



Obstructive Sleep Apnea: Assessment and Management in Adults

Effective Date: October 21, 2021

Scope

This guideline applies to adult patients 19 and older with suspected obstructive sleep apnea (OSA).

While sleep apnea may occur in 1-4% of children¹, pediatric diagnosis and management is beyond the scope of this guideline. For a brief pediatric overview, see [Appendix A: Sleep Apnea in Children](#). Other conditions that may contribute to daytime sleepiness are also out of the scope of this guideline. Please see [Appendix B: Other Conditions Associated with Daytime Sleepiness](#).

Key Recommendations

History

- If OSA is suspected, conduct a detailed history and a physical examination, focused on the upper airway.²
- The STOP-Bang questionnaire can be used to help determine if a patient is at increased risk of moderate to severe OSA.²
- While the most common symptom of OSA is excessive daytime sleepiness, the clinical presentation can vary. Completion of the [Epworth Sleepiness Scale](#) is recommended.²
- Patients with untreated OSA may have increased perioperative morbidity.³ Consider appropriate screening when referring patients for potential surgery (e.g., STOP-Bang Questionnaire). See also the [BC Surgical Rehabilitation Toolkit](#) for further information. [Expert opinion]

Testing and Referral

- Home Sleep Apnea Test (HSAT) should not be used to screen asymptomatic patients. HSAT is only recommended for the diagnosis of OSA in symptomatic patients who are determined to be at an increased risk of moderate-to-severe OSA, and who have no exclusion criteria (see [Requisition](#)).²
- A negative or equivocal HSAT does not exclude OSA. If an HSAT is negative, inconclusive or technically inadequate, and OSA is suspected, polysomnography is recommended.²
- BC now has a [Standard Requisition for HSAT](#) that referring practitioners are required to use.
- Symptomatic patients for which the HSAT is not the appropriate diagnostic test should be referred for a sleep disorder consultation for polysomnography.² [Expert Opinion]

Management and Follow-up

- When assessing whether a patient should be treated, it is important to consider the severity of the symptoms, presence and severity of any comorbid disease, presence of any safety-critical occupation and the results of all sleep studies.
- OSA is a serious chronic disease that warrants regular follow-up, short-term to ensure initial compliance and response to treatment and long-term to confirm continued effectiveness.³
- Patients with OSA may be prone to drowsiness while driving. Physicians caring for these patients should be familiar with [BC's Driver Medical Fitness Information for Medical Professionals](#). [Expert Opinion]
- Surgery for OSA, including minimally invasive techniques to reduce tissue volume, incurs typical surgical risks. Since there may be effective medical alternatives to surgery, prior referral to a sleep disorder physician is recommended.

Types of Sleep Apnea

There are four types of sleep apnea:

- **Obstructive sleep apnea (OSA)** is the most common type of sleep apnea encountered in primary care. It is characterized by complete cessation or transient reduction in breathing with maintained or increasing respiratory effort. Home Sleep Apnea Testing (HSAT) **should only be performed** on patients who present with an increased risk of moderate-to-severe OSA.
- **Other less common types of sleep apnea include:**
 - **Central sleep apnea** is characterized by complete cessation or transient reduction in breathing with absent respiratory effort. This occurs in patients with neurological disease or in association with drug/substance abuse or high altitude.
 - **Cheyne-Stokes breathing** is characterized by a crescendo-decrescendo pattern of respiration between central apnea. This frequently occurs in patients with heart failure or cerebrovascular disease.
 - **Complex sleep apnea** is characterized by the persistence or emergence of central apneas or hypopneas when treated with Continuous Positive Airway Pressure (CPAP or BiPAP) and obstructive apnea has been resolved. This may occur in up to 10% of patients with OSA treated with CPAP.

Sleep hypoventilation is a sleep disorder characterized by significant hypercapnia and hypoxemia during sleep. This usually occurs in patients with OSA and morbid obesity or obstructive or restrictive lung disease. These patients usually require urgent evaluation.⁴

Epidemiology

OSA is associated with poor quality of life^{6,8,9} and has been linked to severe chronic health conditions such as obesity, diabetes, metabolic syndrome^{3,10} and neuro-psychiatric problems.¹⁰

Moderate–severe OSA is associated with an increased risk of cardiovascular disease, resulting in hypertension, coronary disease, stroke, heart failure, and atrial fibrillation.⁵

OSA is widely underdiagnosed; 86% to 95% of individuals found in population surveys with clinically significant OSA report no prior OSA diagnosis.⁶

