available for future development of mobile apps that can help Veterans' with their opioid tapering process.

Two major facilitators emerged from the findings. The first was an interest in novel interventions. It was previously merged with willingness, which was common across the narratives from the interviews. These Veterans were accustomed to trying out various forms of interventions until they found what worked for their overall pain management. While the opportunity to have a variety of interventions available may be a unique situation to Veterans who receive health care at a VA healthcare center. It is worthy to note that having access to these interventions have improved the lives of Veterans with chronic pain and increased their willingness to try new interventions. They acknowledged that their pain cannot be solved by just medication alone or by a singular intervention. Thus, our findings suggest that the Veterans are willing to try out a mobile app on opioid tapering, which is consistent with findings from a previous study that found older adults were willing to use mHealth for their chronic pain (Parker, Jessel, Richardson, & Reid, 2013).

The second major facilitator that emerged was communication with a provider. This facilitator had also been previously merged with connection to a provider, which described an app feature to allow questions or information from the app to be shared with their provider. Consistent with previous studies, patients' perceived facilitators to engage in opioid tapering included having social support and communication with a trusted

healthcare provider (Frank et al., 2016; Matthias, et al., 2013; Matthias et al., 2017). The positive experiences recounted by the Veteran participants was most commonly attributed to their relationship with their providers at the VA and the idea of working together to come to a solution. The history of patient-provider relationships may have assisted with gaining trust and willingness from many of these Veterans to try tapering in the first place. Overall, the relational history these Veterans have with their providers played a vital role in how they accepted their providers' recommendations to taper off their opioids and to engage in novel interventions such as a mobile app for opioid tapering.

Many of the facilitators would help to address some of the barriers identified, such as lack of mobile literacy and lack of knowledge. As mobile ownership continues to increase on its own including among older adults (Pew Research, 2017) it is important that other external solutions such as classes or trainings be available and offered to first-time mobile phone users. In addition, many of these Veterans have support systems at work, home, or the VA that would be able to provide guidance to learn how to use a new mobile app on opioid tapering. Also, it is necessary that when a mobile app focusing on opioid tapering is developed that health communication strategies be employed to increase awareness amongst Veterans that it is available. Barriers such as working around app malfunctions, privacy concerns, and a lack of accessibility functions would require developers to consider these when designing the framework of the app. It has been seen in a prior study that the needs of people with disabilities are underrepresented in the growth of mHealth apps (Jones, Morris, & Deruyter, 2018). Overall, these barriers to mobile app use for opioid tapering should be addressed to prevent future disparities in access to this resource.

### *Limitations*

Though this paper provides insights into the ways that Veterans perceive mobile app use for opioid tapering, it has several limitations. First, the sample size comprised a small number of patients, which limits the generalizability of the findings. Future research would benefit from a larger sample across multiple VA healthcare centers. Second, limited funding and time constraints did not allow for multiple coders to engage in the data analysis phase, which reduced rigor and trustworthiness in the qualitative study design. Despite these limitations, the findings provide some insight into the way Veterans' perceive their opioid tapering experiences and how they would use a mobile app for their opioid tapering process. It can inform future research studies and app developers who want to design a mobile app for the Veteran to use at home or as an adjunct to their treatment plan for opioid tapering.

### *Conclusion*

It is well known that the opioid crisis continues to be a problem in the United States at large. It is important to continue strategizing to reach as many individuals who live with chronic pain and are taking dangerously high doses of opioids. This study contributes to the literature for mHealth interventions that are developing new ways to deliver care to patients through a mobile app. The findings strongly suggest that this Veteran population is willing to utilize a mobile app focused on opioid tapering. Findings indicated several themes that would increase use of a mobile app on opioid tapering and also barriers that may prevent use. It is important that these barriers and facilitators are also considered in the development of a mobile app for opioid tapering.

### *Recommendations*

It is important to consider the needs of the providers as well that are not specialized in treating chronic pain or addiction nor have the resources to provide quality care to their patients. Also, referrals to specialists may not be accessible for all patients. Implementation of a mobile app on opioid tapering as an adjunct to their care with a provider should be further studied. It may alleviate some of the discomfort or burden that some providers experience with patients who are candidates for opioid tapering.

Also, due to the recent events with Covid-19, many outpatient healthcare services transitioned to new models of care that avoid face-to-face in-person contact between providers and their patients. There has been an interest in the use of telehealth, mHealth, and other methods of technological aids to continue providing care. Future work should include how to engage patients who are candidates for opioid tapering and are not able to access a specialist to begin the process.

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## Appendix

### Interview Guide

1. To what degree does your pain treatment help control your pain?
2. How do you communicate with your health care provider about your pain control?
3. How does it feel being able to discuss your pain with a health care provider? Probe: Why do you think you feel that way?
4. Do you feel that your health care provider has time to talk with you about your pain and pain management when you need to in between office visits?
5. What concerns might you have about your current pain treatment?
6. How do you manage your pain treatment at home? Do side effects cause you to change how you manage your pain? Probe: What side effects cause you to change your pain treatment?
7. If you have a resource to help manage your pain care, what would it be? Probe: What would it do?

*Veteran can view the web tool on the iPad.*

8. What are your thoughts regarding using a mobile app for opioid tapering? For pain management?
9. What are ways that mobile apps can improve your opioid tapering? Your Pain management?
10. What are barriers that may prevent you from using a mobile app?
11. After reviewing the web tool, what are your overall thoughts? Probe: Look? Feel? Content?
12. Regarding the menu on the web tool, what are your thoughts regarding the different menu items?  
(Menu items include: *Get Help Tapering, Manage Pain, Improve Sleep, Manage Stress, My*

*Plan, and Connect with a Peer Specialist)* Probe: What do you think you would choose to explore first and why?