https://doi.org/10.5664/jcsm.8922

JCSM | Journal of Clinical Sleep Medicine

SCIENTIFIC INVESTIGATIONS

Impact of the COVID-19 pandemic on obstructive sleep apnea: recommendations for symptom management

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Study Objectives: In the context of the current COVID-19 pandemic situation, we address the following important questions: (1) How can patients be identified for possible OSA while sleep clinic testing is temporarily unavailable or limited? and (2) What measures can be suggested to improve sleep health until proper diagnosis and treatment become safe and available again?

Methods: As a proxy for home or in-laboratory testing, validation of a symptom-based measure of OSA risk is presented, based on an ongoing larger prospective study of 156 family medicine patients with OSA (88 women, 68 men; mean age, 57 years) and 60 control participants (36 women, 24 men; mean age, 54 years) recruited from the community. Participants completed the Sleep Symptom Checklist (SSC) and a range of other self-report measures; primary care patients also underwent a polysomnographic sleep study.

Results: Results showed that (1) individuals with OSA reported more symptoms on the SSC related to insomnia, daytime symptoms, sleep disorders, and psychological maladjustment than did the control group (all $P < .001$), and (2) their sleep-related symptoms were significantly more severe than those of the control patients. In addition, several polysomnographic indices in recently diagnosed untreated individuals with OSA were significantly correlated with SSC measured sleep disorder symptoms, and SSC scores significantly distinguished participants with OSA from control participants.

Conclusions: Our findings suggest that family practitioners can effectively prescreen patients for possible OSA by inquiring about 5 items that form the SSC sleep disorders subscale. If OSA is suspected, then we can recommend a range of behavioral techniques to improve symptoms. The current pandemic causes us to reflect that the provisional targeting of symptoms and guidance regarding mitigation strategies while waiting for specialist care could serve patients well at any time.

Keywords: OSA, COVID-19, screening, family medicine, behavioral interventions

Citation: Rizzo D, Libman E, Baltzan M, Fichten C, Bailes S. Impact of the COVID-19 pandemic on obstructive sleep apnea: recommendations for symptom management. *J Clin Sleep Med.* 2021;17(3):429–434.

BRIEF SUMMARY

Current Knowledge/Study Rationale: The greatest impact of the current COVID-19 pandemic is on those who already have health conditions, whether they contract the disease itself or experience the consequences of lifestyle restrictions imposed to reduce the risk of infection. OSA and COVID-19 have cardiovascular and cerebrovascular disease in common, which suggests a potential compounded risk.

Study Impact: Our findings suggest that family practitioners can effectively prescreen patients for possible OSA by asking 5 questions, and if OSA is suspected, we recommend a range of behavioral techniques to improve symptoms. The current pandemic causes us to reflect that the provisional targeting of symptoms and guidance regarding mitigation strategies while waiting for specialist care could serve patients well at any time.

INTRODUCTION

The COVID-19 pandemic has rapidly spread across the globe, disrupting lives and undermining sleep and psychological and physical health.[1–6] Its impact will be with us for an as yet unknown length of time. The greatest effect will be on those who already have health conditions, whether they contract the disease itself or experience the consequences of lifestyle restrictions imposed to reduce the risk of infection.

According to the Public Health Agency of Canada,[7,8] 22% (5.4 million) of adult Canadians report either being diagnosed with OSA or being at high risk for OSA. This disorder is characterized by repetitive collapse of the upper airway during sleep.[9] Such repetitive surges counteract the usual fall in heart rate and blood pressure that accompany normal sleep and are thought to contribute to the known adverse cardiovascular consequences of untreated OSA. Diagnosis of OSA is based on a range of respiratory and physiological measures, obtained during an overnight sleep study, either in a sleep laboratory or with a home testing device. The most common treatment modality is PAP.