The Canadian Health Measures Survey results from 2016 and 2017 showed:⁷

- **6.4% of Canadian adults had been diagnosed with OSA by a health care professional**
- **Those at particular risk include:**
 - Older adults (60 to 79 years, 3 times more likely)
 - Males (2 times more likely to be diagnosed compared to females)
 - Males reporting snoring, trouble breathing or high neck circumference (≥ 17 inches)
 - Females reporting fatigue, insomnia, or high body mass index ($>35\text{kg/m}^2$)

At the clinically relevant Apnea Hypopnea Index (AHI) level of 15 or greater per hour, the prevalence of OSA in the elderly population can be very high – up to 49% in some studies.^{8,9}

Risk Factors¹⁰

Risk factors for OSA include, but are not limited to:

- Down syndrome¹¹
- family history of obstructive sleep apnea
- Mandibular hypoplasia (retrognathia, micrognathia)
- low-lying soft palate (i.e., high Mallampati Score)
- large tongue
- tonsillar hypertrophy

- upper body obesity with a large neck size
- East Asian origin¹²
- Parkinson’s disease¹³
- traumatic brain injury¹⁴
- nasal and nasopharyngeal obstruction¹⁵
- neuromuscular disease¹⁶
- Marfan syndrome¹⁷
- polycystic ovarian disease¹⁸

Risks of Untreated or Undertreated OSA^{2,19–21}

Untreated or undertreated OSA pose serious risks and have been associated with: daytime sleepiness, impaired quality of life, motor vehicle crashes, occupational injury, systemic hypertension, type 2 diabetes, cardiac arrhythmia, aortic dilatation/dissection, coronary artery disease, heart failure, stroke, depression, cognitive impairment, cancer, ocular disease, pneumonia, renal dysfunction, dementia, seizures, hypogonadism, maternal/fetal health, post-operative complications, and premature death.

Patients with untreated OSA may have increased perioperative morbidity (postoperative cardiac events, acute respiratory failure, desaturation and reintubation);²¹ consider appropriate screening when referring patients for potential surgery (e.g., using the STOP-Bang Questionnaire, [Appendix C: STOP-Bang Questionnaire](#)). See also the [BC Surgical Rehabilitation Toolkit](#) for further information.

History and Physical Examination

- History and physical examination are crucial first steps towards the recognition and diagnosis of OSA.² Patient history should focus on nocturnal breathing abnormalities, daytime sleepiness, and family and personal medical history.
- Consider using the STOP-Bang questionnaire to help determine if a patient is at increased risk of moderate to severe OSA ([Appendix C: STOP-Bang Questionnaire](#)).²
- Determine the patient’s risk factors for OSA (see list on pages 2-3 above).
- While the clinical presentation of OSA can vary, the most common symptom is excessive daytime sleepiness. Inquire about the impact of daytime sleepiness (e.g., “Have you had any accidents or near misses related to sleepiness while driving?” or “Have you ever had to stop an activity due to sleepiness?”). Request completion of the [Epworth Sleepiness Scale](#). A score of greater than 10 suggests significant daytime sleepiness, although a score of 10 or less does not exclude daytime sleepiness or OSA.
- Other OSA symptoms include:
 - fatigue
 - habitual loud snoring
 - choking, gasping, or pauses in breathing during sleep
 - morning headache
 - recurrent night-time awakenings
 - unrefreshing or restless sleep
 - impaired concentration
 - nocturia
- All patients should be questioned about driving or safety critical occupation (e.g., truck, taxi, bus drivers, railway engineers, commercial pilots²²) where sleepiness could be a hazard, whether they operate heavy equipment, the class of their driver’s license and whether they have fallen asleep at the wheel or have come close to doing so in the past 5 years.

Physical examination:

- Head and neck examination are important.
 - Measure the neck circumference if feasible
 - Examine the upper airway and it may be useful to evaluate the Mallampati score – Mallampati Classification ([Appendix D: Mallampati Classification](#)). A higher Mallampati classification has been associated with OSA diagnosis and increased AHI. For every 1-point increase in the Mallampati score, the odds of having OSA increased by more than 2-fold.²³.

