

# How, what, and why of sleep apnea

## *Perspectives for primary care physicians*

Sharon A. Chung, PHD Shani Jairam, RN Mohamed R.G. Hussain, MD, CCFP, DABSM  
Colin M. Shapiro, MD, PHD, MRCPsych, FRCPC

### ABSTRACT

**OBJECTIVE** To review the need for primary care physicians to screen for patients with obstructive sleep apnea (OSA).

**QUALITY OF EVIDENCE** Literature was reviewed via MEDLINE from 1993 to 2000, inclusive, using the search term “sleep apnea” combined with “epidemiology,” “outcome,” and “diagnosis and treatment.” Citations in this review favour more recent, well controlled and randomized studies, but findings of pilot studies are included where other research is unavailable.

**MAIN MESSAGE** Obstructive sleep apnea is a disorder with serious medical, socioeconomic, and psychological morbidity, yet most patients with OSA remain undetected. Primary care physicians have a vital role in screening for these patients because diagnosis can be made only through overnight (polysomnographic) studies at sleep clinics. Physicians should consider symptoms of excessive or loud snoring, complaints of daytime sleepiness or fatigue, complaints of unrefreshing sleep, and an excess of weight or body fat distribution in the neck or upper chest area as possible indications of untreated OSA.

**CONCLUSION** Current research findings indicate that treating OSA patients substantially lowers morbidity and mortality rates and reduces health care costs. Primary care physicians need more information about screening for patients with OSA to ensure proper diagnosis and treatment of those with the condition.

### RÉSUMÉ

**OBJECTIF** Passer en revue la nécessité pour les médecins de famille de dépister chez les patients l'apnée obstructive du sommeil (AOS).

**QUALITÉ DES DONNÉES** Une recension des ouvrages scientifiques a été effectuée dans MEDLINE de 1993 à 2000 inclusivement à l'aide des termes de recherche en anglais pour «apnée du sommeil» combinés avec «épidémiologie», «issue» et «diagnostic et traitement». Les citations dans la présente étude privilégient les études aléatoires et bien contrôlées plus récentes mais les conclusions d'études expérimentales sont incluses lorsque d'autres recherches n'étaient pas disponibles.

**PRINCIPAL MESSAGE** L'apnée obstructive du sommeil est un trouble comportant une sérieuse morbidité médicale, socio-économique et psychologique et pourtant, la majorité des patients qui en souffrent demeurent non dépistés. Les médecins de première ligne exercent un rôle essentiel dans le dépistage de ces patients parce que le diagnostic ne peut être effectué que par des évaluations (polysomnographiques) durant la nuit dans des cliniques du sommeil. Les médecins devraient considérer les symptômes de ronflement excessif ou bruyant, les plaintes de somnolence ou de fatigue durant la journée, les plaintes de sommeil non réparateur et un excès de poids ou de répartition du gras corporel dans la région du cou ou du thorax supérieur comme des indices possibles d'une AOS non traitée.

**CONCLUSION** Les conclusions des recherches actuelles signalent que le traitement des patients souffrant d'AOS réduit considérablement les taux de morbidité et de mortalité ainsi que les coûts des services de santé. Les médecins de première ligne ont besoin de plus de renseignements concernant le dépistage des patients souffrant d'AOS pour assurer un diagnostic et un traitement appropriés des ceux qui en sont atteints.

*This article has been peer reviewed.*

*Cet article a fait l'objet d'une évaluation externe.*

*Can Fam Physician 2002;48:1073-1080.*

**S**leep apnea is defined as cessation of breathing during sleep lasting more than 10 seconds and resulting in total or partial arrest in respiration. Obstruction of the upper airway during respiratory effort is termed obstructive sleep apnea (OSA). Mechanical abnormalities of the upper airway play a vital role in the pathophysiology of OSA.<sup>1</sup> The upper airway is more likely to collapse if the passage is anatomically narrow or the pharyngeal muscles are lax. Pharyngeal dilator muscle reflexes, normally active when people are awake, appear blunted during sleep, predisposing the airways to collapse.<sup>1</sup>

The severity of OSA is sometimes rated on the apnea-hypopnea index (AHI); an AHI rating of >15 indicates clinically significant OSA. Even patients with mild OSA (<15), however, can experience considerable daytime sleepiness and need treatment.

