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Addressing Barriers to Continuous Positive Airway Pressure Therapy in Veterans

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B. S. Nursing, Goldfarb School of Nursing, 2014

A Dissertation Submitted to the Graduate School at the University of Missouri-

St. Louis in partial fulfillment of the requirements for the degree

Doctor of Nursing Practice with an emphasis in Family Nurse Practitioner

August 2022

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Abstract

Problem. Adherence to continuous positive airway pressure (CPAP) therapy for obstructive sleep apnea (OSA) is about 30-60%. There are many risks of untreated OSA including poor sleep quality, decreased cognitive function, impaired memory, and uncontrolled hypertension which can lead to heart attack and stroke. This project aimed to identify common barriers that Veterans experience when prescribed CPAP devices and to give recommendations to providers that can address nonadherence.

Methods. This quality improvement project used a cross-sectional, descriptive design. Telephone interviews using literature-based questions were conducted to identify common barriers and motivators. A convenience sample included 12 Veterans and three key informants. The sample included adherent and nonadherent CPAP users who are enrolled in Home-Based Primary Care (HBPC) through a Veterans Affairs (VA) medical center.

Results. Qualitative data were analyzed and sorted into four main themes: *barriers*, *motivators*, *source of CPAP education*, and *effects of OSA on health*. The most reported barrier was uncomfortable masks. The most reported motivator was improved sleep. Fifty percent ($n=6$) of participants could not recall receiving education at the time their device was prescribed.

Implications. Benefits of CPAP use and the risks of untreated OSA should be emphasized to nonadherent users. Consistent education and follow-up should be provided to Veterans.

Introduction

Obstructive sleep apnea (OSA) is a common, chronic disorder characterized by partial or total blockage of airflow that happens when neck and throat muscles relax during sleep, resulting in pauses in breathing, or apnea. Apneic episodes last 10-60 seconds and can reduce oxygen saturation up to 40% (American Academy of Sleep Medicine [AASM], 2008). Classic risk factors for OSA include age (> 45 years), male gender, obesity (body mass index [BMI] >30), hypertension, and smoking (National Heart, Lung, and Blood Institute, 2021). The AASM recommends nightly use of continuous positive airway pressure (CPAP) as the preferred treatment option for OSA (Epstein et al., 2009). CPAP delivers gentle airflow through an oral or nasal mask to prevent the upper airway from collapsing during sleep (AASM, 2020). Benefits of regular CPAP use include decreased daytime sleepiness, improved mood, improved cognitive function, improved blood sugar control, and decreased cardiovascular comorbidities such as hypertension, heart attack, and stroke (Askland et al., 2020).

Despite well-known benefits of CPAP therapy, adherence remains an ongoing issue. Trends from 20 years of data estimate CPAP adherence ranges from 30-60% when adherence is defined as four or more hours of wear 5-7 nights per week (Rotenberg et al., 2016). There is a need to improve poor adherence rates among Veterans who receive primary care through a Veterans Affairs (VA) medical center. Identifying perceived barriers in this specific population could address this problem. Veterans are a population that have more risk factors for OSA than civilians because they are more likely to be older and male compared to the civilian population (Bureau of Labor Statistics, 2021). Furthermore, post-traumatic stress disorder (PTSD) is frequently reported in Veterans

and commonly associated with sleep disorders. Research has found up to 70% of Veterans with PTSD are high risk for OSA (El-Solh et al., 2017).

To address nonadherence, the AASM clinical guideline (Patil et al., 2019, p. 336) states that “adequate follow-up, including troubleshooting and monitoring of objective efficacy and usage data to ensure adequate treatment and adherence should occur following [CPAP] therapy initiation and during treatment of OSA.” They also recommend educational interventions be given prior to CPAP initiation. Education should include consequences of untreated OSA, the benefits of CPAP use and the risks of CPAP nonadherence (Patil et al., 2019). While these guidelines can be helpful for healthcare providers, they do not address specific patient populations or identify barriers people may face when prescribed a CPAP device.

Since CPAP is considered the gold standard treatment for OSA and nonadherence is common, it is important that healthcare providers can identify and address barriers that could increase adherence. The purpose of this quality improvement project was to identify perceived barriers and motivators that inhibit or contribute to CPAP adherence. The aim was to provide healthcare providers with evidence-based recommendations that could improve CPAP adherence in Veterans who participate in home based primary care (HBPC) through the VA in a large Midwestern city. This project will use a Plan-Do-Study-Act (PDSA) framework to collect and analyze data to develop recommendations that can be used by HBPC providers to increase CPAP adherence. The project attempted to answer the following questions: (1) what are the most commonly occurring barriers and motivators Veterans experience when prescribed a CPAP device for OSA? and (2) what evidence-based recommendations can be given to providers to address barriers?