Cardiovascular and cerebrovascular events are among the most life-threatening for individuals contracting COVID-19; untreated OSA is also associated with cardiovascular risk,

and there is some indication that treating OSA may moderate OSA-induced cardiovascular symptoms.[10,11] Despite clear independent links between cardiovascular disease and both COVID-19 and OSA, little is known about the potential compounded risk when a patient who has OSA contracts COVID-19, although current reports[12–15] suggest that OSA, particularly with concurrent comorbidities, could contribute to worsening the outcome of COVID-19 infection. Based on such findings, we speculate that treating OSA symptoms may improve COVID-19 outcomes.

The COVID-19 pandemic affects individuals with OSA at many levels. Social distancing, physical isolation, and suspension of many clinical services complicate the already prevalent underdiagnosis of OSA and potentially delay treatment for those who have been diagnosed. OSA and insomnia frequently co-occur,[16,17] and treating coexisting insomnia may improve OSA symptoms.[18] Financial and social concerns resulting from the pandemic may increase rates of insomnia, affect adherence to burdensome OSA treatment regimens, and reduce the seeking of therapy for insomnia.

Such pandemic-related consequences may lead to increased daytime sleepiness, fatigue, compromised driving safety, decreased work productivity, and increased snoring, which may disturb bed partners' sleep.[13] With recent orders to suspend sleep testing (in home and in laboratories), sleep medicine was classified as nonessential during the pandemic, which has resulted in no PAP treatment prescriptions. Moreover, the risk of transmission of the coronavirus via laboratory or home testing equipment remains a pertinent clinical question, adding new challenges to making diagnostic services available. Maintaining and resuming services means introducing structural and procedural measures to ensure the safety of patients and staff.

In Canada, a specialist evaluation is required to proceed with diagnostic testing; testing is only available through sleep laboratories, which are currently not meeting the demand for sleep evaluations because of more-stringent COVID-19 protocols. Sleep laboratories are not performing in-laboratory PAP titrations, to minimize the risk of infection from high-risk aerosol-generating procedures that can put health care workers at risk.[19] In the United States, most patients are evaluated for sleep apnea by home sleep testing and are subsequently prescribed autoCPAP to reduce the number of in-laboratory PAP titrations.[20] The American Academy of Sleep Medicine is recommending that home sleep testing devices only be used every fourth day and undergo intensive sanitization before and after use. In France, the current suggestion is that monitoring should focus primarily on clinical symptoms during this period (eg, daytime sleepiness, sleep quality, snoring, arousals).[21] This set of restrictions likely means greatly reduced patient flow, extending already long wait times for services and leaving undiagnosed individuals with OSA who are experiencing symptoms without access to proper care or treatment.

Notably, family physicians continue to provide medical follow-ups during the pandemic. They are therefore in a position to recommend alternative behavioral techniques addressing OSA symptoms, provided that they are knowledgeable about some basic aspects of sleep medicine.

In the context of a long-term multidisciplinary research program, we have been following participants with and without sleep disorders since 2012. To date, we have been exploring the basis for the dramatic underdiagnosis of OSA in primary care and evaluating ways to address the serious medical and psychological implications of not identifying patients at risk and directing them to appropriate sleep medicine specialists for diagnosis and care. This paper also explored the association of OSA and metabolic syndrome (obesity, hypertension, hyperlipidemia, diabetes) and have evaluated low levels of treatment adherence.[22,23]

Typically, individuals with OSA are identified through reported symptoms and overnight sleep studies. Given the ongoing pandemic, with the possibility of further outbreaks and shutdown orders, important questions to address given the current situation include the following:

1. How can patients be identified for possible OSA while sleep clinic testing is temporarily unavailable or limited?
2. What measures can be suggested to improve sleep health until proper diagnosis and treatment become safe and available again?

Our purpose here is to contribute information, describe alternative methods of identifying OSA-related symptoms, and recommend treatment techniques that can improve sleep disorder–related symptoms while waiting for sleep-disorder testing in the context of this COVID-19 pandemic.