### How common is sleep apnea?

The estimated prevalence of sleep apnea varies with sex and age. Among middle-aged adults, clinically significant OSA affects approximately 2% to 5% of men and 2% of women.<sup>2</sup> About 4% of elderly people present with OSA, and about 29% of those complaining of insomnia are diagnosed with OSA.<sup>3</sup> Sleep apnea is more prevalent and severe in obese people.<sup>4</sup> Others at greater risk of OSA are those with hypertension, congestive heart disease, coronary artery disease,<sup>5</sup> first-ever stroke,<sup>6</sup> gastroesophageal reflux,<sup>7</sup> primary open-angle glaucoma,<sup>8</sup> heart transplants,<sup>9</sup> hypothyroidism,<sup>10</sup> alcoholism,<sup>11</sup> and autonomic neuropathy secondary to diabetes.<sup>12</sup>

### Why is it important to identify sleep apnea?

Sleep apnea has been vastly underrecognized in primary practice.<sup>13,14</sup> Researchers estimate that 82% of men and 93% of women with moderate-to-severe OSA have not been clinically detected or diagnosed.<sup>2</sup> Delay in diagnosis and treatment has led to prolonged morbidity.<sup>15</sup> We hope this review will help physicians understand this sleep disorder and recognize the clinical symptoms of OSA.

The consequences of undiagnosed and untreated OSA are not trivial. The quality of life for patients with untreated OSA is seriously impaired, partly due to their

*Drs Chung, Hussain, and Shapiro are on active staff in the Sleep Research Laboratory in the Department of Psychiatry at the Toronto Western Hospital, University Health Network, in Ontario. Ms Jairam is a staff nurse at the Oakville Trafalgar Memorial Hospital in Ontario.*

excessive daytime sleepiness.<sup>16,17</sup> Also, untreated OSA is linked to psychological morbidity, such as cognitive dysfunction,<sup>18</sup> decreased vigilance,<sup>19</sup> disturbed concentration and memory,<sup>20</sup> increased mental stress,<sup>20</sup> depression,<sup>19,21</sup> fatigue,<sup>22,23</sup> anxiety,<sup>19,20</sup> nocturnal panic attacks,<sup>24</sup> general mood disorders,<sup>25</sup> and male sexual dysfunction.<sup>26</sup>

The most serious socioeconomic effect of untreated OSA is the three- to seven-fold greater prevalence of motor vehicle accidents involving drivers with untreated OSA.<sup>27</sup> Most of these accidents are attributable to decreased vigilance and falling asleep at the wheel.<sup>28</sup> A more direct economic consequence is medical and hospitalization costs. A Canadian study reported that patients with untreated OSA generally used twice the amount of health care services in the years before diagnosis than after diagnosis.<sup>15</sup>

A causal relationship has been found between untreated OSA and coronary artery disease,<sup>29</sup> congestive heart failure,<sup>30</sup> myocardial infarction,<sup>31</sup> stroke,<sup>32</sup> systemic hypertension,<sup>33,34</sup> and pulmonary hypertension.<sup>35</sup> The morbidity and association between hypertension and untreated OSA is well established and is independent of confounding factors (eg, age, sex, body mass index); the association appears stronger among younger patients.<sup>33</sup> The clinical significance of the association between untreated OSA and hypertension is still unclear: untreated OSA might trigger only slight elevations (5 to 10 mm Hg) in diastolic and nocturnal systolic blood pressure.<sup>36</sup> Nevertheless, in patients with untreated OSA, clinically significant systemic or pulmonary hypertension can develop over time,<sup>35</sup> especially when OSA is severe and patients have a greater number of risk factors for hypertension. Physicians should be aware that hypertension associated with untreated OSA is often intractable,<sup>37</sup> and that a high prevalence (56%) of OSA has been observed in men with therapy-resistant hypertension.<sup>38</sup>

The long-term outcome of untreated OSA is a higher mortality rate than that among the general Canadian population.<sup>39</sup> Mean age of death among people with untreated OSA is 59 years.<sup>40</sup>

### Quality of evidence

A MEDLINE search was conducted from January 1993 to December 2000 using the search term "sleep apnea" combined with "epidemiology," "outcome," and "diagnosis and treatment," and limited to articles in English. From more than 1700 citations, 928 abstracts were downloaded, and 295 papers were retrieved based on review of those abstracts. The 59 papers we finally selected for this study were chosen for their relevance to the topic, how current they

were, the quality of the research, the originality and significance of the findings, the scientific contribution of the work, and the accessibility of the paper. Other papers were identified from the reference lists of the papers selected.

Levels of evidence<sup>41</sup> for the epidemiology and treatment content of the studies cited were 5% level II (randomized trials), 42% level III (non-randomized controlled or concurrent cohort studies), 42% level IV (non-randomized historical cohort or observational studies); the remaining 11% were review articles.