Outcomes include: (1) the most common barriers and motivators to CPAP adherence reported by Veterans and key informants including spouses, family members, and other caregivers and (2) a handout distributed to at least three providers that includes evidence-based recommendations to address the most common barriers.

Review of the Literature

To understand current literature regarding the benefits of CPAP adherence and common barriers of CPAP use, a comprehensive literature review was performed using Summon. Summon results were filtered to include PubMed and Cochrane Library databases. Search terms included *continuous positive airway pressure* OR *CPAP*, *obstructive sleep apnea* OR *OSA*, *adherence*, *benefits*, and *barriers*. When *Veterans* was included in the Summon search, there were no relevant results so a separate search using the same keywords and *Veterans* was done in Google Scholar. Filters used in both searches included English language, adult participants, and full-text articles published between 2016 and 2021. These filters and search terms yielded 79 results from Summon and over 700 in Google Scholar. After sorting through relevant articles and eliminating duplicate topics, 12 articles were selected for this literature review.

In addition to well-known benefits of CPAP such as decreased snoring and daytime sleepiness, there is evidence that CPAP adherence may also help manage or prevent some chronic conditions such as dementia, hypertension, and diabetes. A quasi-experimental clinical trial conducted on adults aged 55-89 years old with OSA and mild cognitive impairment found statistically significant improvements in both motor skills, cognitive processing, and attention span in the CPAP-adherent group after one year of

use. These findings suggest CPAP adherence could slow the progress of mild cognitive impairment to dementia or Alzheimer's disease (Richards et al., 2019).

When studying the effects of CPAP on hypertension, a meta-analysis of five randomized controlled trials (RCTs) found reduction in blood pressure in the CPAP groups compared to the no CPAP groups (Liu et al., 2016). The authors estimate that 64-85% of patients with OSA also have hypertension. If CPAP improves blood pressure, it could also decrease complications related to uncontrolled hypertension such as heart disease and stroke (Liu et al., 2016). Another prevalent comorbidity that can result in cardiovascular complications is diabetes, with 23-60% of type 2 diabetics estimated to have OSA (Laursen et al., 2021). A qualitative interview study found that patients who are adherent to their CPAP therapy also report better diabetes control. The authors contribute the improvement in diabetes control to increased daytime alertness that encourages patients to check their blood glucose levels consistently and medicate appropriately (Laursen et al., 2021). Research studies on the effects of CPAP on insulin sensitivity and glucose metabolism are inconclusive so further study is needed (Reutrakul & Mokhlesi, 2020).

A diagnosis Veterans often experience is PTSD, which has a prevalence of about 20% in older Veterans (Goldberg et al., 2016). A common feature of PTSD is chronic insomnia. A retrospective, nonrandomized controlled study discovered an inverse correlation between hours of nightly CPAP use and insomnia severity, even in partially adherent patients (Krakow et al., 2019). Untreated insomnia can lead to worsening PTSD symptoms such as nightmares, anxiety, and depression (Lettieri et al., 2016). Although, symptoms of PTSD including insomnia, anxiety, and claustrophobia can be barriers to

CPAP adherence. Some Veterans with PTSD prefer to use an oral device that keeps the airway open during sleep (El-Solh et al., 2017). Based on AASM Clinical Guideline, patients with OSA who cannot tolerate CPAP can use custom made oral appliances as an alternative treatment, although they are not as effective at treating OSA as CPAP and require a full set of teeth for use.

Despite the benefits of CPAP, nonadherence is a common theme found in the literature. Data collected from 1994-2015 found the overall nonadherence rate was about 35%. There was not a significant improvement in adherence from 1994 compared to 2015, despite initiatives to improve adherence over the 20-year span (Rotenburg et al., 2016). Since nonadherence is common, many researchers focus on predictors of CPAP nonadherence. A retrospective study of over 3000 Veterans found that Black Veterans had reduced CPAP adherence compared to nonblack Veterans (Hsu et al., 2020). These findings are in addition to Richards et al. (2019) who found white, married or co-habiting individuals were more adherent to CPAP. One study hypothesized that certain personality traits such as conscientiousness and agreeableness would have a positive correlation with CPAP adherence. However, they did not find significant relationships and their hypothesis was not supported. They recommend future studies focus on personality as a predictor for CPAP adherence (Buckingham & Corkeron, 2020). Identifying factors that may contribute to nonadherence can help healthcare providers reduce disparities in CPAP treatment.