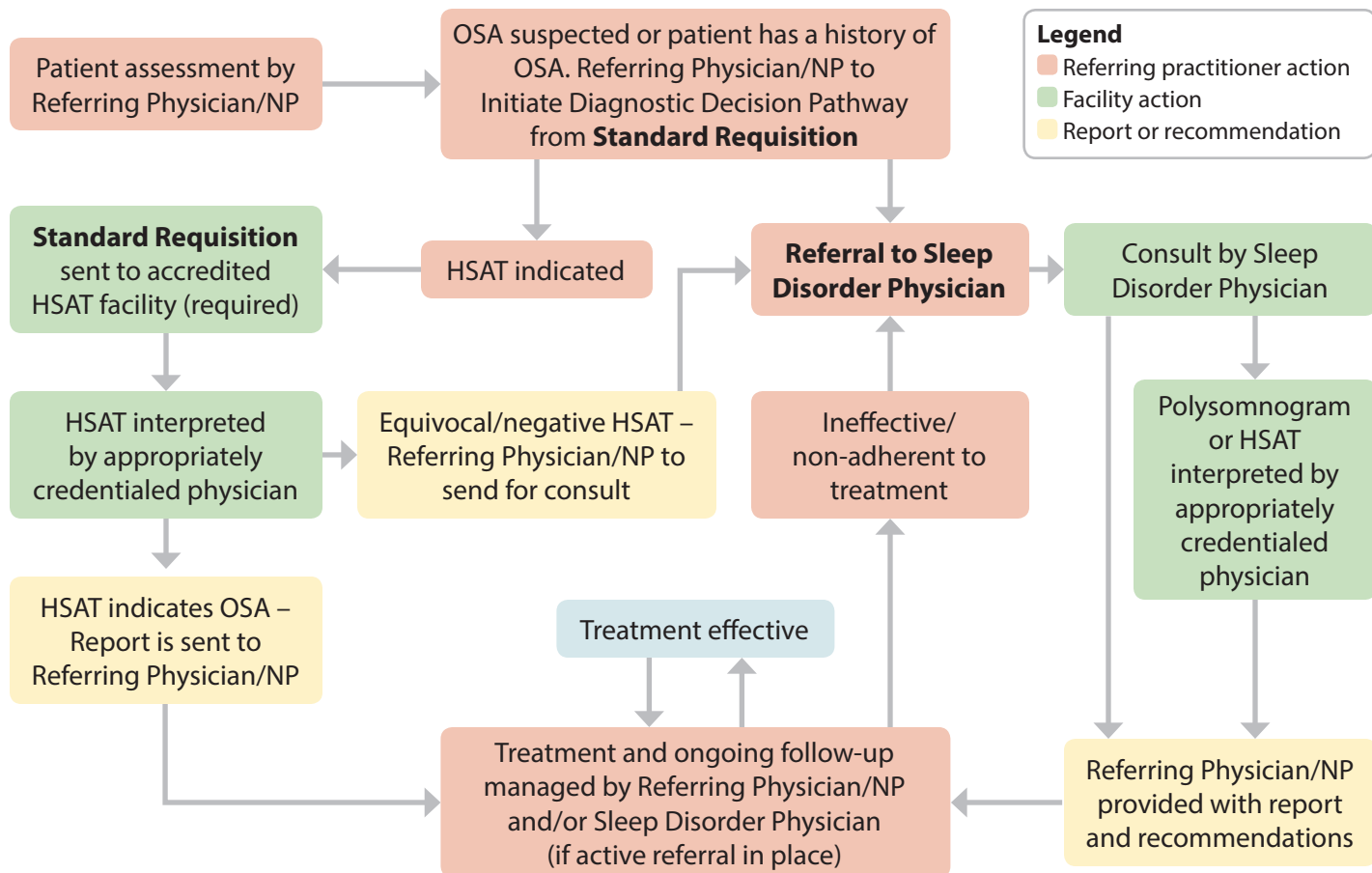
Testing and Referral

- To determine if a patient requires a diagnostic test for OSA, it is important to first identify if they are at increased risk of moderate-to-severe OSA. This is indicated by the presence of excessive daytime sleepiness or fatigue and **at least two of the following three criteria**:
 - witnessed apneas or gasping or choking
 - habitual loud snoring
 - diagnosed hypertension
- If the patient is at an increased risk of moderate-to-severe OSA, then the Home Sleep Apnea Test (HSAT) is an appropriate diagnostic test, rather than a polysomnography.
- **However, HSAT is not the appropriate test if one or more of the following exclusion criteria apply (any one item precludes HSAT):**
 - concern for non-respiratory sleep disorder (e.g., chronic insomnia, sleep walking/talking)
 - risk of hypoventilation (e.g., neuromuscular disease, BMI ≥ 40 kg/m²) chronic/regular opiate medication use significant cardiopulmonary disease (e.g., history of stroke, heart failure, moderate-to-severe lung disease)
 - previous negative or equivocal HSAT
 - age < 16 years
 - inability to complete necessary steps for self-administered HSAT (e.g., cognitive, physical, or other barriers)
- Recognizing that some patients may not have a bed partner, the referring physician may, while conducting a physical examination, assess whether there is a reasonable suspicion of nocturnal breathing events such as apneas, gasping, choking or habitual loud snoring.
- HSAT is not recommended for pediatric patients, however, physician evaluation, rather than age, may be the best way to determine whether an adolescent presents as an adult.
- Patients at increased risk of moderate-to-severe OSA but with one of more of the exclusion criteria above should be referred to a sleep disorder physician for potential polysomnography (PSG).
- Referral for HSAT is limited to:
 - Registrants of the College of Physicians and Surgeons of British Columbia
 - Nurse practitioners or other designated health professional as authorized by the College of Physicians and Surgeons of British Columbia.
- If an HSAT is negative, equivocal, or the patient has been mis-referred:
 1. The diagnostic facility is to notify the referring physician that the patient did not/does not meet the requirements for an HSAT and recommend a sleep disorder consultation and/or Level 1 polysomnogram study (**preferred**), *or*
 2. The diagnostic facility's Medical Director or interpreting physician may refer the patient for a sleep disorder consultation and/or Level 1 study and notify the originating/referring physician, ensuring the originating/referring physician receives a copy of the HSAT result. *In this case the Medical Director or interpreting physician is responsible for patient follow up as the ordering physician and cannot assume the original referring physician will provide patient follow up on the test.*

Facilities must have a policy and procedure for notifying the referring physician of critical results immediately.

- To order HSAT or to request a referral for a sleep disorder consultation, see Associated Documents.