### How to detect OSA symptoms

Snoring is a common complaint, but by itself does not definitely imply presence of OSA.<sup>42</sup> The main symptom of untreated OSA is hypersomnolence or excessive daytime sleepiness<sup>23</sup> that often manifests as dozing off in meetings or while reading, watching television, or driving.<sup>27</sup> Some patients, especially women, describe a lack of energy and tiredness or fatigue rather than sleepiness.<sup>23</sup> These symptoms should be considered clinically significant for OSA. Patients are likely to report unrefreshing and restless sleep at night<sup>16</sup> and occasionally nocturia.<sup>43</sup> Helpful history can be obtained from patients' bed partners who can observe loud snoring, choking, shortness of breath, or changes in patients' personalities (eg, increased irritability) (**Table 1**).

Other symptoms can include morning headaches, frequent nocturnal awakenings, reduced libido, a feeling of drunkenness in the morning, nocturnal gastroesophageal reflux, enuresis, bilateral pedal

edema, and night sweats.<sup>16,35</sup> **Table 2**<sup>14</sup> lists some less common symptoms and complaints of those with untreated OSA.

**Table 2. Less common features of obstructive sleep apnea: Listed under each heading in descending order of incidence.**

#### NOCTURNAL MANIFESTATIONS

- Gasping for air
- Shortness of breath
- Chronic mouth breathing
- Frequent awakenings
- Restless sleep (turning, tossing, leg and arm movements)
- Gastroesophageal reflux
- Nocturnal panic attacks
- Excessive sweating
- Nocturnal cyclical bradycardia

#### DAYTIME MANIFESTATIONS

- Lack of energy, tiredness, fatigue
- Daytime naps are not refreshing
- Morning headaches
- Feeling of morning "drunkenness"
- Bilateral leg edema

Risk factors for developing OSA include obesity, snoring, aging, large neck circumference, hypertension, hypothyroidism, diabetes, heavy alcohol consumption, history of smoking, male sex, postmenopausal status, and family history.<sup>4,10-12,33,34,44-46</sup> Patients of different ethnic origins

**Table 1. Common symptoms and complaints of patients with obstructive sleep apnea (OSA): Patients with any of the first three symptoms warrant referral to a sleep clinic for further investigation.**

SYMPTOMS IN ORDER OF IMPORTANCE	COMPLAINTS THAT CORRESPOND WITH SYMPTOMS
Excessive daytime sleepiness	"I fall asleep in meetings, at my desk, and even sometimes when I am driving." "I could fall asleep anywhere, anytime." "My head barely touches the pillow and I'm asleep."
Loud snoring, stopped or shallow breathing, or choking during sleep	"I snore so loudly my partner can't sleep in the same room." "My partner says that I choke or stop breathing in my sleep." "My pillow is often wet in the morning—I seem to drool a lot."
Unrefreshing sleep, possibly with nocturia	"My sleep is never refreshing, I never feel rested when I wake up." "Even if I take a daytime nap, I still don't feel rested." "I wake up several times during the night, often to pass urine."
Weight gain or more body fat in neck or chest or abdomen*	"I have increased my shirt neck size recently." "I have gained weight over the past year or so."
Irritability, mood changes, and loss of libido. Can mimic depression†	"I have been very irritable, yelling at my kids over small matters." "I have been very moody." "I never feel like having sex anymore."

\*Former weight-lifters or athletes with heavy musculature in the neck and upper chest area without any other noticeable weight gain have a higher incidence of OSA.

†Differential diagnosis is crucial because untreated OSA can produce symptoms of depression.

**CME**

.....

**How, what, and why of sleep apnea**

---

**Table 3. Berlin Questionnaire:** *Level of risk is based on responses in symptom categories. In categories 1 and 2, high risk is characterized by continuing symptoms (more than three or four times a week) in two or more questions on snoring and on sleepiness during waking time or driving, respectively. For category 3, high blood pressure or body mass index >30 are considered high risk. Patients with high-risk features in any two of the three categories warrant referral to a sleep clinic.*

---

Height (m) \_\_\_\_\_ Weight (kg) \_\_\_\_\_ Age \_\_\_\_\_ Male/Female \_\_\_\_\_

---

**CIRCLE THE ANSWERS BELOW****CATEGORY 1**

1. Do you snore?

- Yes     No     Don't know

**If you snore:**

2. Your snoring is

- Slightly louder than breathing     As loud as talking     Louder than talking  
 Very loud, can be heard in adjacent rooms

3. How often do you snore?

- Nearly every day     Three to four times a week     Once or twice a week  
 Once or twice a month     Never or nearly never

