

Veteran Preferences Regarding Wireless Management of Positive Airway Pressure for Obstructive Sleep Apnea at a Tertiary Health-Care System

Ken He MD, Brian N Palen MD, Elizabeth A Mattox MSN MSc, and Elizabeth C Parsons MD MSc

BACKGROUND: Timely monitoring of obstructive sleep apnea (OSA) therapy can be a challenge amid conflicting pressures of rising patient volume and shortage of sleep medicine providers. Positive airway pressure (PAP) devices with wireless modem technology have the potential to improve patient access to care and streamline work load, yet little is known about patient attitudes toward telehealth integration among veterans with sleep apnea. As part of a larger quality improvement initiative at the Veterans Affairs (VA) Puget Sound Health Care System, we elicited veterans' preferences toward modem versus traditional PAP data download, including patient attitudes and factors affecting those preferences. **METHODS:** We conducted an anonymous survey of veterans without previous CPAP experience presenting for initial device setup and training at VA Puget Sound PAP clinics. Surveys assessed subject demographics, PAP download preferences (modem vs mail), and Likert-type scale ratings of importance placed on factors including convenience and information privacy. Using multinomial logistic regression, we examined the association between convenience rating and download preference, adjusting for information privacy rating, age, and commute time. **RESULTS:** Of 444 surveys analyzed, respondents were primarily male with a mean age of 52 y. Most respondents reported taking ≥ 30 min to commute to the PAP clinic. Convenience was rated as the most important factor affecting download preferences. Veteran preferences regarding PAP download method were mixed, with 47% preferring modem, 38% preferring memory card mail-in, and 15% undecided. A higher rating of convenience was significantly associated with modem preference, both before and after adjustment for information privacy rating, commute time, and veteran age (adjusted relative risk ratio 1.67, $P < .001$, 95% CI 1.40–1.99). **CONCLUSIONS:** PAP data download preferences were mixed among new veteran users. Veterans placed a high value on the potentially competing concerns of convenience and information privacy. Veterans preferring modem factored convenience as important in their decision making, independent of privacy concerns. *Key words:* sleep apnea syndrome; CPAP; patient preference; telehealth; telemedicine; e-health; home health monitoring; technology. [Respir Care 0;0(0):1–•. © 0 Daedalus Enterprises]

Introduction

Obstructive sleep apnea (OSA) affects up to 26% of adults, with negative consequences including quality of

life impairment, work productivity loss, motor vehicle accidents, and cardiovascular risk.^{1,2} Treatment of OSA with positive airway pressure (PAP) can improve insomnia, reduce cardiovascular risk, and potentially improve posttraumatic stress disorder symptoms.³⁻⁷ Optimal OSA manage-

Drs Palen and Parsons are affiliated with the Division of Pulmonary and Critical Care Medicine, University of Washington, Seattle, Washington. Dr He, Dr Palen, Ms Mattox, and Dr Parsons are affiliated with the Veterans Affairs Puget Sound Health Care System, Seattle, Washington.

Drs He and Palen contributed equally to this work.

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ment requires timely follow-up to monitor therapy efficacy by a sleep specialist at an accredited sleep center.⁸⁻¹⁰ OSA care is a growing need among veterans.¹¹⁻¹³ Veterans utilizing the Department of Veterans Affairs (VA) Veterans Health Administration (VHA) system for OSA care may experience barriers due to sleep medicine provider shortage and concentration of specialty services at mostly metropolitan, tertiary care centers.¹⁴⁻¹⁷ Rural veterans are particularly vulnerable to follow-up attrition or fragmented care,¹⁸ yet they represent approximately 43% of the 19.4 million United States veterans served by the VHA system.¹⁹

Monitoring of PAP data download by wireless modem is an emergent telehealth technology that allows for remote, real-time, even nightly therapy assessment and adjustment without an in-person visit.²⁰ Telehealth strategies incorporating wireless PAP download may promote early PAP adherence²¹ and improve sleep-related functional outcomes.²²⁻²⁷ Patient satisfaction with telehealth formats is high, with patients citing increased convenience, therapy feedback, and accountability.²⁸⁻³⁰ The VHA is a leader in telehealth utilization to improve care coordination, especially among rural veterans,³¹⁻³⁵ yet PAP modem download is a relatively new development that has not yet reached widespread implementation in most VA health systems.