- For patients with suspected OSA, [Figure 1](#). outlines the patient pathway.

Figure 1: Patient Pathway for Patients with Suspected OSA



Interpretation of Results

- The diagnostic sleep report should provide an assessment as to whether the patient has OSA and whether it is mild, moderate, or severe.
- **Apnea Hypopnea Index (AHI):** Is defined by the number of apnea and hypopnea per hour of measured sleep.
- In addition to symptoms and presence of comorbid disease, AHI is one of the criteria used to determine the severity of sleep apnea.
 - AHI values should be considered in conjunction with clinical presentation, including a patient's symptoms, co-morbidities and occupation, and all sleep monitoring abnormalities such as degree of hypoxemia (see [Table 1: AHI Interpretation](#) below).

Table 1: AHI Interpretation

Result	Interpretation
AHI values	Severity of OSA: ² in conjunction with symptoms and comorbid disease <ul style="list-style-type: none">• Normal (< 5 events per hour)• Mild (5-14 events per hour)• Moderate (15-29 events per hour)• Severe (\geq 30 events per hour)

OSA Management

When assessing whether a patient should be treated it is important to consider the severity of the symptoms, presence and severity of any comorbid disease, presence of any safety-critical occupation and all the sleep monitoring abnormalities.

Patients with OSA and daytime sleepiness and/or sleep related arterial oxygen desaturation appear more likely to develop vascular complication if left untreated. It is important to treat most patients with OSA if they have comorbid disease or work in a safety critical occupation such as a commercial driver. Treatment should be considered in patients with fatigue and/or sleepiness even if the AHI is in the milder range.

Patients with OSA may be prone to drowsiness while driving. Physicians caring for these patients should be familiar with [BC's Driver Medical Fitness Information for Medical Professionals](#). [Expert opinion]

Surgical options are primarily for patients with tonsillar hypertrophy or craniofacial abnormalities and require referral to a sleep disorder physician and to the appropriate surgeon for more comprehensive evaluations.

Healthy Behaviours and Diet: The importance of healthy behaviours and diet, including exercise and weight loss, should be recommended for patients with elevated BMI, although it is not adequate as a stand-alone therapy if the patient is sleepy or has moderate to severe OSA. Weight loss is more successful if the patient uses definitive therapy to control their OSA and then retest after their weight goal is achieved to see if definitive therapy is still required.

Continuous Positive Airway Pressure (CPAP): CPAP is generally the most effective treatment for OSA. If a patient is diagnosed with OSA and is unwilling or intolerant of CPAP, consider alternate therapies or refer to sleep disorder physician.

Positional Therapy: Avoiding sleeping in the supine position is an option if testing shows that OSA is primarily in the supine position. There are electronic devices that can monitor and record sleeping positions.