4. Has your snoring ever bothered other people?

- Yes     No

5. Has anyone noticed that you quit breathing during sleep?

- Nearly every day     Three to four times a week     Once or twice a week  
 Once or twice a month     Never or nearly never

**CATEGORY 2**

6. How often do you feel tired or fatigued after your sleep?

- Nearly every day     Three to four times a week     Once or twice a week  
 Once or twice a month     Never or nearly never

7. During your waking time, do you feel tired, fatigued, or not up to par?

- Nearly every day     Three to four times a week     Once or twice a week  
 Once or twice a month     Never or nearly never

8. Have you ever nodded off or fallen asleep while driving a vehicle?

- Yes     No

**If yes:**

9. How often does this occur?

- Nearly every day     Three to four times a week     Once or twice a week  
 Once or twice a month     Never or nearly never

**CATEGORY 3**

10. Do you have high blood pressure?

- Yes     No     Don't know     Never

---

*Adapted from Table 2 in Netzer et al<sup>14</sup> with permission from the American College of Physicians.*

---

can present differently with OSA. For example, Chinese patients tend to be younger and have a lower body mass index than white patients, but they present with more severe underlying craniomandibular abnormalities.<sup>47</sup>

Polysomnography, routinely performed only in sleep disorder centres, is the main established technique for determining the presence and severity of sleep-disordered breathing.<sup>13</sup> Diagnosis and treatment of OSA patients at sleep clinics depends on primary physicians' ability to recognize the disorder and make the appropriate referral. Because it is not feasible to send every patient who snores for evaluation, primary physicians should conduct careful interviews, physical examinations, and screening for other medical disorders.

For most physicians, the symptoms listed in **Table 1** give a good indication of whether to refer patients for further investigation. For those who prefer a more structured approach, **Table 3**<sup>14</sup> presents an adaptation of the Berlin Questionnaire<sup>14</sup> that was designed specifically to assist primary care physicians in recognizing OSA. Patients who report snoring often and loudly and who suffer from excessive daytime sleepiness in association with hypertension are at very high risk of OSA. The questionnaire takes about 5 minutes to complete, and for patients with clinically significant OSA (AHI >15), the positive predictive value is 0.97, the specificity 0.97, and the sensitivity 0.54.

Another questionnaire commonly used for screening for OSA, the Epworth Sleepiness Scale,<sup>48</sup> examines excessive daytime sleepiness, a key feature of OSA. The eight items of the Epworth Sleepiness Scale measure propensity for daytime sleep in adults with an internal consistency (Cronbach's  $\alpha$ ) of 0.88, and at a cutoff score of >10, this measure has a 94% sensitivity and 100% specificity. While this questionnaire is not specifically diagnostic for OSA, it is a useful indicator of general sleep disorders. Apart from these two inventories, no other questionnaires are specific and exclusive for OSA and useful in primary clinical settings. Physicians should note that neither of the above questionnaires is intended to replace a medical interview; they are examples of screening tools that can be completed by patients in the waiting room to assist physicians with diagnosis of OSA.

It is important to emphasize that primary physicians should assess their patients' medical status thoroughly before referring them for a sleep study. The following laboratory investigations could be specifically helpful in assessment, diagnosis, and management of OSA and its complications.

- Complete blood count: elevated hemoglobin or hematocrit levels suggest chronic hypoxia.
- Electrocardiogram (ECG): abnormalities of cardiac rhythm (first- or second-degree heart block) are common in severe OSA.
- Electrolytes: electrolytes, particularly serum potassium levels, are important when evaluating ECG disturbances.
- Blood glucose and serum thyroid-stimulating hormone levels: diabetes and glucose intolerance are clearly associated with OSA. Hypothyroidism is a cause of upper airway obstruction and OSA, and is easily treated.

### Treatment

Treatment options for OSA patients include modification of body position during sleep,<sup>49</sup> weight loss,<sup>50</sup> continuous positive airway pressure (CPAP), oxygen supplementation,<sup>51</sup> oral appliances,<sup>52</sup> and surgery.<sup>53</sup> Preliminary reports of using serotonin reuptake inhibitors (SSRIs) and tricyclic antidepressants (TCAs) to treat OSA<sup>54</sup> are promising; it has been proposed that serotonin is a central respiratory stimulant. In some patients, OSA is more severe and frequent during rapid eye movement (REM) sleep, and suppression of REM sleep by SSRIs and TCAs<sup>54</sup> might, in large part, explain their beneficial effects. Other pharmacologic treatments appear ineffective.<sup>55</sup>

Adjunctive management of OSA should include moderating alcohol consumption and avoiding sedatives-hypnotics and narcotics because these are respiratory depressants and might worsen breathing disorders. **Table 4**<sup>41,49-58</sup> summarizes the advantages and disadvantages of the various treatments for OSA.