Recent publications in civilian populations suggest that modem download provides equivalent or greater PAP adherence and greater patient satisfaction compared with usual care.^{24,36,37} However, VHA-enrolled veterans differ from the civilian population in ways that may impact their attitudes and preferences regarding sleep care. Compared with the general United States population, VHA-enrolled veterans are more likely to be male, white non-Hispanic, and are on average older with higher personal incomes.^{19,38,39} Such factors may impact veteran attitudes toward telehealth strategies. Two small pilot studies have demonstrated that institution of PAP modem monitoring is feasible among veterans and is associated with high patient satisfaction and adherence,^{28,30} yet to our knowledge, there are no data specifically eliciting whether most veterans prefer remote monitoring nor identifying subgroups of veterans who might still prefer or benefit from conventional follow-up.

Similar to national trends, OSA care is a growing need at the VA Puget Sound, with sleep medicine referrals at our facility increasing by 20% each year over the past

QUICK LOOK**Current knowledge**

Sleep apnea is very common, particularly among veterans, creating a challenge to meet growing patient demand despite a general shortage of sleep medicine providers. Optimal sleep apnea care includes positive airway pressure (PAP) device monitoring and adjustment to ensure adequate therapy. PAP modem download offers the potential to streamline care and improve access, yet little is known about veteran preferences toward telehealth technology or what factors veterans consider important when integrating technology into patient-centered care initiatives.

What this paper contributes to our knowledge

At a tertiary care veterans administration health center, PAP data download preferences were mixed among new veteran users. Veterans considered convenience, information privacy, and provider recommendation as factors important to their decision making.

5 years. VA Puget Sound has an estimated 20,000 veterans enrolled in our CPAP clinic, which conducts approximately 3,000 visits/y. To better serve a growing population with a significant number of rural veterans, in 2015 we sought to evaluate the introduction of wireless PAP download into our current care practice.

We surveyed veterans presenting for initial CPAP setup to elicit preferences regarding modem versus conventional in-clinic PAP download. At a broader quality improvement level, we sought to examine patient factors that might impact care preferences and attitudes, with the goal of identifying the veteran groups most likely to prefer telehealth CPAP management.

Methods**Study Population**

The VA Puget Sound is part of the VA Northwest Health Network serving veterans in Washington, Alaska, Oregon, Idaho, Montana, and California. It is the largest VA health network geographically, serving >89,000 veterans at 7 clinical sites.⁴⁰ Approximately 41% of veterans receiving care within the VA Northwest Health Network reside in rural areas.⁴⁰ Veterans receiving care at VA Puget Sound are representative of the VHA-served veteran population at large. National and Washington State data reveal that veterans are predominately male (approximately 90%) and white non-Hispanic, have a median age of 64 y, and are

Correspondence: Elizabeth Parsons MD MSc, VA Puget Sound Health Care System, 1600 S Columbian Way, S-111 Pulm, Seattle, WA 98108. E-mail: Elizabeth.parsons@va.gov.

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more likely to work in management and professional occupations compared with their civilian counterparts.¹⁹

At VA Puget Sound, sleep evaluation is initiated by a sleep consultation placed by a referring provider into the electronic medical record. A sleep medicine provider then reviews the consultation request and orders the appropriate evaluation. Veterans meeting OSA treatment criteria by current American Academy of Sleep Medicine guidelines are evaluated in one of 2 PAP clinics located approximately 40 miles apart, for initial PAP device setup, education, and training. Patients receive a self-addressed envelope with instructions to mail their device memory card within 1 month for data download to assess adherence and treatment efficacy.

Data Collection

This survey was performed as part of an ongoing quality improvement project with a goal of incorporating telehealth strategies to streamline care and improve access. With the recent advent of PAP modem technology at our facility, we sought to elicit subject preferences to best guide our implementation of this technology. We conducted an anonymous survey on veterans presenting for initial device setup and training to the 2 VA PAP clinics between December 19, 2014 and July 9, 2015. Written surveys (see the supplementary materials at <http://www.rcjournal.com>) were administered at the beginning of the visit with instructions to minimize potential bias.