Other devices (oral, etc.): Oral appliances may be useful for mild to moderate OSA or those intolerant/unwilling to use CPAP and can be effective for some patients.

For additional OSA management information, see [Appendix F: OSA Management Options](#). For additional information on oral and other devices, see [Appendix G: Oral and Other Devices](#).

Follow-Up

- OSA is a serious chronic disease that warrants regular follow-up; short-term to ensure initial compliance and response to treatment and long-term to confirm continued effectiveness.³
- There is no need to re-test if the patient is doing well on long-term CPAP therapy and there is no change in clinical status.
 - Annual follow-up is recommended with CPAP download
 - Indications for retesting: Persistent daytime symptoms, abnormal overnight oximetry or residual sleep disordered breathing based on CPAP download
- Whatever treatment is used, the patient should be followed until the AHI is normal (less than 5 events per hour), the [Epworth Sleepiness Scale](#) score is 10 or less, the patient feels rested, and a bed partner reports no residual snoring. Ideally, the patient is using the treatment every night, all night.
- CPAP machines also provide a patient accessible read out of 'events per hour'. This is an index of residual sleep apnea and not a true AHI as it is not derived from sleep monitoring but is a useful daily indication of therapy effectiveness.

Problem Solving CPAP therapy

After treatment, non-adherence to CPAP therapy, CPAP intolerance and persistent sleepiness after therapy may occur. Considerations include:

- CPAP non-adherence: Lack of interest/understanding of OSA – importance of treatment can be reinforced; depends on indications for treatment and severity of disease.²⁴

CPAP intolerance – is common and should be addressed by the CPAP provider.²⁴ See table below for common causes of intolerance. See [Table 2: CPAP Intolerance and Treatment Recommendations](#) below.

Table 2: CPAP Intolerance and Treatment Recommendations

CPAP Intolerance/Problem	Recommended Treatment
Nasal congestion	Saline nasal rinses +/- intranasal steroid, increase humidity, consider full face mask
Difficulty exhaling against pressure	Use Expiratory Pressure Release (EPR) option
Mouth/nasal dryness	Adequate hydration and heated humidity on CPAP machine; chin strap for mouth leak
Claustrophobia	Trial of CPAP while sitting or awake and supine before using during sleep; consider nasal mask or pillows (vs full face mask)
Persistently elevated AHI	Make sure any leak is well controlled, obstructive events generally respond to pressure increase
Persistent fatigue or sleepiness	Ensure CPAP is used for full night (7 hours or more recommended); possible other sleep disorder, refer for consultation

Methodology

These guideline recommendations are tailored to support practice in British Columbia and are based on the ADAPTE Collaboration guideline adaption methodology.²⁵ Clinical recommendations were developed based on the sourced guidelines,^{2,3,19,26–29} a Primary Care Pathway: Uncomplicated Obstructive Sleep Apnea,²⁴ as well as expert clinical consensus where evidence was insufficient or unavailable.

The source guidelines were chosen following an environmental scan of internationally available guidelines. Guidelines were chosen for adaptation following an evaluation using the Appraisal of Guidelines for Research and Evaluation II (*AGREE II*) tool.³⁰ In situations where there is a lack of rigorous evidence, best clinical opinion has been provided to support decision making and high-quality patient care.

The guideline development process includes significant engagement and consultation with primary care providers, sleep disorder physicians, and key stakeholders. For more information about Guidelines and Protocols Advisory Committee (GPAC) guideline development processes, refer to the GPAC handbook available at BCGuidelines.ca.

The level and quality of evidence for the key recommendations are based on those used by the AASM: Clinical Practice Guideline for Diagnostic Testing for Adult Obstructive Sleep Apnea (2017).² Please refer to those guidelines for a summary of the levels of evidence (table 5). Where evidence was insufficient or unavailable expert clinical consensus was used and is indicated in the key recommendations as “expert opinion”.

Resources

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Abbreviations

AHI – Apnea Hypopnea Index

BMI – Body Mass Index

CPAP – Continuous Positive Airway Pressure

EPR – Expiratory Pressure Release

HSAT – Home Sleep Apnea Testing

OSA – obstructive sleep apnea

PSG – Polysomnography

Appendices

[Appendix A: Sleep Apnea in Children](#)

[Appendix B: Other Conditions Associated with Daytime Sleepiness](#)

[Appendix C: STOP-Bang Questionnaire](#)

[Appendix D: Mallampati Classification](#)

[Appendix E: Sleep Study Levels](#)

[Appendix F: OSA Management Options](#)

[Appendix G: Oral and Other Devices](#)

Associated Documents

[Standard Requisition for Home Sleep Apnea Test \(without Sleep Disorder Physician consultation\) – HLTH 1944](#)

[Referral Request – Sleep Disorder Consultation – HLTH 1945](#)

This draft guideline is based on scientific evidence current as of effective date.