Background

A previous study developed a survey data collection instrument based on items from existing validated questionnaires.[24] This 21-item survey instrument—the Sleep Symptom Checklist (SSC)—was designed as a brief measure oriented to specific sleep disorders (eg, sleep apnea, periodic limb movement disorder, insomnia) that is potentially practical to use in general medical practice.[25] This measure provided a new approach to OSA screening that can be administered by a physician or self-reported by the patient and required no medical data (ie, body mass index or other metabolic indices). Family practitioners completed the SSC with their patients at regular visits and referred the patients to the sleep study. Findings indicated that for those primary care patients who completed the SSC in the context of a multifaceted experimental protocol that included overnight polysomnography (PSG), 86% of women and 92% of men had PSG-confirmed OSA. This result coincided with their SSC sleep disorder–related scores. In addition, the process of completing the SSC encouraged dialogue about sleep and sleep disorders between patients and family practitioners.[25] In this article, we examine the association between the SSC subscales and a range of sleep and PSG indices.

METHODS

Participants

From an ongoing larger prospective study, we selected 156 family medicine patients with OSA (88 women and 68 men) who had completed all relevant measures before starting treatment for OSA (ie, PSG and questionnaire measures).

Table 1—Mean comparisons between OSA group and control group on SSC subscales.

	OSA (n = 156)		Control (n = 60)		*t*	*df*	*P*	Cohen's *d*
	Mean	SD	Mean	SD				
Sleep disorders	9.52	4.99	3.94	2.86	10.11	214	<.001	1.37
Insomnia	8.51	4.39	4.06	3.21	8.21	214	<.002	1.16
Daytime symptoms	7.86	3.82	4.14	2.67	8.14	214	<.003	1.13
Psychological maladjustment	2.70	2.47	0.98	1.51	6.19	214	<.004	0.84

df = degrees of freedom, SD = standard deviation, SSC = Sleep Symptom Checklist.

Inclusion criteria were age > 30 years (mean age, 56.66 years; standard deviation, 10.93), no prior testing for or diagnosis of OSA, and no experience of severe medical or psychiatric disorders preventing participation. The original aim was to include both patients with possible OSA and those in good general health with a low likelihood of OSA. Sixty control participants (36 women, 24 men; mean age, 53.93 years; SD, 12.40) were recruited from the community. Mean ages between both groups were not significantly different ($P = .135$). Similarly, sex frequencies were also not significantly different ($\chi^2 = 0.249$; $P = .618$).

Procedure

All participants completed the SSC and the questionnaire measures needed for the larger investigation. Primary care patients completed these measures before OSA testing. They were then referred to a board-certified sleep medicine specialist for assessment followed by an overnight PSG study at an American Academy of Sleep Medicine–certified sleep laboratory. After completing their sleep study and questionnaires, participants met with the sleep medicine specialist to obtain the results of the assessment. Diagnosis of OSA takes symptoms into consideration. If the AHI is > 5 events/h with symptoms, then treatment is indicated. If the AHI, as measured by home sleep testing, is < 5 events/h, then re-evaluation of the diagnosis is important because the home sleep testing may underestimate AHI.

Measures

PSG

Nocturnal PSG was used to obtain sleep parameter scores (ie, frequency of nocturnal arousals, total sleep time, sleep onset latency, wake after sleep onset, and sleep efficiency) and OSA-related factors (ie, nocturnal profile of oxygen saturation, AHI, and respiratory events related to arousal from sleep). Participants were monitored in a supervised sleep laboratory from 10:00 PM to 7:00 AM. Monitoring included electro-oculogram, electroencephalogram, bilateral anterior tibialis and chin electromyogram, electrocardiogram, pulse oximetry, nasal and oral airflow with thermistor and nasal pressure cannulae, microphone for snoring, end-tidal carbon dioxide monitoring, and respitrace bands for measurement of respiratory effort. Apnea events and associated arousals were scored manually according to scoring rules established by the American Academy of Sleep Medicine (*The AASM Manual for the Scoring of Sleep and Associated Events: Rules, Terminology and Technical Specifications*).[26] An apnea event was defined as a cessation of breathing lasting 10 seconds or more. Hypopneas were scored when there was a 30% or more decrease in airflow with 3% or more oxygen desaturation or a subsequent cortical arousal. Scoring sleep began at lights out and stopped when the participant arose in the morning.