In addition to non-modifiable risk factors such as gender, race, and age, there are many self-reported barriers that CPAP users report. The most common barriers found in one study included: (1) an uncomfortable mask, (2) machine was inconvenient when

traveling, (3) nasal congestion, (4) inability to sleep with the device on, (5) and embarrassment when wearing the mask (Luyster et al., 2016). These findings are in addition to emotional barriers such as anxiety and claustrophobia that are especially prevalent in patients with PTSD (El-Solh et al., 2017). Although there are many barriers, some reported motivators found in the qualitative study by Luyster et al. (2016) were: (1) improved sleep, (2) feeling refreshed after sleep, (3) better sleep for spouse/partner, (4) spousal support, and (5) healthcare provider support. When trying to improve adherence in certain populations, focusing on motivators could be an important aspect of increasing CPAP adherence.

Since nonadherence is an issue mentioned often in the literature, some studies focus on strategies that could increase CPAP adherence. Luyster et al. (2016) asked CPAP users what elements they would want incorporated into a training program. The most common answers were: (1) question/answer sessions, (2) demonstration of CPAP equipment, (3) education about OSA and CPAP devices, 4) early and frequent follow-up, and (5) spouse or partner involvement. Shapiro (2021) implemented the CPAP-SAVER method that included: (S) support through nurse telephone calls, an (A) airway model to educate CPAP users about the OSA disease process, (V) videos, (E) education sheet to promote positive attitudes about CPAP devices, and (R) report cards reflecting hours and nights of use to improve self-efficacy. Compared to the control group without intervention, there was no difference in adherence rates after the SAVER intervention was implemented for one month. However, initial adherence rates among the participants were 70-80%, which is higher than the general population adherence rate of 30-60% (Shapiro, 2021). Participants in the SAVER study were mostly white, middle-aged,

middle class, college-educated individuals. These demographics are consistent with other studies that have focused on improving CPAP adherence. While new programs might not be effective for every population, elements from different interventions could be used based on results and user feedback.

While the SAVER intervention program focused on education and feedback to improve adherence, some interventions focus on behavioral changes. A meta-analysis of Cochrane Library and World Health Organization trials compared no intervention to positional therapy and CPAP therapy (Srijithesh et al., 2019). Positional therapy uses different techniques to encourage people to sleep on their sides, which can reduce OSA symptoms such as snoring and partner disruption. Compared to no intervention, positional therapy improved subjective sleep quality and sleepiness. Compared to consistent CPAP use, positional therapy was not as effective as improving subjective sleep quality and sleepiness. However, self-reported adherence to positional therapy was higher than self-reported CPAP adherence (Srijithesh et al., 2019). The authors did not find statistically significant improvements in quality of life or cognitive function due to the short duration of the trials, which were generally less than six months.

When educational or behavioral interventions fail and CPAP is not a viable option, alternative options should be considered. Behavior therapies that are encouraged by the AASM include weight loss, avoiding alcohol and sedating medications especially at bedtime, and positional therapy. These behavioral changes should be used in addition to CPAP unless OSA is resolved (Epstein et al., 2009). According to the AASM clinical guideline, a custom oral appliance is an acceptable but less effective alternative treatment when CPAP and behavior therapy have failed. When other therapies have failed, AASM

Clinical Guideline recommends upper airway surgery such as tonsillectomy or tracheostomy. Surgery is highly effective but should be considered a last resort (Epstein et al., 2009). Despite several treatment and therapy options and prevalence of nonadherence, CPAP remains the gold standard for treatment and efforts should be made to improve adherence.

While CPAP adherence has been studied extensively, there are gaps in the literature and a need for future research to find effective interventions to improve adherence. Most literature focuses on middle to older aged white males. Few studies have used older Veterans as subjects, which is the focus for this project. A limitation in most studies is short duration of data collection, such as the SAVER program which was evaluated after one month of implementation (Shapiro, 2021). A meta-analysis of 41 studies in the Cochrane Airway Trials Register found another limitation is that studies often rely on self-reported adherence data which has been found to overestimate true adherence rates (Askland et al., 2020). Interventions have varying efficacy based on patient population, initial adherence rate, duration, perceived support, and intervention type.