The guideline was developed by the Guidelines and Protocols Advisory Committee and adopted by the Medical Services Commission.

For more information about how BC Guidelines are developed, refer to the GPAC Handbook available at [BCGuidelines.ca: GPAC Handbook](http://BCGuidelines.ca:GPACHandbook).

THE GUIDELINES AND PROTOCOLS ADVISORY COMMITTEE

The principles of the Guidelines and Protocols Advisory Committee are to:

- encourage appropriate responses to common medical situations
- recommend actions that are sufficient and efficient, neither excessive nor deficient
- permit exceptions when justified by clinical circumstances

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The Clinical Practice Guidelines (the "Guidelines") have been developed by the Guidelines and Protocols Advisory Committee on behalf of the Medical Services Commission. The Guidelines are intended to give an understanding of a clinical problem, and outline one or more preferred approaches to the investigation and management of the problem. The Guidelines are not intended as a substitute for the advice or professional judgment of a health care professional, nor are they intended to be the only approach to the management of clinical problem. **We cannot respond to patients or patient advocates requesting advice on issues related to medical conditions. If you need medical advice, please contact a health care professional.**



Appendix A: Sleep Apnea in Children^{1,31,32}

- The prevalence of OSA in children is 1 – 4% with one of the more common causes being tonsillar hypertrophy.
- Nasal congestion or enlarged adenoids can aggravate oral-pharyngeal obstruction by causing increased negative pressure when trying to inhale through a restricted nasal airway. A trial of a nasal steroid may be helpful followed by a referral to ENT for persistent nasal restriction.
- Other common conditions associated with OSA are micro or retrognathia, Down's Syndrome, craniofacial syndromes (including cleft palate pre and post repair), obesity, neuromuscular disorders and metabolic disorders.
- Severe craniofacial disorders require an ENT evaluation or referral to a craniofacial clinic at BC Children's Hospital.
- OSA symptoms in children are similar to adults with snoring, pauses in breathing, snorting, choking, gasping, daytime fatigue and sleepiness. In addition, impaired daytime concentration may be misdiagnosed as ADHD, behavioural and emotional problems or learning disabilities. Children can also present with slow growth, failure to thrive, and secondary enuresis.
- Polysomnography remains the gold standard for OSA diagnosis in children. HSAT is not recommended as it is not sensitive enough to be accurate. Children with suspected OSA should be referred to a physician with pediatric sleep experience or the Sleep Clinic at BC Children's Hospital.



Appendix B: Other Conditions Associated with Daytime Sleepiness

Other conditions associated with excessive daytime sleepiness include:²⁴

- **Sleep restriction:** behavioural, jet lag, shift work, circadian rhythm disorder
- **Sleep-disordered Breathing:** sleep-related hypoventilation, central sleep apnea
- **Movement disorders in sleep:** periodic limb movement disorder (disrupts sleep)
- **Parasomnia** (e.g., sleep walking, sleep talking)
- **Primary hypersomnia:** Narcolepsy, Idiopathic hypersomnolence
- **Medications:** antidepressants (almost all), sedatives/alcohol, narcotics, stimulant withdrawal
- **Medical/psychiatric disease:** mood/anxiety disorders, chronic disease (e.g., chronic heart failure, chronic kidney disease)
- **Endocrine abnormalities:** hypothyroidism, hypopituitary conditions



Appendix C: STOP-Bang Questionnaire

Is it possible that you have Obstructive Sleep Apnea (OSA)?

Please answer the following questions below to determine if you might be at risk.