SSC

The SSC is a 21-item survey of a broad range of symptoms that are both directly and indirectly related to sleep disorders. It is easily completed by patients of all ages. Participants rate each symptom for its severity from 0 (not at all) to 3 (very severe) based on their experience during the previous month.[25] The temporal stability of the severity ratings was found to be acceptable (total $r = .79$; $P < .01$). Cronbach's alpha was 0.74. Factor analysis yielded 4 distinct subscales: insomnia, daytime symptoms, sleep disorders, and psychological maladjustment. Of interest is the sleep disorders subscale (**Table 1**).

RESULTS

By comparing the mean scores of the OSA and control groups on the 4 SSC subscales, we show that individuals with OSA reported more symptoms on the SSC related to insomnia, daytime symptoms, sleep disorders, and psychological maladjustment than did participants in the control group (all $P < .001$), and that their sleep-related symptoms were significantly more severe (**Table 2**).

Several PSG indices in recently diagnosed untreated individuals with OSA were significantly correlated with sleep disorder symptoms (ie, waking with headaches, interruption of breathing during sleep, snoring, waking with a dry mouth, and unrefreshing sleep). Sleep disorder–related symptoms were positively correlated with percentage of sleep time in REM sleep ($r^2 = .179$; $P < .05$), percentage of sleep time in stage 1 sleep ($r^2 = .204$; $P < .05$), respiratory arousals ($r^2 = .245$; $P < .01$), spontaneous arousals ($r^2 = .178$; $P < .02$), respiratory events (AHI; $r^2 = .216$; $P < .01$), oxygenation—basal oxygen value ($r^2 = –.173$; $P < .05$), and oxygenation—minimal oxygen value ($r^2 = .264$; $P < .01$). The PSG indices for the control group were not associated with sleep disorder–related symptoms.

When the 4 SSC subscales were used as predictors in a discriminant analysis, they could correctly classify 69.3% of patients into OSA and control groups (Wilks' lambda, 0.844; χ^2 [df, 1] = 37.9; $P = .000$). *R* canonical correlation analyses

Table 2—OSA risk factors.

Questions for family physician to ask (recommendations could be offered if patient answers yes to any of these questions)	Do you experience interruption of breathing during sleep?
	Do you snore?
	Do you fall asleep during the day when not wanted?
	Do you wake up with a dry mouth?
	Do you wake up with a headache?
	Insomnia
	Obesity (body mass index ≥ 30)
Presence of comorbid conditions (comorbidities associated with death in patients with COVID-19 commonly occur in patients with OSA, including hypertension, diabetes mellitus, hyperlipidemia, and obesity[20])	Diabetes mellitus
	Hyperlipidemia
	Cardiovascular morbidities
	Cardiovascular risk factors
	Atrial fibrillation
	Hypertension
	Major cardiovascular events (myocardial infarction, stroke)

showed that canonical loadings of the SSC sleep disorders subscale items "interruption of breathing" (r^2 = .834), "falling asleep during the day when not wanted" (r^2 = .772), and "snoring" (r^2 = .638) were the dominating variables of the subscale and had a canonical correlation of 0.51 between the sets of variables ($P < .001$).

DISCUSSION

Our results show that the SSC can identify patients who may potentially have OSA vs those who do not have a sleep disorder. Patients with OSA had worse scores on all 4 subscales of the SSC compared to the control patients, and their PSGs showed an association between several biophysiological factors and the sleep disorders SSC subscale: respiratory and spontaneous arousals, AHI, and oxygenation levels. Our results also confirm the co-occurrence of OSA and insomnia.