The PDSA framework was used as a plan to improve a process (P), carry out the plan (D), study the results of the plan or intervention (S), and modify the intervention based on the findings (A) (Institute for Healthcare Improvement, 2021). The “Plan” phase was done by creating interview questions that addressed CPAP use in Veterans. The “Do” phase was carried out by conducting interviews with participants. The “Study” phase included interview analysis and identification of the most common barriers to

CPAP adherence. The “Act” phase involved providing healthcare providers with recommendations that could increase CPAP adherence.

Although there are alternative treatment options to CPAP, they are generally less effective and should only be used if CPAP fails or is not tolerated (Epstein et al., 2009). Healthcare providers should use evidence-based interventions to increase adherence in patients who struggle with CPAP adherence. Askland et al. (2020) suggest that personalized interventions that incorporate supportive, behavioral, and educational elements would likely be helpful in increasing adherence rates. A PDSA framework was used to identify common barriers and motivators to CPAP use and to provide evidence-based recommendations to providers that will hopefully increase CPAP adherence.

Methods

Design

A cross-sectional, descriptive design was used for this quality improvement project. Voluntary phone interviews with participants were conducted February through March 2022. Interview data were analyzed to develop and distribute practice recommendations for home-based primary care (HBPC) team members.

Setting

HBPC provides home-based primary care for approximately 370 Veterans in a large VA medical system in an urban Midwestern city in the United States. One division of HBPC was used for this project. This division provides care to 60-80 Veterans and consist of one Nurse Practitioner (NP), three Registered Nurses (RNs), a pharmacist, a social worker, a physical therapist, a dietician, and a psychologist. HBPC is provided to Veterans who are often homebound and have difficulty attending traditional clinic visits

(U. S. Department of Veterans Affairs, 2020). Generally, the lead NP sees each patient every three months and an RN sees each patient once a month. The interdisciplinary team manages complex health care needs including medication and lab management and ensuring safe home environments. HBPC staff can ensure proper setup of CPAP devices in the home. The department is not currently required to document on CPAP use or OSA education during visits, although some team members choose to review their machine use and provide educational materials if time allows. The goal of HBPC is to maintain Veterans' health at home and reduce the need for a higher level of care such as nursing homes and emergency room visits.

Sample

The convenience sample for this study included English speaking male and female Veterans who are enrolled in the HBPC program. They required access to a telephone. Inclusion criteria were Veterans who are diagnosed with OSA and prescribed CPAP therapy. The sample included adherent and nonadherent Veterans. Exclusion criteria included Veterans with dementia or severe cognitive impairment. All ages, races, and ethnicities were included in the sample.

Key informants included spouses, partners, or caregivers who are involved in the daily care and routine of Veterans who agreed to participate in the study. Key informant interviews were conducted at the time of Veteran interviews. The sample size included 12 Veterans and three key informants.

Data Collection and Analysis

Qualitative data were collected through phone interviews with Veterans (Appendix A) and key informants including spouses and partners (Appendix B).

Interviews used open-ended, literature-based questions pertaining to barriers, motivators, and knowledge surrounding CPAP devices and OSA. Qualitative data collected through phone interviews were analyzed using the *Framework Method for Qualitative Analysis* (Gale, Heath, Cameron, Rashid, & Redwood, 2013). Using this framework, the investigator used the following steps: (1) documented direct quotes from participants' interviews, (2) reviewed interview responses for key words and phrases and entered them into an Excel spreadsheet, and (3) determined major themes once interviews were complete.

Demographic data (*Table 1*) were collected through a retrospective chart review and recorded in a password-protected Excel document on a password-protected computer. Descriptive statistics were used for demographic data.

No identifying information was stored. Each participant and key informant were assigned a unique identifier. The list of participants' unique identifiers and interview responses were stored on an Excel document and retained by investigator until the study is complete.

Approval Processes

This project received approval the VA Research Department and the University of Missouri- St. Louis (UMSL) Institutional Review Board (IRB) as a quality improvement project.

Benefits of this project included improving health outcomes for Veterans in HBPC. If provider recommendations are effective, it could increase CPAP adherence in this population. Potential risks and ethical considerations were related to obtaining personal information such as name, phone number, and other demographic data. Other

information collected included personal experiences and habits related to participants' own health care management.