STOP		
Snoring? Do you Snore Loudly (loud enough to be heard through closed doors or your bed-partner elbows you for snoring at night)?	Yes	No
Tired? Do you often feel Tired, Fatigued, or Sleepy during the daytime (such as falling asleep during driving or talking to someone)?	Yes	No
Observed? Has anyone Observed you Stop Breathing or Choking/Gasping during your sleep?	Yes	No
Pressure? Do you have or are being treated for High Blood Pressure?	Yes	No

Bang		
Body Mass Index more than 35 kg/m ² ?	Yes	No
Age older than 50?	Yes	No
Neck size large? (Measured around Adams apple) Is your shirt collar 16 inches / 40cm or larger?	Yes	No
Gender = Male?	Yes	No

For general population

OSA – Low Risk: Yes to 0 – 2 questions

OSA – Intermediate Risk: Yes to 3 – 4 questions

OSA – High Risk: Yes to 5 – 8 questions

or Yes to 2 or more of 4 STOP questions + male gender

or Yes to 2 or more of 4 STOP questions + BMI > 35kg/m²

or Yes to 2 or more of 4 STOP questions + neck circumference 16 inches / 40 cm

Property of University Health Network, available at <http://www.stopbang.ca/osa/screening.php>

Modified from:

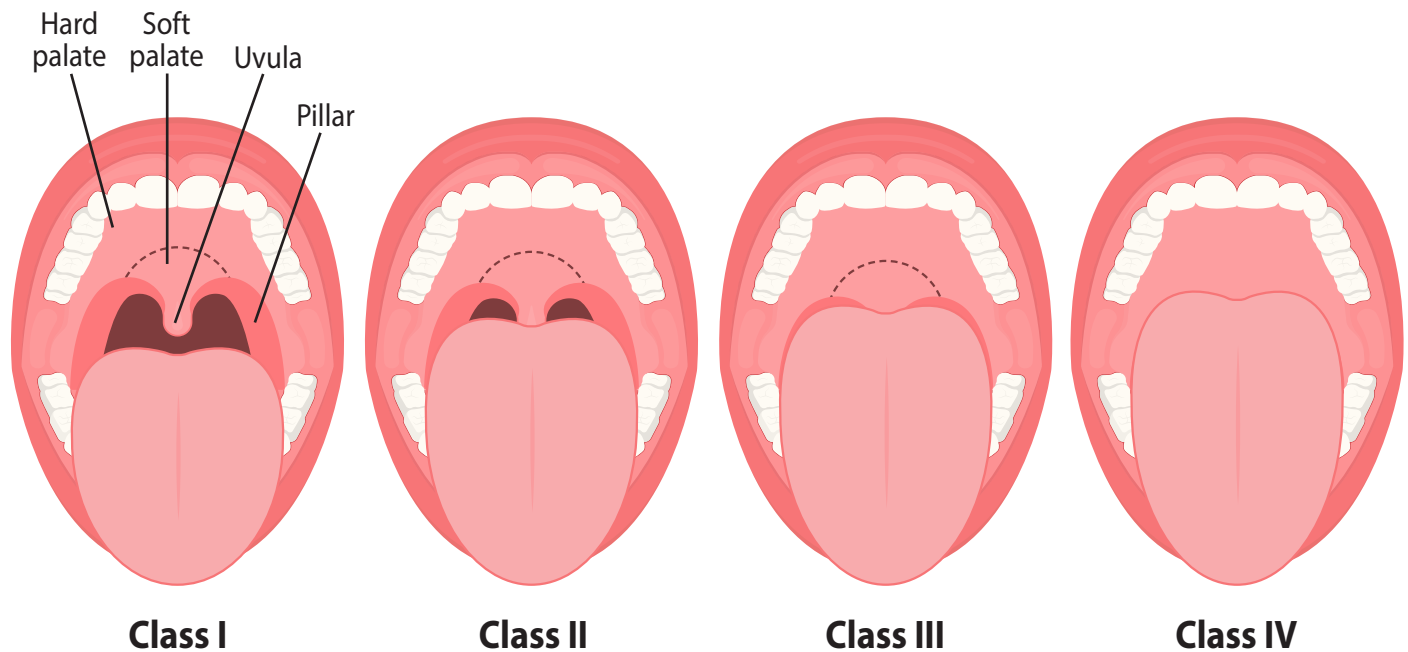
Chung F et al. Anesthesiology 2008; 108: 812-821,

Chung F et al Br J Anaesth 2012; 108: 768-775,

Chung F et al J Clin Sleep Med Sept 2014.



Appendix D: Mallampati Classification of Airway*



* Modified Mallampatti Classification created based on Samsoun GL, Young JR. Difficult tracheal intubation: a retrospective study. *Anaesthesia* 1987; 42:487.

