Humans spend one-third of their lives asleep. Few facets of life have a greater impact on our health than the amount of quality sleep we get each night. Sleep is essential for the optimal functioning of all our body systems, and it affects our ability to fight disease and recover from stresses. Historically, sleep was considered to be a passive activity; however, sleep is now recognized as a dynamic process and a vital aspect of our physical and mental health.

Sleep loss from untreated sleep disorders can adversely affect your patients’ health and well-being. Learning about breathing-related sleep disorders, such as OSA, will enable you to effectively care for patients experiencing this common ailment.

What’s sleep?
Sleep is defined as a natural suspension of consciousness from which a person can be awakened, as distinguished from a coma—a state of unconsciousness from which a person can’t be aroused by even the most vigorous stimuli. During sleep, the brain stem continues to control respirations, heart rate, and BP, but higher brain functions such as movement, awareness, and decision making are depressed. Environmental monitoring continues to some extent during sleep, as evidenced by the fact that a strong stimulus such as a loud noise immediately arouses us.

How we feel and perform during the day is directly related to how much sleep we get at night. The exact amount of sleep each person needs varies depending on many factors, especially age. Although some people need more sleep and others less, adults need an average of 7 to 9 hours a night. The best guide to individual sleep requirements is how rested one feels in the morning and how well he or she performs during the day.
apnea
Sleep isn’t simply a time when our brains and bodies slow down. While we sleep, our brains stay active and our bodies fight off infection, support the metabolism of glucose, consolidate memories, and release hormones regulating growth and appetite. What most people don’t realize is that sleep deprivation accumulates over time. When we don’t get enough sleep, we build up a “sleep debt”—the difference between the amount of sleep we need on a daily basis and the amount we actually get.

Although it may seem like losing sleep isn’t a big deal, sleep deprivation has a wide range of negative effects, including:

- fatigue
- irritability and nervousness
- inability to tolerate stress
- problems remembering or thinking clearly
- reduced immunity (frequent colds and infections).

The good news is that sleep debt can be repaid. However, sleep time can’t be built up in advance of need and then used to compensate for lost sleep.

Sleep stages

When we go to sleep, it seems that we fall into a deep slumber that lasts for most of the night, but this isn’t correct. The sleep cycle is complex, consisting of different levels of sleep that can be gauged by measuring brain waves, or the electrical activity of the brain, with an electroencephalogram (EEG). The brain waves of a sleeping person demonstrate different stages of consciousness: non-rapid eye movement (NREM), rapid eye movement (REM), and wakefulness.

NREM sleep consists of three stages, each deeper than the one before it. During REM sleep, we have dreams and roll our closed eyes back and forth. Together, the stages of NREM (stages N1, N2, and N3) and REM (known as stage R) form a complete sleep cycle that repeats every 90 to 110 minutes.

As we begin to fall asleep, we enter NREM sleep. Stage N1 is the transition between wakefulness and sleep that lasts about 5 minutes. Our eyes are closed, yet they move slowly under our eyelids; our muscles begin to relax and we can be easily awakened. Thoughts flit about, and we experience a drifting sensation. Body temperature, respirations, pulse, and BP are normal.

Stage N2 is the beginning of true sleep, characterized by a total loss of consciousness lasting 10 to 25 minutes. In this stage, eye movement stops, breathing and heart rate slows and becomes regular, and body temperature decreases. Arousal is more difficult.

Stage N3, also known as slow-wave sleep, is the deepest of all sleep stages. During this stage, BP falls, breathing becomes slower, muscles relax, and arousal is difficult. Parasomnias, such as sleepwalking (somnambulism), bed wetting (nocturnal enuresis), and sleep talking (somniloquy), occur during this stage.

Stage R (REM sleep) follows N3 and first occurs about 90 minutes after falling asleep. It recurs every 90 minutes or so thereafter. In the first few cycles of the night, REM is extremely short—only a few minutes. During this stage, heart rate increases, BP rises, and breathing becomes more rapid, less regular, and shallower. Digestive system activity declines. Men develop penile erections. Eyes dart back and forth, dreaming occurs, and skeletal muscles become temporarily paralyzed to protect us from physically acting out our dreams. As the night progresses, REM sleep periods increase in length, whereas periods of deep sleep (N3) decrease. We spend nearly all our sleep time in stages R, N1, and N2.

Sleep patterns change throughout the life cycle. Stage R sleep occupies about half of the total sleeping time in infants and then declines until age 10, when it stabilizes at about 25%. In contrast, stage N3 sleep declines steadily from birth and often disappears completely in those over age 60.
Contrary to popular belief, our need for sleep doesn’t decrease when we get older; rather, the ability of older adults to get into deep sleep decreases with age. Older individuals often don’t get enough quality, restorative rest because their brains remain in the lighter stages of sleep and they awaken often.