Typically, individuals with OSA are identified through reported symptoms and overnight sleep studies. Given the current COVID-19 pandemic, patients can be identified by their family physicians for possible OSA while sleep clinic testing is temporarily unavailable or limited by using a simple screening tool, such as the SSC, to assess sleep disorder risk. Furthermore, although sleep clinics are less available for proper follow-up, family physicians may also make recommendations to improve sleep health until proper diagnosis and treatment become safe and available again.

People with moderate to severe asthma may be at higher risk of experiencing more severe symptoms related to COVID-19.[27] Chronic intermittent hypoxia is common in both OSA and allergen-induced asthma, and both may result in physiological deficits of expiratory flow limitation. Therefore, particular attention to seasonal allergy schedules should also be considered.[27]

Our findings support the contention that family practitioners can effectively prescreen patients for possible OSA by their responses to the 5 items that form the SSC sleep disorders subscale (**Table 2** lists the questions in order of importance). If OSA is suspected, then a range of behavioral techniques can be recommended to improve symptoms. Our results show that the SSC is an acceptable tool to identify potential OSA and use to make recommendations to improve sleep during the pandemic. Weighted analyses showed that some items on the SSC subscale are more important than others. However, recommending behavioral interventions poses no risk to the patient.

Recommendations

Identification of possible OSA and associated risks

After noting current reports implicating untreated OSA as possibly exacerbating the intensity of COVID-19 symptoms and comorbidities, it is important to continue some level of screening patients for sleep disorders during the pandemic while traditional diagnostic measures are suspended or to resume screening with reduced patient flow. Screening for OSA is recommended within the COVID-19-positive population. Our findings suggest that family practitioners can effectively prescreen patients for possible OSA by inserting the 5 questions from the SSC sleep disorders subscale (**Table 2**) into their habit history and status protocol.

Behavioral interventions and mitigation strategies

Change sleep posture: If OSA is suspected, then a range of behavioral techniques can be recommended to improve symptoms. Typical sleep posture can have a gravitational effect on the soft tissue of the upper airway, which may in turn cause a collapse of the airway potentially leading to a breathing obstruction. Although PAP is superior to positional therapy in reducing the severity of sleep apnea,[28] positional therapy (ie, the avoidance of the supine posture during sleep)[29–31] is a recognized method for reducing symptoms of OSA.

Several products exist on the market that discourage lying on the back during sleep (eg, T-shirts with pads on the back) and can also be crafted at home (eg, a fanny pack filled with soft material worn backward). Health practitioners could also recommend sleeping propped up (ie, recline the entire body or the

Table 3—Behavioral interventions.

Positional therapy	Avoid supine position
	Sleep propped up
Address seasonal allergies and nasal congestion	Use nasal irrigation, decongestant sprays, antihistamines
	Sleep elevated
Address insomnia and poor sleep quality if present	Treat insomnia (self-help, telehealth)
	Improve sleep hygiene
Lifestyle alterations	Lose weight
	Limit alcohol consumption
	Stop smoking
	Limit sedatives
	Exercise
	Reduce stress

entire upper body, not solely the head) with the help of pillows or a recliner, or a 15 cm piece of wood under the head of the bed.[32,33]

Nasal irrigation to avoid congestion: Nasal irrigation with a saline solution is another treatment recommendation. Congestion because of seasonal allergies may also obstruct the airways, and over-the-counter solutions are available for patients who experience seasonal allergies.[34]

Treat insomnia: Insomnia has been recognized as a predisposing factor in cardiovascular disease.[35] The high incidence of comorbid insomnia among individuals with OSA indicates that recommendations for cognitive-behavioral therapy for insomnia could be helpful while awaiting OSA testing.[36,37] Note that in OSA with comorbid insomnia, it is still to be determined whether cognitive-behavioral therapy for insomnia is made more difficult by the presence of OSA and whether OSA should be treated first or during the therapy. Treatment of insomnia has been shown to improve OSA symptoms and adherence to PAP therapy.[38] Treatment options include self-help books and informational websites, telehealth treatment with qualified therapists, and self-help apps and treatment modules delivered online.