Mallampati classification is useful in determining the pretest likelihood of potential obstructive sleep apnea. Patient should be in the sitting position, with the head in the neutral position, the mouth opened maximally, and the tongue protruded maximally. Examiner should be seated opposite the patient at eye-level. A higher Mallampati score has been associated with OSA diagnosis and increased AHI. For every 1-point increase in the Mallampati score, the odds of having OSA increased by more than 2-fold.²³



Appendix E: Sleep Study Levels

Sleep Study Level	Test Description
I	<p>Polysomnogram (PSG) – Overnight test conducted in a sleep lab. Measures a complete set of biological signals, including airflow, electroencephalography (EEG), electrocardiogram (ECG), electrooculography (EOG), electromyography (EMG), oxygen saturation, thoracic effort, abdominal effort, body position, and limb movement. Often referred to as the gold standard for diagnostic sleep testing as a) EEG is the only way to actually measure sleep; b) PSG test can be used to diagnose all forms of sleep apnea (including OSA) and parasomnias, movement disorders, bruxism, and nocturnal seizures.²</p>
II	<p>Ambulatory polysomnogram – Overnight, unattended test. Currently not a significant factor in diagnostic sleep testing in B.C.</p>
III	<p>Home Sleep Apnea Test (HSAT) – Overnight test conducted by the patient (after instruction) in their home or preferred sleeping location. Used to diagnose only obstructive sleep apnea in patients who present with an increased risk of moderate-to-severe OSA, based on a comprehensive clinical sleep evaluation.^{3,26-28} (See Testing and Referral, page 4).</p> <p>HSAT measures two respiratory variables (thoracic effort and airflow), oxygen saturation, and a cardiac variable (e.g., pulse or electrocardiogram). It is not as sensitive as a PSG because without an EEG, sleep cannot be measured.</p>
IV	<p>Overnight Oximetry – measures oxygen saturation and pulse rate. It is not an appropriate test to diagnose OSA.³³</p>



Appendix F: OSA Management Options

See page 7 for details concerning OSA Severity.

OSA Severity	Treatment Options ³⁴				
	Weight loss	Positional Therapy	Tongue Retaining Device TRD	Mandibular Advancement Device (MAD)	CPAP
Primary Snoring	Yes	Yes – only if testing showed snoring was primarily in supine position	Yes	Yes	No
Mild OSA	Yes, with additional treatment if patient remains sleepy, has comorbid conditions or a safety critical occupation	Yes, only if testing showed OSA was primarily in supine position, with additional treatment if patient remains sleepy, has comorbid conditions or a safety critical occupation	Yes – if patient is in the low end of Mild OSA	Roughly 70% chance of being effective.	Yes
Moderate OSA	Requires additional treatment	Yes, only if testing showed OSA was primarily in supine position, with additional treatment if patient remains sleepy, has comorbid conditions or a safety critical occupation. Would need to use an electronic monitoring device to determine if patient is sleeping supine.	No	Roughly 50% chance of being fully effective, less if patient is obese (BMI>35). Confirm effectiveness with follow up testing	Yes
Severe OSA	Requires additional treatment	Yes, only if testing showed OSA was primarily in supine position, with additional treatment if patient remains sleepy, has comorbid conditions or a safety critical occupation. Would need to use an electronic monitoring device to determine if patient is sleeping supine.	No	Roughly 40% chance of being fully effective, less if patient is obese (BMI>35). Confirm effectiveness with follow up testing	Yes



Appendix G: Oral and Other Devices

Mandibular Advancement Device (MAD) is an appliance that fits over the upper and lower teeth with an adjustment to push the lower jaw forward. The device brings the tongue forward creating a more patent airway. Although expensive, for those that it works for, a custom device can be as effective as CPAP and often better tolerated. Patients may experience jaw or dental pain from MAD's which may inhibit use. Some movement and misalignment of the teeth may occur, but usually resolves itself if treatment is discontinued within the first year of treatment. Note there are many brands of MAD's. The ones using rigid bars or screws are likely to be more effective than those using elastic straps to pull the lower jaw forward.

Tongue Retaining Device is a flexible, silicone device that fits behind the lips in front of the teeth. It is a relatively inexpensive way of controlling snoring or very mild OSA with few side effects, compliance is generally low.

"Boil and bite" devices are much less expensive but are bulky and made of a soft material that does not last as long. They are usually patient-fitted, more prone to complications and much less effective. Boil and bite devices are not recommended for treatment of OSA.

Other devices used by patients: Devices such as adhesive nasal strips and nasal dilators may help nasal air flow but do not directly address the obstruction in the oral-pharyngeal airway that causes OSA. Similarly, chin straps may keep the mouth closed but do not correct the oral-pharyngeal airway obstruction. There is also a very real danger of an improperly applied strap pushing the jaw back and causing more obstruction.