Nasal CPAP, the most common treatment, is effective in eliminating most apneas. Patients with mild OSA sometimes comply poorly with CPAP treatment, but those with more severe OSA tend to have higher, sustained compliance.<sup>56</sup> For OSA patients, CPAP has been shown unequivocally to alleviate excessive daytime sleepiness<sup>25</sup>; restore quality of life<sup>17</sup>; improve vigilance,<sup>19</sup> concentration,<sup>20</sup> fatigue,<sup>22</sup> and memory<sup>20</sup>; reduce use of health care services<sup>15</sup>; and decrease traffic accidents.<sup>25</sup> Most recovery is seen within a year of treatment, but improvement in mood has been observed only after 2 years of CPAP treatment.<sup>25</sup> For patients with comorbid primary depression and OSA, recommendations are to treat the sleep apnea to facilitate managing the depression.<sup>21</sup>

Despite continuing debate in this expanding field, appropriate provision of health care for patients with OSA appears to be economically beneficial. Treated

**Table 4. Advantages and disadvantages of treatments for obstructive sleep apnea (OSA)**

TREATMENT	ADVANTAGES	DISADVANTAGES	LEVEL OF EVIDENCE*
Weight loss	Can help improve overall health and lessen the severity of OSA	Process is slow and resumption of normal weight might not fully treat OSA	2 <sup>50</sup>
Continuous positive airway pressure (CPAP)	Very effective and less invasive than other methods; effectively treats obstructive and central apneas and lessens snoring. Moderately lowers blood pressure after short-term use	Must be used nightly for life. Can have poor compliance due to discomfort with machine, especially for patients with mild sleep apnea	2 <sup>56,58</sup> 3 <sup>57</sup>
Surgery	More convenient than other forms of therapy (ie, no nightly appliances or modifications required)	Requires careful screening because successful in only carefully selected cases	4 <sup>53</sup>
Oral devices	An alternative for patients who cannot tolerate CPAP. High compliance (~90%)	Treatment fails in 37% to 46% of patients. Not fully effective in reducing apneic events. Long-term effects on oral anatomy unknown	3 <sup>52</sup>
Modification of body position	Can lessen severity of OSA and reduce snoring	Difficult to enforce and might not fully treat OSA	4 <sup>49</sup>
Oxygen administration	Improves oxygenation and hypopneas, some of the main effects of OSA disorders	Does not reduce apneas or improve daytime sleepiness. Might be useful only as an adjunct to CPAP	3 <sup>51</sup>
Pharmaceutical agents, eg, serotonin reuptake inhibitors, theophylline, naloxone, or bromocriptine	Most patients prefer this more convenient mode of treatment	Serotonin reuptake inhibitors show promise, but do not reduce daytime sleepiness. Theophylline, naloxone, and bromocriptine do not significantly reduce hypopneas	2 <sup>54</sup> 3 <sup>55</sup>

\*As described in Sackett.<sup>41</sup>

patients use far fewer physician services and are less frequently hospitalized.<sup>15</sup> A few studies report that, in the short term, CPAP treatment lowers blood pressure,<sup>57</sup> improves cardiac function,<sup>58</sup> and decreases mortality.<sup>59</sup> Rigorous, long-term research is essential to determine the efficacy of CPAP for continuing treatment of OSA-linked hypertension and cardiovascular morbidity and to confirm that CPAP treatment improves long-term outcome and reduces mortality among OSA patients.

### Conclusion

Busy primary care physicians are routinely challenged by the need to add information about medical conditions to their store of knowledge. The substantial medical, social, and economic consequences of untreated OSA; the overwhelming number of patients who have escaped clinical detection; and the likelihood of successful treatment strongly justify screening for this disease. Routinely asking patients about loud snoring, excessive daytime sleepiness, and unsatisfactory sleep will better serve primary care patients and advance diagnosis and treatment of OSA. ❁

### Contributors

**Dr Chung** formulated and conducted the research and wrote the final text of the paper. **Ms Jairam** assisted with the research and helped to write the early versions of the paper. **Dr Hussain** assisted in formulating the research idea, co-wrote sections of the manuscript, and helped revise the text. **Dr Shapiro** assisted in formulating and conducting the research, co-wrote sections of the manuscript, and helped revise the text.