Procedures

A report of Veterans who participate in HBPC and are prescribed CPAP was obtained from the electronic health record (EHR). Veterans who met inclusion criteria were contacted for a phone interview and verbal consent was obtained (Appendix C). The EHR of eligible participants was reviewed to determine if participants are adherent or nonadherent to CPAP treatment. Phone calls were only made through HBPC office telephones to protect Veteran and investigator privacy. Three attempts were made to contact each eligible Veteran. Each attempt was documented on an Excel spreadsheet (Appendix D). A voice message with a return phone was left if the phone call was not answered (Appendix E). The phone number to call back was a direct line to Kelly Compas, an NP who leads HBPC. If Kelly was contacted by a participant, she informed the investigator so that the interview could be conducted. Each attempt to contact Veterans was made 7-10 days apart. A note was entered in the participants' EHR with their responses to interview questions. Notes were coded 98966 or 98967, depending on the duration of the interview, to indicate a non-physician telephone encounter.

Results

Demographics

Nineteen Veterans met criteria for this study. Three Veterans did not answer phone calls or return voice messages. Four Veterans declined to participate. Interviews with twelve Veterans and three key informants were conducted. Key informants were spouses or significant others of participants. Veterans ages ranged from 55-80+ years old.

The Veteran sample included ten males (83.33%) and two females (16.66%). Eleven Veterans identified as African American (91.66%) and one identified as white (8.33%). Four of the 12 Veterans (33.33%) use their CPAP device regularly. Of the four regular CPAP users, nightly CPAP use ranged from 6-12 hours with a mean of 8.5 hours. One Veteran (8.33%) had a grade school education level, two (16.66%) had some high school education, six had high school or high school equivalent diplomas (50%), two (16.66%) had some college education, and one (8.33%) had a college degree. Seven Veterans (58.33%) lived at home with family, four (33.33%) lived home alone, and one (8.33%) lived in an assisted living facility. Six Veterans (50%) were able to complete activities of daily living (ADLs) independently, five (41.66%) needed assistance, and one (8.33%) was dependent on others. Eleven Veterans (91.66%) had a documented history of hypertension, nine (75%) had a documented history of diabetes, and five (41.66%) had a documented history of PTSD.

Interviews

The most reported barrier to CPAP adherence was an uncomfortable or ill-fitting mask, with six Veterans (50%) naming this as the main barrier although many Veterans mentioned multiple barriers. Four Veterans (33.33%) stated that a different mask would encourage them to wear their device more often. Other barriers that were mentioned once each included dried out sinuses, noisy machine, issue with air settings, bulky device, and that the device did not help with sleep. The most-commonly reported motivator to CPAP use was improved sleep, with five Veterans (41.66%) naming this as the main motivator although many Veterans mentioned multiple motivators. Three Veterans stated that they wear their device because they are told to by family or healthcare providers, three

mentioned that they feel better overall after wearing their CPAP, two reported improved memory, and two stated they have no motivators. Motivators that were mentioned once each were improved breathing, improved alertness, finding the correct settings, and the impact of the death of a close friend who died from untreated sleep apnea.

When asked what they thought would improve adherence for new CPAP users, six Veterans (50%) responded that people should know more about the benefits on breathing, sleeping, and overall health. Two Veterans (16.66%) said people should be consistent with the device, one (8.33%) said people should try quieter/smaller machines, and one (8.33%) said the focus should be on not smoking.

Another common theme that emerged from the interview data was that Veterans could not recall education being provided when CPAP was prescribed. When education was provided, it often came from healthcare settings such as sleep clinics and primary care providers. Knowledge regarding the effects of OSA on health varied from Veterans being unsure, stating there are “many” effects, and generalized responses about heart health, breathing, and sleeping effects. These findings are summarized in *Table 2*.

Interviews with key informants showed consistent findings with Veteran interviews. Motivators reported by key informants included better sleep. Barriers included issues with mask discomfort. Key informants stated different mask options and consistent follow-up with healthcare providers could improve adherence.

Discussion

Using findings from Veteran interviews and guidelines from the American Academy of Sleep Medicine (Epstein et al., 2009), recommendations for providers were developed that could improve CPAP adherence (Appendix F). This handout was given to

five NPs and 14 RNs within HBPC. The recommendations can be implemented during each visit every 1-3 months. Since mask discomfort was the most common barrier, mask and machine options should be offered and explained to Veterans. During home visits, NPs and RNs should review devices to determine hours of nightly use and ensure Veterans can apply and maintain their device properly.