The survey assessed subject demographics (sex, age, self-reported commute time to the PAP clinic); download preference (modem, mail-in memory card, or undecided); and factors affecting download preference decision making, such as convenience, information privacy, provider preference, recommendations from other persons, and other stated reasons (Likert-type scale of 1 [not at all important] to 7 [extremely important]). This survey was voluntary and anonymous and was performed under the auspices of quality improvement, in accordance with procedures set forth in VHA Handbook 1058.05. Institutional review board approval was therefore not required.

Statistical Analyses

All analyses were performed using Stata/MP version 13.1. We performed descriptive analysis of sex, age, commute times, ratings of decision factors (“other category” was not included due to minimal responses), and follow-up preferences (responses assigned as undecided if no preference or both modem and mail-in were selected). We performed unadjusted multinomial logistic regression examining the association between ratings of convenience and wireless modem preference. We then repeated the analysis adjusting for a priori potential confounders of

Table 1. Veteran Descriptives

Characteristics	Values
Demographics	
Age, mean \pm SD (range) y	52 \pm 14 (20–92)
Male sex, <i>n</i> (%)	404 (91)
Commute time (min), <i>n</i> (%)	
<30	113 (25)
30–60	189 (43)
>60	142 (32)
Importance in decision-making, median (interquartile range)*	
Convenience	6 (2)
Information privacy	5 (3)
Provider preference	5 (2)
Recommendation by other persons	4 (2)
PAP download preference, <i>n</i> (%)	
Modem	209 (47)
Mail-in	170 (38)
Undecided	65 (15)

n = 444.

* Scale from 1 (not at all important) to 7 (extremely important).

information privacy rating, age, and commute time. We did not adjust analyses for sex due to the limited number of female respondents.

Results

Demographics

A total of 491 surveys were returned. Of these, 444 veterans completed all survey items for inclusion in the analyses (Table 1). Respondents were primarily male (91%) with a mean age of 52 y (range 20–92 y). Self-reported commute times from the veterans’ residence to the VA PAP clinic were <30 min (25%), 30–60 min (43%), and >60 min (32%).

Veteran Preferences and Factors Affecting Decision Making

When asked their preferred mode of PAP download, 47% of veterans preferred modem, 38% preferred memory card mail-in, and 15% were undecided, with notable comments of “prefer the method that works the best,” “don’t know how it works,” and “modem if no security issues” among others. When asked about factors affecting their decisions with respect to download preference, veterans rated convenience the highest (median rating “very important”), followed by information privacy (median rating “moderately important”) and provider preference (median rating “moderately important”).

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Table 2. Association Between Download Preferences and Veteran Factors/Demographics

Subject Factors/Demographics	Unadjusted RRR (P, 95% CI)*	Adjusted RRR (P, 95% CI)*†
Rating of convenience		
Prefers modem	1.56 (<.001, 1.32–1.84)	1.67 (<.001, 1.40–1.99)
Undecided	1.03 (.76, 0.86–1.24)	1.04 (.70, 0.85–1.26)
Rating of information privacy		
Prefers modem	0.96 (.40, 0.87–1.06)	0.87 (.01, 0.78–0.97)
Undecided	0.99 (.88, 0.86–1.14)	0.98 (.77, 0.84–1.14)
Age		
Prefers modem	0.98 (.03, 0.97–1.00)	0.98 (.01, 0.96–0.99)
Undecided	1.00 (.86, 0.98–1.02)	1.00 (.95, 0.98–1.02)
Commute time		
Prefers modem	1.11 (.43, 0.85–1.46)	1.21 (.19, 0.91–1.62)
Undecided	1.09 (.67, 0.74–1.59)	1.09 (.68, 0.74–1.60)

* Mail-in was the base comparator.
† Adjusted analyses were for convenience, information privacy, age, and commute time.
RRR = relative risk ratio

Association Between Preference and Veteran Factors

For unadjusted multinomial logistic regression, higher rating of convenience was associated with higher likelihood of modem download preference (relative risk ratio [RRR] 1.56, $P < .001$, 95% CI 1.32–1.84, with mail-in method as the baseline outcome) (Table 2). This association remained statistically significant after adjusting for potential confounders, including information privacy rating, commute time, and veteran age (RRR 1.67, $P < .001$, 95% CI 1.40–1.99).

