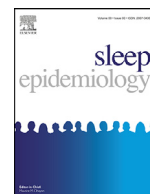




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Patient characteristics and compliance with positive airway pressure therapy during New York City's 2020 COVID-19 pandemic stay-at-home orders: The NYU comprehensive epilepsy center-sleep center telemedicine experience

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ABSTRACT

Objectives: We sought to evaluate the success of telemedicine during New York City's COVID-19 pandemic stay-at-home period, and understand the distribution of sleep complaints seen. We also compared positive airway pressure (PAP) therapy compliance for a random patient sample to determine whether the pandemic influenced PAP usage.

Methods: Encounters from the stay-at-home period were reviewed for patient characteristics and clinician impressions, and were compared to administrative data from the prior 2.5 months ("control" period). PAP compliance was compared between the periods for a randomly selected group of forty patients.

Results: The telemedicine show rate was 89.37%. Sleep apnea then insomnia were the predominant diagnoses. Insomnia complaints were higher during the stay-at-home period. PAP compliance and AHI were similar between the periods.

Conclusions: Sleep apnea and insomnia were common complaints; insomnia was significantly more common during the pandemic. PAP compliance was similar between the two periods for a randomly selected cohort.

1. Introduction

During the first outbreak of novel coronavirus disease (COVID-19) in the United States [1], New Yorkers were instructed to stay home [2]. Medical practices transitioned to telemedicine to serve the medical needs of NYC during the pandemic [3]. Sleep providers of the NYU Langone Health Comprehensive Epilepsy Center – Sleep Center began seeing patients exclusively via telemedicine in the latter half of March 2020, through May 2020 when stay-at-home orders were eased.

With the pandemic came stressors that could affect sleep duration and quality. Studies have found higher rates of insomnia, sleep disturbance, and daytime sleepiness in the severely COVID-affected areas [4–7]. There may be higher-rates of sleep apnea in persons affected by COVID-19-related stress [8]. We sought to understand the distribution of sleep problems seen by telemedicine during the stay-at-home period compared to the pre-pandemic period.

Our second purpose was to assess whether positive airway pressure (PAP) therapy compliance changed during the stay-at-home period. Practitioners confronted questions of whether PAP therapy could

inadvertently aerosolize COVID-19 [9] within households; other patients worried about the adequacy of equipment disinfection during a pandemic. Conversely, some patients reported increasing PAP usage to "open" their lungs amidst a respiratory pandemic. Position pieces published in the United Kingdom [10,11] offer opposing opinions on pandemic PAP usage. We sought to understand if PAP compliance in our population changed during the stay-at-home period.

2. Methods

2.1. Design

A retrospective review of medical records of patients seen by sleep providers of the NYU Langone Health Comprehensive Epilepsy Center – Sleep Center via phone or video between March 16th and May 31st, 2020, the period of the NYC COVID-19 stay-at-home order, was performed. Sleep complaints were compared to pre-pandemic administrative data from the control period (January 1st – March 15th, 2020). PAP compliance was compared for included patients (see criteria below) be-

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tween the stay-at-home and control periods. This study was approved by the Institutional Review Board of NYU Langone Health.

2.2. Study population

The primary study population consisted of adult patients seen by telemedicine during the stay-at-home period. A total of 582 charts were reviewed; with an 89.37% show rate, 521 encounters were included for descriptive review. Show rate was defined as presenting for sleep evaluation at the designated appointment time (whether in-person, or via telemedicine). Sleep complaints were compared between clinician impressions and control period administrative data.

To compare PAP compliance, patients who had been started on PAP therapy between January 1st and October 1st, 2019, were screened for use between October 30th and December 1st, 2019. If a patient demonstrated use, his/her subsequent PAP use was compared between the control period and the stay-at-home period. This comparison was done for 40 randomly selected patients. PAP usage was defined consistent with Center for Medicare and Medicaid Services' guidelines for PAP compliance – use of PAP ≥ 4 h a night for 70% of nights in the defined time frame (October 30th – December 1st, 2019).

2.3. Data collected and statistical analysis

Information on show rates, new/follow-up visit, age, gender, and clinician impressions were collected for the telemedicine population. The clinic provided administrative data on pre-pandemic clinician impressions. For the PAP therapy comparison, data were collected from EncoreAnywhere™, a remote PAP data management system, including: age; gender; percentage of days [therapy] was used; percentage of days of usage ≥ 4 h; average usage on all days, and on days used; and, apnea-hypopnea index (AHI). Data were collected from the control and stay-at-home periods. Data were entered into REDCap, a HIPAA-compliant data application. Statistical analyses were done on Social Science Statistics (<https://www.socscistatistics.com/tests/chisquare2/default2.aspx>) or Microsoft Excel using either Chi-squared or two-tailed paired *t*-test where applicable.

3. Results

During the stay-at-home period, 521 telemedicine patients were seen, an 89.37% show rate (versus 91.91% [977 encounters] during the control period); 44.91% of patients were female; mean age was 50 years (range: 19 – 91 years old); 216 encounters were for new referrals (41.46% of encounters).

The total number of clinician impressions was 855 (patients could have more than one sleep issue). Sleep apnea was the most common issue (44.33%), followed by insomnia (23.16%), restless legs syndrome (RLS; 5.96%), periodic leg movement disorder (PLMD; 5.38%), narcolepsy (4.21%), circadian rhythm disorders (3.98%), other (3.27%), inadequate sleep hygiene (2.81%), seizures (2.22%), REM sleep behavior disorder (RBD; 1.75%), hypersomnia (1.52%), and NREM parasomnias (1.4%). Rates of insomnia were higher in new than follow-up patients (41.76% versus 35.99%).