Lifestyle alterations: Countless studies have shown the association between OSA and smoking, exercise, stress, and diet.[39–42] Lifestyle is particularly challenging to address during a pandemic considering that many individuals are working remotely, limiting outings, and experiencing more stress. Steering toward less-destructive behaviors or substituting them with healthier behaviors such as cycling could provide the stress release that is needed by many during this trying time. In addition, weight reduction and limiting alcohol and sedatives can also be helpful (**Table 3**).[30]

Sustainability

An additional benefit to the proposed proxy diagnostic approach is that it is a quick way to address the very high rate of unrecognized OSA in older individuals, particularly women, when visiting family doctors. The proposed 5 questions in **Table 2** can easily be incorporated into the preappointment written patient status record that patients are frequently asked to complete while waiting to be seen by their physician.

Research in the area of COVID-19 may contribute further information about the influence of OSA and other sleep disorders, such as insomnia, on the course of the infection. The associated comorbidities of both OSA and insomnia (ie, the metabolic syndrome of diabetes, hypertension, hyperlipidemia, and obesity) add another level to potential interaction with COVID-19.

We all must adapt to exceptional circumstances and invent new ways to live, work, and support our patients at risk. Some of these new practices will be carried on after the pandemic ends. With regard to OSA recognition, testing, and treatment, we are aware that in the context of the Canadian health care system as elsewhere, there have for many years existed long delays (often a year or more) from the time a referral is made from family medicine until testing is done by sleep specialists and treatment is initiated. The use of type 3 home sleep testing could also be considered instead of PSG while also respecting strict COVID-19 protocols (eg, a teaching setup at a distance of 2 m; machines packaged for carry-away then returned with a dropoff, then opened and cleaned with a professional respiratory therapist wearing gloves and mask; slower workflow than usual). As sleep clinic services resume, we can expect even longer wait times as the backlog of patients will need to be addressed. The pandemic causes us to reflect that the provisional targeting of symptoms and guidance regarding mitigation strategies while waiting for specialist care could serve patients well at any time.

ABBREVIATIONS

PSG, polysomnography
SSC, Sleep Symptom Checklist

REFERENCES

1. Ho CS, Chee CY, Ho RC. Mental health strategies to combat the psychological impact of COVID-19 beyond paranoia and panic. *Ann Acad Med Singap.* 2020;49(3):155–160.
2. Duan L, Zhu G. Psychological interventions for people affected by the COVID-19 epidemic. *Lancet Psychiatry.* 2020;7(4):300–302.

