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ORIGINAL RESEARCH

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Virtual otolaryngologic management of sleep apnea patients: Lessons learned from COVID-19 pandemic

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Abstract

Objective: To discuss the virtual management options and strategies learned during the COVID-19 pandemic for treatment of patients with sleep complaints and sleep disordered breathing presenting to the otolaryngologist.

Methods/Results: The addition of a virtual evaluation can be beneficial in assessing the patient presenting to the otolaryngologist with sleep complaints. With the implementation of telemedicine, validated subjective assessment tools, and a limited physical exam, patients can be triaged for the need for treatment implementation, further evaluation or testing, and counseled regarding various management options.

In this article, we discuss the lessons learned from the authors' collective experience on how to effectively use telemedicine as a tool in the management repertoire for patients with sleep disorders.

Conclusion: The otolaryngologist will commonly see patients with sleep complaints, particularly patients diagnosed with obstructive sleep apnea not able to tolerate conservative therapies. These patients are well suited for virtual evaluation utilizing telemedicine. The technology and workflows which have been developed during the COVID-19 pandemic can be carried forward for select patients to improve access and efficiency of care.

Level of evidence: 5.

KEYWORDS
COVID-19, obstructive sleep apnea, pandemic, telemedicine, virtual

1 | INTRODUCTION

The novel coronavirus (SARS-CoV-2 or COVID-19) has influenced drastic change in how we conduct our daily lives. This disease was declared a pandemic by the World Health Organization on March 11, 2020. Since that time, as the disease has progressed, we have seen physicians adapt to allow for continued patient care while mitigating the risk of disease spread. Many otolaryngologists have adopted new practices and technology to continue to care for their patients.

The use of telemedicine has emerged as an integral component in this workflow. This has allowed for face-to-face communication

between patients and physicians, whereas enabling physical distancing to optimize the safety of both the patient and the medical staff.[1,2] This technology has tremendous benefit as it allows for the establishment or maintenance of the doctor-patient relationship while facilitating patient evaluation and triage for further office examination, testing, imaging, or treatment. Telemedicine is particularly valuable when treating patients with sleep disorders.

The aim of this commentary is to detail the authors collective experience, learned through the COVID-19 pandemic about how otolaryngologists can implement telemedicine into their treatment algorithm when managing patients presenting with sleep disorders.

2 | TELEMEDICINE

Telemedicine has become a colloquial term since the onset of the COVID-19 pandemic and represents HIPAA compliant video conferencing platforms which allow for physical separation, but maintenance of face-to-face interaction between a patient and physician. It has been utilized for the evaluation and management of patients for years and was first employed in specialties such as urgent care, cardiology, psychiatry, and dermatology. It has been described in the otolaryngology literature for approximately 20 years, but its implementation has been limited thus far. With the onset of the COVID-19 pandemic, some of these constraints have been lifted allowing for broad adoption of telemedicine in otolaryngology practices.[3-5]

The patient presenting with sleep complaints is an ideal candidate for this technology. When using telemedicine for the sleep patient, a comprehensive patient assessment can be easily completed which includes a detailed sleep history (chief complaint, associated symptoms, nightly sleep pattern, prior therapies, etc), review of relevant past medical history, and completion of subjective questionnaires to aide in diagnosis and assessment of treatment outcomes. In addition, a limited physical exam can be completed and sleep testing ordered to facilitate patient counseling and treatment planning. Telemedicine is also ideal for follow up of previously established sleep patients. Although some of these data points can be collected through a telephone conversation, telemedicine allows for a face-to-face interaction and a limited physical exam.