NPs and RNs should provide consistent education about OSA including its effects on hypertension, diabetes, and cognitive function. Since 91.66% of this sample has documented hypertension, there should be a focus on complications of uncontrolled blood pressure such as heart attack and stroke. Education should be provided in simple terms and offered in a variety of teaching styles including verbal and visual explanation. Videos and images can be viewed on VA-issued iPads during visits. Educational materials can be provided and displayed in the home where Veterans can reference material. Caretakers and family members should be included when possible since their involvement was mentioned as a main motivator to CPAP use. Interventions should be applied to new users and established users. Education interventions, Veteran level of understanding, and hours of nightly use should be documented in the medical record after each visit to monitor progress over time.

Since this project was started, a recall was issued on the most-commonly used CPAP device. Veterans have been notified of the recall, but this is an additional, unexpected barrier to adherence. Over time, the VA will be replacing recalled devices, but patients have been instructed to use their old device until receiving a new one. New machines will include new masks that could address the barrier of mask discomfort, especially for CPAP users with older machines.

This project could be extended to include data from Veterans enrolled in other HBPC divisions. Different divisions could have different barriers and motivators based on income level, education level, or access to resources. Further statistical analysis could be conducted to find correlations between CPAP adherence and demographic data. Limitations of this study include a small sample size and limited time to implement and evaluate practice changes.

Conclusion

There is a need to improve CPAP adherence in certain populations. This project was conducted to address common barriers and motivators to CPAP use in Veterans who participate in home-based primary care. The findings of this project suggest patient populations have unique barriers and motivators and therefore require unique interventions. By providing HBPC NPs and RNs with evidence-based recommendations to improve CPAP use, these healthcare professionals can have a better understanding of the barriers their patients face and an improved practice approach to improving CPAP adherence. An ongoing assessment of new and established CPAP users is needed to improve adherence and reduce the risks of untreated OSA.

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Appendix A

Interview Guide for Veterans

1. What do you understand about how sleep apnea affects your health?
2. What are motivators that encourage you to wear your CPAP device regularly?
3. What are the barriers you have experienced in wearing a CPAP device regularly?
4. What would encourage you to use your CPAP device more often?
5. What kind of education or support, if any, did you receive when prescribed the device?
6. If you were to create a CPAP program for new users what type of information or support would you include?

Adapted from: Luyster, F. S., Dunbar-Jacob, J., Aloia, M. S., Martire, L. M., Buysse, D. J., & Strollo, P. J. (2016). Patient and partner experiences with obstructive sleep apnea and CPAP treatment: a qualitative analysis. (2016). *Behavioral Sleep Medicine, 14*, 67-84. <https://doi.org/10.1080/15402002.2014.946597>

Appendix C

Telephone Consent for Participants

Hello, my name is Lauren Elliott. I'm a nurse practitioner student through the University of Missouri- St. Louis. I am contacting you because you meet criteria to participate in a quality improvement project that I am conducting. This project is not funded, and your participation is voluntary. You will not be penalized in any way if you choose not to participate. The project will help me meet my requirements to fulfill my Doctorate degree in Nursing Practice.

I am calling to ask if you are interested in participating in a brief phone interview about identifying barriers to CPAP use and trying to identify ways to increase nightly CPAP use. The interview will take approximately 10-15 minutes.

Are you willing to hear more information?

(If yes, continue with below. If no, thank them for their time and end the call.)

The purpose of this project is to learn more about common barriers and motivators that Veterans experience when prescribed a CPAP device. This information will hopefully help healthcare providers address commonly reported barriers and improve outcomes related to sleep apnea.

If you find any questions difficult to answer, please let me know and we will move on.

I am committed to protecting your privacy and maintaining confidentiality. I will not identify you by name or any other information that would make it possible for anyone to identify you in any presentation or written reports about this study.

Do you have any questions about this process?

Would you like to participate in this questionnaire?

If 'no', thank them for their time and end the call. If 'yes', begin asking interview questions.