3. McBride O, Murphy J, Shevlin M, et al. Monitoring the psychological impact of the COVID-19 pandemic in the general population: an overview of the context, design and conduct of the COVID-19 Psychological Research Consortium (C19PRC) Study. PsyArXiv. Preprint posted online April 13, 2020. doi: 10.31234/osf.io/wxe2n
4. Driggin E, Madhavan MV, Bikdeli B, et al. Cardiovascular considerations for patients, health care workers, and health systems during the COVID-19 pandemic. *J Am Coll Cardiol.* 2020;75(18):2352–2371.
5. Altena E, Baglioni C, Espie CA, et al. Dealing with sleep problems during home confinement due to the COVID-19 outbreak: practical recommendations from a task force of the European CBT-I Academy. *J Sleep Res.* 2020;29(4): e13052.
6. Huang Y, Zhao N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 epidemic in China: a web-based cross-sectional survey. Psychiatry Res. 2020;288:112954.
7. Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. *N Engl J Med.* 1993; 328(17):1230–1235.
8. Ayas N, Skomro R, Blackman A, et al. Obstructive sleep apnea and driving: a Canadian Thoracic Society and Canadian Sleep Society position paper. *Can Respir J.* 2014;21(2):114–123.
9. Edwards BA, Eckert DJ, Jordan AS. Obstructive sleep apnoea pathogenesis from mild to severe: Is it all the same? *Respirology.* 2017;22(1):33–42.
10. Qian Y, Zou J, Xu H, et al. Association of upper airway surgery and improved cardiovascular biomarkers and risk in OSA. *Laryngoscope*. 2019;130(3):818–824.
11. Pépin J-L, Jullian-Desayes I, Sapène M, et al. Multimodal remote monitoring of high cardiovascular risk patients with OSA initiating CPAP: a randomized trial. *Chest*. 2019;155(4):730–739.
12. McSharry D, Malhotra A. Potential influences of obstructive sleep apnea and obesity on COVID-19 severity. *J Clin Sleep Med.* 2020;16(9):1645.
13. Baker JG, Sovani M. Case for continuing community NIV and CPAP during the COVID-19 epidemic. *Thorax*. 2020;75(5):368.
14. Mittal A, Forte M, Leonard R, Sangani R, Sharma S. Refractory acute respiratory distress syndrome secondary to COVID-19 successfully extubated to average volume-assured pressure support non-invasive ventilator. *Cureus*. 2020; 12(4):e7849.
15. Prachand VN, Milner R, Angelos P, et al. Medically necessary, time-sensitive procedures: a scoring system to ethically and efficiently manage resource scarcity and provider risk during the COVID-19 pandemic. *J Am Coll Surg.* 2020;231(2): 281–288.
16. Janssen HCJP, Venekamp LN, Peeters GAM, Pijpers A, Pevernagie DAA. Management of insomnia in sleep disordered breathing. *Eur Respir Rev.* 2019; 28(153):190080.
17. Sweetman A, Lack L, McEvoy D. Refining the measurement of insomnia in patients with obstructive sleep apnea. *J Clin Sleep Med.* 2019;15(12):1717–1719.
18. Sweetman A, Lack L, McEvoy RD, et al. Cognitive behavioural therapy for insomnia reduces sleep apnoea severity: a randomised controlled trial. *ERJ Open Res.* 2020;6(2):00161-2020.
19. Barker J, Oyefeso O, Koeckerling D, Mudalige NL, Pan D. COVID-19: community CPAP and NIV should be stopped unless medically necessary to support life. *Thorax*. 2020;75(5):367.
20. Thorpy M, Figuera-Losada M, Ahmed I, et al. Management of sleep apnea in New York City during the COVID-19 pandemic. *Sleep Med.* 2020;74:86–90.
21. Bastier P-L, Aisenberg N, Durand F, et al. Treatment of sleep apnea by ENT specialists during the COVID-19 pandemic. *Eur Ann Otorhinolaryngol Head Neck Dis.* 2020;137(4):319–321.
22. Libman E, Bailes S, Fichten C, et al. Adherence to CPAP treatment in women with obstructive sleep apnea.*Sleep.* 2017;40(suppl_1):A302.
23. Libman E, Bailes S, Fichten CS, et al. CPAP treatment adherence in women with obstructive sleep apnea. *Sleep Disord.* 2017;2017:2760650.
24. Bailes S, Rizzo D, Baltzan M, et al. Manifestations of insomnia in sleep apnea: implications for screening and treatment. *Behav Sleep Med.* 2016;14(4):429–441.