### Competing interests

None declared

**Correspondence to:** Dr Sharon Chung, Department of Psychiatry, Toronto Western Hospital, 399 Bathurst St, ECW 3D-008, Toronto, ON M5T 2S8; telephone (416) 603-5275; fax (416) 603-5292; e-mail sachung@uhnres.utoronto.ca

### References

1. Wheatley JR, Amis TC. Mechanical properties of the upper airway. *Curr Opin Pulm Med* 1998;4(6):363-9.
2. Young T, Evans L, Finn L, Palta M. Estimation of the clinically diagnosed proportion of sleep apnea syndrome in middle-aged men and women. *Sleep* 1997;20(9):705-6.
3. Lichstein KL, Riedel BW, Lester KW, Aguillard RN. Occult sleep apnea in a recruited sample of older adults with insomnia. *J Consult Clin Psychol* 1999;67(3):405-10.
4. Resta O, Foschino-Barbaro MP, Legari G, Talamo S, Bonfitto P, Palumbo A, et al. Sleep-related breathing disorders, loud snoring and excessive daytime sleepiness in obese subjects. *Int J Obes Relat Metab Disord* 2001;25(5):669-75.

5. Schafer H, Koehler U, Ewig S, Hasper E, Tasci S, Luderitz B. Obstructive sleep apnea as a risk marker in coronary artery disease. *Cardiology* 1999;92(2):79-84.
6. Parra O, Arboix A, Bechich S, Garcia-Eroles L, Montserrat JM, Lopez JA, et al. Time course of sleep-related breathing disorders in first-ever stroke or transient ischemic attack. *Am J Respir Crit Care Med* 2000;161(2 Pt 1):375-80.
7. Ing AJ, Ngu MC, Breslin AB. Obstructive sleep apnea and gastroesophageal reflux. *Am J Med* 2000;108(Suppl 4a):120S-5S.
8. Mojon DS, Hess CW, Goldblum D, Bohnke M, Korner F, Mathis J. Primary open-angle glaucoma is associated with sleep apnea syndrome. *Ophthalmologica* 2000;214(2):115-8.
9. Brilakis ES, Olson EJ, McGregor CG, Olson LJ. Sleep apnea in heart transplant recipients: type, symptoms, risk factors, and response to nasal continuous positive airway pressure. *J Heart Lung Transplant* 2000;19(4):330-6.
10. Hira HS, Sibal L. Sleep apnea syndrome among patients with hypothyroidism. *J Assoc Physicians India* 1999;47(6):615-8.
11. Aldrich MS, Brower KJ, Hall JM. Sleep-disordered breathing in alcoholics. *Alcohol Clin Exp Res* 1999;23(1):134-40.
12. Ficker JH, Dertinger SH, Siegfried W, Konig HJ, Pentz M, Sailer D, et al. Obstructive sleep apnoea and diabetes mellitus: the role of cardiovascular autonomic neuropathy. *Eur Respir J* 1998;11(1):14-9.
13. Riley RW, Powell NB, Guilleminault C, Clerk A, Troell R. Obstructive sleep apnea. Trends in therapy. *West J Med* 1995;162(2):143-8.
14. Netzer NC, Stoohs RA, Netzer CM, Clark K, Strohl KP. Using the Berlin Questionnaire to identify patients at risk for the sleep apnea syndrome. *Ann Intern Med* 1999;131(7):485-91.
15. Bahammam A, Delaive K, Ronald J, Manfreda J, Roos L, Kryger MH. Health care utilization in males with obstructive sleep apnea syndrome two years after diagnosis and treatment. *Sleep* 1999;22(6):740-7.
16. Douglas NJ. ABC of sleep disorders. The sleep apnoea/hypopnoea syndrome and snoring. *BMJ* 1993;306(6884):1057-60.