In the United States, continuous positive airway pressure (CPAP) is the typical initial treatment modality utilized for obstructive sleep apnea (OSA) and a trial of positive airway pressure (PAP) therapy can be initiated after a telemedicine evaluation in patients presenting with this disease. In some health systems, CPAP is not required as an initial treatment modality for OSA and a telemedicine visit allows for discussion of options for disease management. A PAP trial is often carried out with an auto-titrating PAP device. Telemedicine also allows for close follow-up to facilitate timely evaluation and optimization of therapy, which has been shown to improve PAP compliance.[6-8] Those patients who have already attempted PAP therapy and are pursuing alternative options can also be managed accordingly; they can be assessed virtually and directed to a more comprehensive in-office examination, proceed with Drug Induced Sleep Endoscopy (DISE), or pursue other conservative or surgical management strategies based on the findings from the telemedicine evaluation.

Many practices have adopted telemedicine since the onset of the COVID-19 pandemic with multiple platforms allowing for institution of this technology. A telemedicine option for patients presenting with sleep complaints can be offered to patients who require significant travel, have comorbidities restricting frequent office visits due to the risk of virus exposure, or those who prefer their initial visit or follow-up to be done virtually. Based on this virtual assessment, planning for future office examination, testing, or treatment initiation be done.

3 | SLEEP HISTORY EVALUATION

Telemedicine can be utilized for a variety of patient populations presenting with sleep complaints. This technology allows for an assessment of the patient and can be done for initial surgical consultations, second opinions, or follow-ups of those patients with a prior history of sleep disorders. In addition, patients who do not yet have a formal diagnosis presenting with a chief complaint of snoring, daytime fatigue, and concern for sleep apnea can be evaluated. Lastly, telemedicine can be valuable in some pediatric patients, with the aid of their caregivers.

A complete sleep history is a pivotal part of the evaluation of any patient presenting with sleep complaints. This includes assessing the patient's chief complaint, associated symptoms, timing of symptoms, exacerbating/alleviating factors, nightly sleep pattern, and previous interventions. Snoring is a common chief complaint and it is important to ascertain the context of snoring, positional relief/exacerbation, and associated witnessed apneas or episodes of waking up gasping for air. Daytime symptoms can also be associated with OSA and should be assessed. These include morning headaches, waking up unrefreshed, and daytime sleepiness. In children, daytime symptoms may include school performance problems, hyperactivity, neurocognitive issues, sleepiness, and fatigue.

In the United Sates, CPAP is the typical initial/treatment modality for OSA and some patients will have already attempted and failed this therapy. In this cohort, it is important to understand the specific issues leading to CPAP failure. Many patients struggle because of a sense of claustrophobia when using the mask, leakage of air, recurrent awakenings with use, among other issues. Nasal obstruction can also lead to difficulty with CPAP tolerance.[8-10] Customization of the mask interface and addition of heated humidification can improve tolerance. These are important points to establish in the history as they may help in tailoring a treatment plan for the specific patient.

Many patients presenting to the otolaryngologist already carry a diagnosis of OSA, have attempted management with CPAP, and are seeking alternative options. Patients who have failed CPAP may have also attempted alternative conservative options including the use of a mandibular advancement device (MAD), positional therapy, or myofunctional therapy. For children, oxygen therapy may also have been considered along with medical therapy including nasal steroids or montelukast. A history of weight loss or gain is important as

patients may require an updated sleep study to assess current disease severity. It is also important to assess if they have undergone prior nasal surgery as an adjunct to support PAP therapy.[11,12] In those seeking evaluation for upper airway stimulation (UAS), a careful history of prior breast or chest surgery is paramount. Patients should be questioned about other implanted devices or the need for recurrent MRI as these factors will impact surgical planning for UAS.

It is also important to establish the patients normal sleep pattern. This can be done by questioning their typical bed time, time to sleep onset, number of awakenings, time to get back to sleep, and time of morning awakening. Comorbid sleep disorders are frequently seen in patients with OSA and can include insomnia, shift work disorder, inadequate sleep hygiene, and advanced/delayed sleep phase disorders.[13,14] It is valuable to identify the existence of these diagnoses, in addition to their primary complaint, as it allows for adequate counseling prior to the initiation of management along with a customized treatment plan to address all issues.