25. Bailes S, Baltzan M, Rizzo D, Fichten CS, Amsel R, Libman E. A diagnostic symptom profile for sleep disorder in primary care patients. *J Psychosom Res.* 2008;64(4):427–433.
26. Berry RB, Brooks R, Gamaldo CE, et al; for the American Academy of Sleep Medicine. *The AASM Manual for the Scoring of Sleep and Associated Events: Rules, Terminology and Technical Specifications.* Version 2.0. Darien, IL: American Academy of Sleep Medicine; 2012.
27. Owens RL, Macrea MM, Teodorescu M. The overlaps of asthma or COPD with OSA: a focused review. *Respirology.* 2017;22(6):1073–1083.
28. Ha SC, Hirai HW, Tsoi KK. Comparison of positional therapy versus continuous positive airway pressure in patients with positional obstructive sleep apnea: a meta-analysis of randomized trials. *Sleep Med Rev.* 2014;18(1):19–24.
29. Oksenberg A, Silverberg DS. The effect of body posture on sleep-related breathing disorders: facts and therapeutic implications. *Sleep Med Rev.* 1998;2(3):139–162.
30. Ravesloot MJ, van Maanen JP, Dun L, de Vries N. The undervalued potential of positional therapy in position-dependent snoring and obstructive sleep apnea—a review of the literature. *Sleep Breath.* 2013;17(1):39–49.
31. Svatikova A, Chervin RD, Wing JJ, Sanchez BN, Migda EM, Brown DL. Positional therapy in ischemic stroke patients with obstructive sleep apnea. *Sleep Med.* 2011;12(3):262–266.
32. Maher E, Epstein L. Obstructive sleep apnea. In: Mattice C, Brooks R, Lee-Chiong T, eds. *Fundamentals of Sleep Technology.* 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2012: 169.
33. Souza FJFB, Genta PR, de Souza Filho AJ, Wellman A, Lorenzi-Filho G. The influence of head-of-bed elevation in patients with obstructive sleep apnea. *Sleep Breath.* 2017;21(4):815–820.
34. Wickwire EM. Behavioral management of sleep-disordered breathing. *Prim Psychiatry*. 2009;16(2):34–41.
35. Javaheri S, Redline S. Insomnia and risk of cardiovascular disease. *Chest*. 2017;152(2):435–444.
36. Ong JC, Crawford MR, Wyatt JK, et al. A randomized controlled trial of CBT-I and CPAP for comorbid insomnia and OSA: initial findings from the MATRICS Study. *Sleep*. 2019;42(Supplement 1):A154.
37. Sweetman A, Lack L, Lambert S, Gradisar M, Harris J. Does comorbid obstructive sleep apnea impair the effectiveness of cognitive and behavioral therapy for insomnia? *Sleep Med*. 2017;39:38–46.
38. Sweetman A, Lack L, Catcheside PG, et al. Cognitive and behavioral therapy for insomnia increases the use of continuous positive airway pressure therapy in obstructive sleep apnea participants with comorbid insomnia: a randomized clinical trial. *Sleep*. 2019;42(12):zsz178.
39. Zhu HM, Yi HL, Guan J, et al. Relationship between smoking and the severity of OSA. Article in Chinese. *Lin Chung Er Bi Yan Hou Tou Jing Wai Ke Za Zhi*. 2019; 33(9):862–865, 869.
40. Bielicki P, Trojnar A, Sobieraj P, Wąsik M. Smoking status in relation to obstructive sleep apnea severity (OSA) and cardiovascular comorbidity in patients with newly diagnosed OSA. *Adv Respir Med.* 2019;87(2):103–109.
41. St-Onge M-P, Tasali E. Weight loss is integral to OSA management: 10-year follow-up in sleep AHEAD published online ahead of print, 2020 Aug 14]. *Am J Respir Crit Care Med.*
42. Edwards BA, Bristow C, O'Driscoll DM, et al. Assessing the impact of diet, exercise and the combination of the two as a treatment for OSA: a systematic review and meta-analysis. *Respirology.* 2019;24(8):740–751.

SUBMISSION & CORRESPONDENCE INFORMATION

Submitted for publication June 1, 2020
Submitted in final revised form October 7, 2020
Accepted for publication October 7, 2020
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DISCLOSURE STATEMENT

This was not an industry-supported study. This study was supported by the Canadian Institutes of Health Research and the American Academy of Dental Sleep Medicine. The authors report no conflicts of interest.