17. Bolitschek J, Schmeiser-Rieder A, Schobersberger R, Rosenberger A, Kunze M, Aigner K. Impact of nasal continuous positive airway pressure treatment on quality of life in patients with obstructive sleep apnoea. *Eur Respir J* 1998;11(4):890-4.
18. Kim HC, Young T, Mathews CG, Weber SM, Woodard AR, Palta M. Sleep-disordered breathing and neuropsychological deficits. *Am J Respir Crit Care Med* 1997;156:1813-9.
19. Munoz A, Mayoralas LR, Barbe F, Pericas J, Agusti AG. Long-term effects of CPAP on daytime functioning in patients with sleep apnoea syndrome. *Eur Respir J* 2000;15(4):676-81.
20. Borak J, Cieslicki JK, Koziej M, Matuszewski A, Zielinski J. Effects of CPAP treatment on psychological status in patients with severe obstructive sleep apnoea. *J Sleep Res* 1996;5(2):123-7.
21. Kaplan R. Obstructive sleep apnoea and depression—diagnostic and treatment implications. *Aust N Z J Psychiatry* 1992;26(4):586-91.
22. Derderian SS, Bridenbaugh RH, Rajagopal KR. Neuropsychologic symptoms in obstructive sleep apnea improve after treatment with nasal continuous positive airway pressure. *Chest* 1988;94:1023-7.
23. Chervin RD. Sleepiness, fatigue, tiredness, and lack of energy in obstructive sleep apnea. *Chest* 2000;118:372-9.
24. Edlund MJ, McNamara ME, Millman RP. Sleep apnea and panic attacks. *Compr Psychiatry* 1991;32(2):130-2.
25. Yamamoto H, Akashiba T, Kosaka N, Ito D, Horie T. Long-term effects of nasal continuous positive airway pressure on daytime sleepiness, mood and traffic accidents in patients with obstructive sleep apnoea. *Respir Med* 2000;94(1):87-90.
26. Karacan I, Karatas M. Erectile dysfunction in sleep apnea and response to CPAP. *J Sex Marital Ther* 1995;21(4):239-47.
27. Teran-Santos J, Jimenez-Gomez A, Cordero-Guevara J. The association between sleep apnea and the risk of traffic accidents. Cooperative Group Burgos-Santander. *N Engl J Med* 1999;340(11):847-51.
28. Kribbs NB, Dinges D. Vigilance decrement and sleepiness. In: Harsh JR, Ogilvie RD, editors. *Sleep onset mechanisms*. Washington, DC: American Psychological Association; 1994. p. 113-25.
29. Peker Y, Kraiczik H, Hedner J, Loth S, Johansson A, Bende M. An independent association between obstructive sleep apnoea and coronary artery disease. *Eur Respir J* 1999;14(1):179-84.
30. Naughton MT, Bradley TD. Sleep apnea in congestive heart failure. *Clin Chest Med* 1998;19(1):99-113.
31. Hung J, Whitford EG, Parsons RW, Hillman DR. Association of sleep apnea with myocardial infarction in men. *Lancet* 1990;336:261-4.
32. Dyken ME, Somers VK, Yamada T, Ren Z, Zimmerman B. Investigating the relationship between stroke and obstructive sleep apnea. *Stroke* 1996;27:401-7.
33. Bixler EO, Vgontzas AN, Lin HM, Ten Have T, Leiby BE, Vela-Bueno A, et al. Association of hypertension and sleep-disordered breathing. *Arch Intern Med* 2000;160(15):2289-95.
34. Nieto FJ, Young TB, Lind BK, Shahar E, Samet JM, Redline S, et al. Association of sleep-disordered breathing, sleep apnea, and hypertension in a large community-based study. Sleep Heart Health Study. *JAMA* 2000;283(14):1829-36.