The distribution of pandemic-period clinician impressions is compared to control-period administrative data in Table 1. Insomnia complaints were significantly higher during the stay-at-home period compared to the control period ($X^2 [2, 1821] = 21.94, p < 0.00001$), as were RLS, PLMs, circadian rhythm disorders, insufficient sleep and RBD. Sleep apnea complaints fell during the stay-at-home period ($X^2 [2, 1821] = 47.35, p < 0.00001$).

The comparison of PAP usage between the control and stay-at-home periods is listed in Table 2. There were no statistically significant differences in percentage of days of PAP use, percentage of days of use > 4 h, average time used, or AHI between the two periods. Mean age for this random sample was 63 years old (35% female).

4. Discussion

Show rates were similar between telemedicine and control-period clinic encounters, however, total number of visits decreased. As seen in other epicenters, insomnia was common during the NYC stay-at-home period [4–7], with a significantly higher frequency during the pandemic [12]. High rates of anxiety, depression and stress have been associated with COVID-19 outbreaks [13], and insomnia is linked to these mental health issues [14]. Increases in RLS, PLMs, and insufficient sleep complaints may be attributable to increased insomnia or associated stress [14–17], but could alternatively be explained by small sample size (as significant increases were also seen in seizure, RBD and circadian rhythm disorder complaints). Enhanced mental health resources during future outbreaks may combat not only pandemic-associated stress, but potentially related sleep disorders as well. General measures proposed to ameliorate sleep disruption include such counseling, as well as advise to engage in sunlight exposure during the daytime, continue with a regular sleep-wake cycle, exercise, and avoid excessive consumption of alcohol and unhealthy foods [18].

Sleep apnea was the predominant issue among new and follow-up encounters during the stay-at-home period (71.98% and 72.86%, respectively), but was significantly less prevalent among sleep complaints during the stay-at-home period versus the control period. Already under-recognized [19], sleep apnea screening may have been deferred by medical providers and the lay public during the pandemic period, and/or displaced by more pressing insomnia symptoms.

Sleep apnea is treated with PAP therapy, but our providers confronted mixed reactions to continuing this during the pandemic – from fear of its aerosolizing nature [9] and concerns over maintaining clean equipment, to self-reports of increased compliance to forestall respiratory failure in case of COVID-19 infection. Similar reactions were noted in a survey of OSA patients treated at NYC's Montefiore Medical Center [20].

We focused on PAP compliance among patients who were started on PAP therapy in 2019, and for whom remote compliance data could be downloaded. Because there is an adjustment period to using PAP therapy, we believed focusing on PAP setups prior to October 1st, 2019, would help us isolate the effect of stay-at-home orders from setup-related issues with regard to compliance. To ensure patients were using PAP going into 2020, usage was screened from October 1st through December 31st, 2019. Patients with usage were potential candidates for this study and were selected randomly for compliance comparison.

We observed no change in compliance or AHI between the control and stay-at-home periods, also seen in a Boston population [12]. It may be that extreme reactions to PAP countered each other, or patients were simply unaware of the controversies surrounding continuation of PAP therapy during a COVID-19 outbreak. Patients may have realized that discontinuation of PAP therapy could lead to worsening of mental and physical health, and potentially increased hospitalizations among those dependent on PAP for treatment of chronic respiratory failure [11].

Our study population was limited to our center. Our comparison of PAP therapy compliance was randomized but not controlled or case-matched, which may also limit generalizability of these results. The PAP comparison cohort was older and more male than all patients seen in the Center, but this may reflect the general demographics of OSA patients. We do provide an objective assessment of the distribution of sleep complaints in a COVID-19 epicenter seen via telemedicine, and demonstrate continued usage of PAP during the surge.

5. Conclusion

Most stay-at-home period telemedicine encounters were successful. Sleep apnea, then insomnia, were common findings among new and follow-up patients during the stay-at-home period, and insomnia rates increased during the pandemic. PAP compliance and AHI were similar in

Table 1
Effect of stay-at-home orders on sleep complaints.

Sleep Complaints	Stay-at-Home Period 855	Control Period 966	p value*
<i>Major Categories of Sleep Complaint:</i>			
Sleep Apnea	379 (44.33%)	584 (60.46%)	< 0.00001
Insomnia	198 (23.16%)	141 (14.6%)	< 0.00001
Restless Legs Syndrome	51 (5.96%)	8 (0.83%)	< 0.00001
Periodic Leg Movements Disorder	46 (5.38%)	9 (0.93%)	< 0.00001
Narcolepsy	36 (4.21%)	37 (3.83%)	.68
Circadian Rhythm Disorders	34 (3.98%)	22 (2.28%)	.04
Insufficient Sleep Hygiene	24 (2.81%)	3 (0.31%)	.000011
Seizures	19 (2.22%)	8 (0.83%)	.01
REM Behavior Sleep Disorder	15 (1.81%)	7 (0.72%)	.045
Idiopathic Hypersomnia	13 (1.75%)	16 (1.66%)	.05
NREM Parasomnias	12 (1.4%)	14 (1.45%)	.93

*Chi-squared test. Threshold for significance was $p < 0.05$.**Table 2**
Effect of stay-at-home orders on patient compliance with PAP therapy.

PAP Compliance (n = 40)	Stay-at-Home Period	Control Period	p value**
% of Days Used	76.48%	76.62%	0.97
% of Days Used ≥ 4 H	69.75%	68.27%	0.72
Average Usage (All Days)	314.9 min	306.9 min	0.68
Average Usage (Days Used)	393 min	385.58 min	0.49
AHI	4.94	5.25	0.33

**Two tailed paired *t*-test (PAP compliance). Threshold for significance was $p < 0.05$.

a random cohort when compared between the stay-at-home and control periods.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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