Appendix D

Phone Attempts

Participant	Phone Attempt #1	Phone Attempt #2	Phone Attempt #3
1	2/22/2022 Answered		
2	2/22/2022 Answered		
3	2/23/2022 Answered		
4	2/23/2022 Answered		
5	2/23/2022 Answered		
6	2/23/2022 Answered		
7	2/23/2022 Answered		
8	2/23/2022 Answered		
9	3/10/2022 No answer	3/16/2022 Answered	
10	3/10/2022 No answer	3/16/2022 Answered	
11	3/10/2022 No answer	3/16/2022 No answer	3/24/2022 Answered
12	3/10/2022 Answered		

Appendix E

Voice Message Script

Hello, this is Lauren Elliott calling from home-based primary care through the St. Louis VA. I was calling to ask you a few questions about your health. I will attempt to call you again on [specific date] or you may reach me at 314-xxx-xxxx. If I do not answer, please leave a message and I will return your call. Thank you.

Appendix F

Recommendations for Providers

IMPROVING CPAP ADHERENCE

Recommendations for HBPC Providers

ADDRESS BARRIERS

Uncomfortable masks is the most common barrier reported by HBPC Veterans. Ensure Veterans have tried different mask options and can apply the device correctly.

INCORPORATE MOTIVATORS

Emphasize health benefits of CPAP, including improved sleep and improved cognitive function. Veterans report that support from family and healthcare providers motivated them to use their device. Involve family and caretakers when possible.

MONITOR DEVICE

Review CPAP device for objective usage data (hours of use per night) during each visit. Ensure the machine is located in a convenient location for the Veteran to access nightly.

EDUCATE

Many Veterans do not recall getting education regarding sleep apnea. Inform CPAP users that untreated sleep apnea can lead to poor blood pressure control, which can result in MI or stroke. CPAP also improves memory and cognitive function.

DOCUMENT

At each visit, document hours of nightly use, mask options that have been successful or unsuccessful, types of education provided (handouts, videos, explanation, etc.), and Veteran response to interventions. Monitor progress over time.

Table 1*Demographic Data (N=12)*

Demographics	<i>n</i>	%
Age (years)		
55-60	2	16.66
66-70	3	25
76-80	5	41.66
80+	2	16.66
Gender		
Male	10	83.33
Female	2	16.66
Race		
African American	11	91.66
Caucasian	1	8.33
Level of Education		
Grade School	1	8.33
Some High School	3	25
GED	2	16.66
High School	4	33.33
Some College	2	16.66
College	1	8.33
Ability to Perform ADLs		
Independent	6	50
Needs Assistance	5	41.66
Dependent	1	8.33
Housing Arrangement		
Home Alone	4	33.33
Home with Family	7	58.33
Residential Living	1	8.33
Co-existing Conditions		
Hypertension	11	91.66
Diabetes	9	75
PTSD	5	41.67

Table 2*Data Matrix*

Participant	Barriers	Motivators	Source of education	OSA effects on health
1	Uncomfortable mask	Spouse	Cannot recall education or support provided when CPAP was prescribed	CPAP “gives me air” and “helps me breathe at night”
2	Uncomfortable mask Dried out sinuses	Correct settings Encouraged by a friend	Attended classes/seminars for new CPAP users	Affects health in many ways
3	Uncomfortable mask	Improved sleep	Knowledge obtained from sleep clinic	OSA “affects my heart when I sleep”
4	Doesn’t improve sleep	None	Does not recall any education or support	“I don’t understand it”
5	Loud machine	Improved sleep; alertness; memory Feels better overall	HPBC educated on set-up, use, and cleaning	Not getting sleep affects the heart and blood pressure
6	Incorrect “air” settings	Improved sleep Feels better overall	Booklets provided when CPAP was prescribed are used as reference Information obtained during sleep study	OSA “has to do with my breathing” Can’t sleep without CPAP
7	Uncomfortable mask	Improved sleep	Does not recall any education or support	“I don’t know”
8	“Very hard to get used to”	Encouraged by nurses	Does not recall any education or support	CPAP “helps you breathe better”
9	Recall	Improved memory	Does not recall any education or support	“Smoking makes it worse” OSA causes shortness of breath
10	Uncomfortable mask	Improved sleep	Does not recall any education or support	Not using CPAP affects health in the long run
11	Uncomfortable mask	Feels better overall	HPBC educated on set-up, use, and cleaning	CPAP “keeps my heart from stopping in my sleep”
12	Bulky machine	Improved sleep Encouraged by others	Information provided by clinic during sleep study	States little understanding of health effects