### Editor's key points

- Sleep apnea, which affects 2% to 5% of adults, is a serious condition that can adversely affect patients' lives.
- A diagnosis of sleep apnea should be considered if patients have any of the following symptoms: snoring, irregular breathing during sleep, unrefreshing sleep, excessive daytime somnolence, weight gain or being very overweight, irritability, mood swings, and loss of libido.
- The continuous positive airway pressure (CPAP) system is the most efficacious treatment according to the literature.

### Points de repère du rédacteur

- L'apnée du sommeil est un problème qui touche de 2 à 5% des adultes et qui présente une co-morbidité importante en plus d'affecter la qualité de vie des patients.
- On doit soupçonner ce diagnostic en présence des symptômes suivants: ronflement, irrégularités dans la fréquence respiratoire durant le sommeil, sommeil non récupérateur, somnolence diurne excessive, gain de poids ou surcharge pondérale, irritabilité, changements de l'humeur et perte de la libido.
- Le système «CPAP» (continuous positive airway pressure) sont les traitements les plus efficaces selon la littérature scientifique.

35. Blankfield RP, Hudgel DW, Tapolyai AA, Zyzanski SJ. Bilateral leg edema, obesity, pulmonary hypertension, and obstructive sleep apnea. *Arch Intern Med* 2000;160(15):2357-62.
36. Davies CW, Crosby JH, Mullins RL, Barbour C, Davies RJ, Stradling JR. Case-control study of 24-hour ambulatory blood pressure in patients with obstructive sleep apnoea and normal matched control subjects. *Thorax* 2000;55(9):736-40.
37. McAlister FA, Lewanczuk RZ, Teo KK. Resistant hypertension: an overview. *Can J Cardiol* 1996;12(9):822-8.
38. Isaksson H, Svanborg E. Obstructive sleep apnea syndrome in male hypertensives, refractory to drug therapy. Nocturnal automatic blood pressure measurements—an aid to diagnosis? *Clin Exp Hypertens A* 1991;13(6-7):1195-212.
39. He J, Kryger MH, Zorick FJ, Conway W, Roth T. Mortality and Apnea Index in obstructive sleep apnea. *Chest* 1988;94:9-14.
40. Young T, Finn L. Epidemiological insights into the public health burden of sleep disordered breathing: sex differences in survival among sleep clinic patients. *Thorax* 1998;53(Suppl 3):S16-9.
41. Sackett DL. Rules of evidence and clinical recommendations. *Can J Cardiol* 1993;9(6):487-9.
42. Hui DS, Chan JK, Ho AS, Choy DK, Lai CK, Leung RC. Prevalence of snoring and sleep-disordered breathing in a student population. *Chest* 1999;116:1530-6.
43. Kramer NR, Bonitati AE, Millman RP. Enuresis and obstructive sleep apnea in adults. *Chest* 1998;114:634-7.
44. Wetter DW, Young TB, Bidwell TR, Badr MS, Palta M. Smoking as a risk factor for sleep-disordered breathing. *Arch Intern Med* 1994;154(19):2219-24.
45. Redline S, Tishler PV, Tosteson TD, Williamson J, Kump K, Browner I, et al. The familial aggregation of obstructive sleep apnea. *Am J Respir Crit Care Med* 1995;151(3 Pt 1):682-7.
46. Krieger J, Turlot JC, Mangin P, Kurtz D. Breathing during sleep in normal young and elderly subjects: hypopneas, apneas, and correlated factors. *Sleep* 1983;6(2):108-20.
47. Liu Y, Lowe AA, Zeng X, Fu M, Fleetham JA. Cephalometric comparisons between Chinese and Caucasian patients with obstructive sleep apnea. *Am J Orthod Dentofacial Orthop* 2000;117(4):479-85.
48. Johns MW. A new method for measuring daytime sleepiness: the Epworth Sleepiness Scale. *Sleep* 1991;14(6):540-5.
49. Cartwright RD. Effect of sleep position on sleep apnea severity. *Sleep* 1984;7(2):110-4.

## CME

.....

50. Smith PL, Gold AR, Meyers DA, Haponik EF, Bleecker ER. Weight loss in mildly to moderately obese patients with obstructive sleep apnea. *Ann Intern Med* 1985;103(6 Pt 1):850-5.
51. Phillips BA, Schmitt FA, Berry DT, Lamb DG, Amin M, Cook YR. Treatment of obstructive sleep apnea. A preliminary report comparing nasal CPAP to nasal oxygen in patients with mild OSA. *Chest* 1990;98:325-30.
52. Yoshida K. Effects of a mandibular advancement device for the treatment of sleep apnea syndrome and snoring on respiratory function and sleep quality. *Cranio* 2000;18(2): 98-105.
53. Li KK, Riley RW, Powell NB, Gervacio L, Troell RJ, Guilleminault C. Obstructive sleep apnea surgery: patient perspective and polysomnographic results. *Otolaryngol Head Neck Surg* 2000;123(5):572-5.
54. Hanzel DA, Proia NG, Hudgel DW. Response of obstructive sleep apnea to fluoxetine and protriptyline. *Chest* 1991;100:416-21.
55. Guilleminault C, Hayes B. Naloxone, theophylline, bromocriptine, and obstructive sleep apnea. Negative results. *Bull Eur Physiopathol Respir* 1983;19(6):632-4.
56. Engleman HM, Martin SE, Deary IJ, Douglas NJ. Effect of continuous positive airway pressure treatment on daytime function in sleep apnoea/hypopnoea syndrome. *Lancet* 1994;343(8897):572-5.
57. Minemura H, Akashiba T, Yamamoto H, Akahoshi T, Kosaka N, Horie T. Acute effects of nasal continuous positive airway pressure on 24-hour blood pressure and catecholamines in patients with obstructive sleep apnea. *Intern Med* 1998;37(12):1009-13.
58. Sin DD, Logan AG, Fitzgerald FS, Liu PP, Bradley TD. Effects of continuous positive airway pressure on cardiovascular outcomes in heart failure patients with and without Cheyne-Stokes respiration. *Circulation* 2000;102(1):61-6.
59. Veale D, Chailleux E, Hoorelbeke-Ramon A, Reybet-Degas O, Humeau-Chapuis MP, Alluin-Aigouy F, et al. Mortality of sleep apnoea patients treated by nasal continuous positive airway pressure registered in the ANTADIR observatory. Association nationale pour le traitement a domicile de l'insuffisance respiratoire chronique. *Eur Respir J* 2000;15(2):326-31.

...