The use of subjective questionnaires is also a valuable adjunct during the initial office visit and subsequent encounters. These can aide in assessing symptoms, making accurate diagnoses, and following progress of treatment. Commonly used subjective measures include the insomnia severity index (ISI), Epworth sleepiness scale (ESS), functional outcomes of sleep questionnaire (FOSQ), nasal obstruction symptom evaluation (NOSE), eating assessment tool 10 (EAT-10). For children, the OSA18 quality of life survey for children, and the Pediatric Sleep Questionnaire (PSQ) are frequently used.

The ISI is a self-administered 7 question instrument that can be used to assess patients sleep quality and perception of insomnia. Each question is measured on a 0-4 Likert scale and a total score of 15 or more indicates clinical insomnia.[15,16] The ESS is a self-administered 8 question instrument shown to provide a measure of the patients level of daytime sleepiness. Each question is scored on a 0-3 Likert scale and a total score greater than 10 is considered abnormal.[17] The FOSQ is a 30-question instrument developed to assess the impact of excessive sleepiness on daily activities across five domains.[18] In patients presenting with complaints of nasal obstruction, difficulty tolerating CPAP because of difficult nasal breathing, or those undergoing nasal surgery, the NOSE score can be valuable. It consists of five questions and is graded on a 0-100 scale. Scores greater than 25 are suggestive of moderate-severe nasal obstruction.[19] For those patients who have been intolerant of CPAP and are planning to undergo tongue base or hypopharyngeal surgery for management of their OSA, the eating assessment tool 10 is useful in the pre or postoperative setting to assess dysphagia.[20] The OSA18 The PSQ is a 22-item survey which is completed by caregivers and is calculated based on the percentages of "yes" answers with the final scores range from 0 to 1.0. Its sensitivity for each subscore, using a cutoff value of 0.33, ranges from 81% to 85%, with a specificity of 87%.[6]

There are numerous validated instruments that can be utilized and each physician should select those best suited for their practice and individual patients.

4 | SLEEP TESTING

In assessing patients presenting with sleep complaints, it is imperative to review any prior testing as they may already carry a diagnosis of sleep apnea. These reports and any preferred survey(s) can be obtained prior to a scheduled appointment to facilitate a virtual visit. Although reviewing prior sleep data, it is crucial to assess for the presence of any central apnea. Positional data is also important to evaluate, as those patients whose indices are significantly worse in the supine position may benefit from primary or adjunctive treatment with a positioning device. In addition, attention should be paid to assessment of factors that may indicate other sleep disorders such as the periodic limb movement index, baseline and sleep-related hypoxemia and hypercarbia (if measured). If studies are significantly outdated or the patient has had substantial change in weight, a repeat study is warranted.

Many patients presenting with sleep complaints and no prior diagnosis may require sleep testing through polysomnography or home testing. This has become a logistical challenge with the onset of the COVID-19 pandemic. As the virus has become wide spread in many cities, access to in-laboratory polysomnography has become limited. Many sleep laboratories are limiting or postponing in lab diagnostic testing. Titration studies may also be limited as there is the possibility of increased aerosolization in COVID-19 positive patients using positive pressure ventilation and increased risk of transmission to those in proximity. Although there is no published data confirming the increased risk of transmission of COVID-19 with the use of PAP, the Centers of Disease Control, World Health Organization, and other health organizations have advised precautions when performing aerosol generating procedures, including PAP.

Home sleep testing has become a primary testing modality in adults with the limited ability to obtain in-laboratory polysomnography. These tests can be picked up by or shipped directly to the patient. Components of the test may be disposable and in some technologies the test kit can be disinfected upon return, prior to any data download. Moving forward, home sleep testing can continue to be utilized in those patients unable or unwilling to undergo in laboratory polysomnography. There are few approved home study options for children which may be a limiting factor for home assessment in this population.