In secondary analyses, modem download preference was negatively associated with higher information privacy rating (adjusted $P = .01$, 95% CI 0.78–0.97) and increasing age (adjusted $P = .01$, 95% CI 0.96–0.99). There was no significant association between download preference and commute time.

Discussion

In this quality improvement project at a tertiary care VA health-care system, PAP download preferences were mixed among new PAP users, with the highest percentage (47%) preferring modem. Veterans rating convenience highly were more likely to prefer modem, an association that remained statistically significant after adjustment for subject age, commute time, and information privacy rating. Older veterans and those who rated information privacy highly were less likely to prefer modem download. Our results may be compared with a prior survey of civilian subjects at a tertiary care sleep clinic, in which most subjects reported comfort and willingness to try a new method of video communication despite lack of prior experience.⁴¹

In contrast to our findings, the authors did not find a relationship between age and subject comfort with telehealth.⁴¹

Two prior publications have demonstrated feasibility of telehealth strategies in veterans with OSA.^{28,30} Stepnowsky et al³⁰ compared daily PAP data transmission by wireless modem with usual OSA care among 45 veterans followed for 2 months, showing a trend toward greater adherence in the telehealth group. The accuracy of wireless transmissions was 100% with a very low rate of transmission failures in all subjects. Neither the modem nor usual care group reported significant privacy concerns about being remotely monitored. Fields et al²⁸ compared real-time video interviews with usual care for follow-up OSA care in 60 veterans with interval data download by PAP wireless modem in all subjects. They found greater improvement in mental health scores at 3 months and subject satisfaction in the telehealth group.

Our findings add to the existing literature^{28,30} by highlighting that veteran receptivity to sleep telehealth strategies may be complex and related to a variety of potentially competing factors. We identified convenience as an important aspect of veterans' perceptions of care quality. Unlike Stepnowsky et al,³⁰ we found that veterans with concerns about monitoring or information privacy were actually less likely to prefer modem download. A few participants in the studies by Fields et al²⁸ and Smith et al²³ noted concerns related to confidentiality and intrusion of privacy. Our project's strengths include a large sample size without exclusionary criteria and eliciting early participant attitudes about their care preferences before introduction of the technology to help identify potential knowledge gaps. Surveys were anonymous with minimal guidance from PAP clinic staff to maximize patient confidentiality and minimize bias of responses.

Surprisingly, we did not find a strong relationship between commute time and preferred PAP download method, although we found a trend toward modem preference (not statistically significant). These findings may be explained by the lack of inherent impact of travel time to our VA PAP clinics between modem and mail-in strategies (in-person follow-up was not explicitly compared). The Michael E. DeBakey VA Medical Center (Houston, Texas) instituted remote sleep medicine services at community-based out-patient clinics, which generated positive responses from geographically distanced veterans not having to visit the main medical center.⁴²

Our results must be interpreted in the context of several limitations. First, this was a voluntary, quality improvement survey of mostly male veterans who chose to participate during an initial visit to VA PAP clinics. Our results may not reflect the views of veterans who chose not to complete the survey or obtained OSA care in the community. Second, our survey assessed veteran preferences re-

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garding download at initial setup, a time when veterans may not be knowledgeable about PAP devices. Experienced users might have different preferences and concerns. Last, our aim was to solicit unbiased veteran preferences regarding their care. Surveys were therefore entirely anonymous and could not be linked to disease severity or outcomes, such as treatment adherence. We obtained demographics and commute time entirely by veteran self-report.

We believe that incorporation of PAP data download by modem and other telehealth strategies for interested veterans will improve OSA care quality for veterans at VA Puget Sound, redirecting limited resources to patients who require more assistance or prefer traditional methods of care. Unanswered questions remain as to how best to merge telehealth and traditional health to address potentially competing concerns of information privacy and convenience. There is a clear need to establish standardized protocols regarding how, when, and who should be monitoring these wireless data transmissions; safeguards to data loss; and how to incorporate patients residing in rural locations outside of wireless network zones.⁴³

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