5 | CONTINUOUS PAP

CPAP remains one of the primary initial treatment options for patients with OSA. The onset of the COVID-19 pandemic has created unique challenges for initiating and continuing CPAP therapy for many patients. Many patients have had limited access to in person office visits as they are hesitant to expose themselves to health care settings and many practices have transitioned to telemedicine.

There are alternative options to combat the current issues we face in the setting of the COVID-19 pandemic to provide therapy to patients. As mentioned above, home sleep testing can be used in lieu of in-laboratory polysomnography. In addition, auto-titrating CPAP devices can be utilized as opposed to set pressure CPAP assessed

through titration polysomnography. In addition, The Centers for Medicare and Medicaid Services (CMS) has announced temporary regulatory changes to allow flexibility to heath care providers caring for these patients during the COVID-19 pandemic. They have eliminated the requirement for face-to-face or in-person encounters. CMS will also not enforce the indications to cover CPAP devices and allow prescription based on the clinician's assessment of the patient.[21,22]

6 | VIRTUAL PHYSICAL EXAM

The physical examination is a vital part of evaluating and providing treatment recommendations when assessing patients. Virtual medicine presents significant challenges for a meaningful physical examination. The examiner should begin the encounter with the presumption that a virtual examination cannot replace a traditional comprehensive examination, and that decisions leading to surgical intervention will require an in-person examination.

The virtual OSA directed physical examination should be performed methodically and efficiently, which begins with good lighting. Lighting can be optimized with a few simple tools available to most patients, including a flashlight and an improvised tongue depressor. Given the right situation, the virtual examination can be surprisingly comprehensive, and in combination with polysomnography data, serves as an excellent screening or triage tool for patients considering alternatives to traditional therapy for management of OSA. However, evaluation of children may also be limited by their ability to cooperate with the examination.

The OSA Directed Virtual Exam can be broken down in to components including body mass index (BMI), facial profile assessment, nasal, oral cavity, oropharynx, and neck examination. (Table 1).

6.1 | Body mass index

The physical examination should begin with an assessment of BMI and fat distribution around the neck.

6.2 | Facial profile assessment

The facial profile has a significant impact on the selection and effectiveness of treatment options. Skeletal hypoplasia, including maxillary and mandibular hypoplasia, can be easily visualized through virtual or in person examination.

6.3 | Nasal examination

The nasal examination should begin with an inquiry about subjective nasal obstruction, side of obstruction, positional obstruction, and sense of smell. The patient's response to nasal decongestants (oxymetazoline) will provide information about variable and fixed nasal obstruction due to inferior turbinate hypertrophy and septal deviation respectively. Assessment of the external nose may give a sense of structural obstruction including an assessment from the base. In addition, a modified Cottle maneuver can be performed which may give some limited information regarding a contribution of nasal valve collapse.

6.4 | The oral examination

The oral cavity can be readily assessed with the aid of a flashlight. OSA related observations should include: the state of the patient's dentition and the use of partial or total dentures, presence of enough structural support or permanent teeth to support an oral appliance, and determination of Angle Class and a gross estimate of skeletal class.

The hard palate should also be visualized and characterized as high arched or broad. The oral tongue should be assessed for scalloping which is an indication of oral crowding. Perhaps the most important component of the predicting surgical success is the modified Mallampati position (Friedman tongue position), which is determined with the patient's mouth open and tongue held in the resting non-protruded position.[23]

TABLE 1 Directed virtual visit physical examination for patients with obstructive sleep apnea

Other	Facial Profile	Nasal	Oral cavity	Oropharynx	Neck	Staging
Document BMI	Midface hypoplasia	Nasal deformity	Dentition	Tonsil size (0-4)	Collar size	Friedman stage – Tonsil size – BMI
Listen for stridor or stertor	Skeletal class – Retrognathia – Prognathia – Orthognathic	Subjective obstruction	Angle class	Uvula length	Thyro-mental distance	HGNS – BMI – AHI – No DISE
		Nasal valve stenosis	Skeletal class	PPM position		
		Afrin challenge	Hard palate			
			Tongue scalloping			
			Modified Mallampati score			

6.5 | Oropharyngeal exam

Like the oral cavity examination, the oropharyngeal exam is aided with good lighting and an improvised tongue depressor. A number of important contributors to OSA can readily be assessed via virtual examination including the tonsil size, the length of the uvula, and in some cases the position of the posterior palatal arch—the palatopharyngeus muscle. The tonsils are graded using the well know Brodsky scale (0-4).[24]

6.6 | The tongue base and larynx

The tongue base and larynx cannot be assessed by a virtual examination. Patients who are being considered for surgical treatment will commonly need to be seen in person for a comprehensive examination, including flexible laryngoscopy to evaluate the tongue base for lymphoid and muscular hypertrophy and the larynx for rare contributors to OSA.

6.7 | Neck exam

Collar size is an important indicator for OSA in adults. Most men are able to provide the physician their collar size. In addition, the thyromental distance, a surrogate measure of mandibular hypoplasia, can be performed by the patient with instruction.

6.8 | Staging

The virtual examination, when coupled with PSG data and PAP titration data, allows the examiner to use different models to predict success or failure of a variety of treatment options. One of the time-tested predictors of success is the Friedman staging system which predicts success for single level surgery for OSA.

In some cases, enough information is obtained from the virtual examination to rule out procedures as a management option for a given patients. For example, many patients may inquire about UAS therapy, but have a high BMI (>35 kg/m^2) that would make them a poor candidate, an AHI that is too low to qualify (<15 events/hour), or be too young (<18 years) based on current US Food and Drug Administration criteria.[25]

7 | MANAGEMENT OF CPAP INTOLERANT PATIENTS

The virtual visit is an ideal platform for the initial evaluation and counseling of patients about the diagnosis of OSA and their treatment options. In those who have already attempted CPAP therapy, this method allows for a comprehensive assessment of reasons for CPAP failure. In addition, it may allow for a broad conversation about the contribution of nasal obstruction, signs and symptoms of rhinitis, as well as previous nasal treatments attempted.

Coupled with a virtual examination and the patients prior sleep study data, a variety of management options can be discussed and a treatment plan initiated. Many patients with OSA have never had a conversation with their sleep provider about alternative treatment options. There are many effective alternative modalities to PAP therapy and patients are happy to discuss the options which include; positional therapy, MADs, weight loss, and various surgical interventions. Many patients will present with a preconceived notion that they want a specific surgery or device. A comprehensive virtual evaluation allows for efficient triage and provides patients with valuable education.

Many otolaryngologists managing these patients will utilize DISE as a means of assessing the location, severity, and character of upper airway obstruction. DISE is an examination completed whereas the patient is sedated and snoring. A flexible fiberoptic scope with camera is used to assess the entirety of upper airway from the nasal cavity to the larynx. After completing a virtual visit, appropriate patients can move forward with DISE for further airway evaluation and treatment planning. Care and appropriate precautions need to be taken by the otolaryngology and anesthesia teams as DISE has moderate risk to be an aerosol generating procedure due to its high likelihood to cause coughing or sneezing. In addition, COVID-19 testing preoperatively should be performed per institutional procedure.[26] In those patients with complaints of nasal obstruction and OSA, further in person evaluation and examination may be necessary prior to proceeding with DISE as these patients may benefit from nasal surgery which can be done concurrently.

8 | CONCLUSION

The virtual visit can be very useful for the assessment and counseling of adults and children with OSA. Here we include tips to optimize the history and examination of these patients and highlight the shortcomings including the internal nasal and laryngeal evaluations in addition to the need for patient cooperation.

CONFLICT OF INTEREST

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AUTHOR CONTRIBUTIONS

Colin Huntley, Maurits Boon, Stacey Ishman, Robson Capasso, Julia Crawford, Mark A. D'Agostino, and Paul Hoff: manuscript development, drafting, and completion.

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