**Take my breath away**
Breathing-related sleep disorders are conditions in which the patient’s sleep is interrupted by problems in his or her breathing. These pauses in respirations are termed apneas or hypopneas. *Apnea* is a Greek word that means “without breath.” Apneas are breathing pauses that last 10 seconds or longer. *Hypopnea* is a reduction in inspiratory airflow, leading to a drop in the oxygen level in the blood. It comes from the Greek words *hypo*, meaning “under” or “less than normal,” and *pnea*, meaning “breath.”

Sleep apnea is an involuntary cessation of breathing during sleep. There are three types of sleep apnea: obstructive, central, and mixed. OSA occurs when the patient’s breathing efforts are intact but air movement is blocked by a temporary obstruction. Central sleep apnea is characterized by the absence of any breathing effort and is associated with brain disease rather than airway blockage. Mixed sleep apnea combines characteristics of both central and OSA types.

Of the three types of sleep apnea, OSA is the most common. There’s a strong relationship between weight and OSA; in fact, 70% of obese individuals have OSA. As people gain weight, their necks get thicker, leading to excess tissue in the back of the throat that narrows the airway and limits the amount of air that can pass through. The result is obesity hypoventilation syndrome, historically referred to as Pickwickian syndrome.

**How it happens**
In normal sleep, the muscles at the back of the throat relax but remain open enough to allow air to pass into and out of the lungs.

In OSA, the muscles in the back of the throat are too relaxed, and gravity causes them to slip backward or downward and block the airway (see *Mechanism of OSA*). These episodes are accompanied by forceful inspiratory efforts that create a suction, which collapses the windpipe as the person struggles to breathe. Because air can’t get into the lungs and carbon dioxide can’t be exhaled, the body’s blood oxygen level drops (hypoxia) and carbon dioxide levels rise (hypercapnia).
When breathing is obstructed, the body wakes up enough to tighten the upper airway muscles and open the windpipe. This happens so quickly, the person isn’t aware of it. Individuals with OSA experience periods of snoring (partial airway obstruction), then periods of silence (complete airway obstruction), followed by snorting, choking, and gasping for breath. This cycle of repeated airway obstruction and consequent arousals can happen several hundred times a night and leave the person continually sleepy during the day but unaware of the reason for it.

**Effects of OSA**

Individuals with OSA often experience both nighttime and daytime symptoms. Nighttime symptoms include loud snoring, gasping for breath, and apneic episodes (often witnessed by a bed partner). Daytime symptoms can involve excessive sleepiness, especially with impairment of driving, feeling unrefreshed upon morning awakening, dry throat, poor concentration, morning headaches, and erectile dysfunction in men.

OSA initiates a chain of events that stresses the cardiovascular system and increases the risk of hypertension, cardiac arrhythmias, stroke, and premature death. Basically, the combination of disturbed sleep and oxygen starvation creates stress on the body. The hypoxemia associated with sleep apnea triggers the sympathetic nervous system to release stress hormones, including adrenaline, which causes an increased heart rate and BP. In response to high BP, the heart secretes atrial natriuretic factor, a hormone that acts on the kidneys to increase urine output and lower BP. This phenomenon leads to another OSA symptom: frequent nighttime urination (nocturia).

OSA affects more than sleep and the cardiovascular system. Repetitive arousals prevent the body from entering the deep stage of sleep during which growth hormone is released. Growth hormone, in addition to increasing height in children and adolescents, helps keep muscles and bones strong, maintains blood glucose, stimulates the immune system, and reduces body fat. Sleep apnea may also lead to mood changes and exacerbate disorders such as anxiety and depression.

Untreated OSA is associated with a number of chronic conditions, including obesity and diabetes, which both predispose patients to OSA and are exacerbated by it. Obesity is the main risk factor for OSA. Sleep deprivation leads to higher levels of the hormone ghrelin, which causes an increased appetite, and lower levels of the hormone leptin, which tells the body it’s full and to stop eating. This imbalance leads to overeating and weight gain.

When sleep apnea leads to excessive daytime sleepiness, beginning and sustaining an exercise program becomes increasingly unlikely. Accordingly, treatment of sleep apnea is an important aspect of weight control that can enable the patient to act on his or her motivation to embark on and maintain an effective weight loss program. It’s generally agreed that as little as a 10% decrease in weight can lead to significant improvements in sleep apnea symptoms.

The association between OSA, obesity, and diabetes is irrefutable. Sleep apnea suffers are nine times more likely to have diabetes than those without the condition. The hypoxemia associated with OSA triggers the release of another stress hormone, cortisol, which increases blood

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**Assessing for OSA**

Be alert for the following signs and symptoms:
- excessive daytime sleepiness
- loud snoring
- frequent nocturnal awakening
- hypoxemia
- apneic episodes
- nocturia
- fatigue-related motor vehicle accidents
- dry throat
- poor concentration
- morning headaches
- hypertension
- cardiac arrhythmias
- erectile dysfunction.
glucose levels. Having OSA and being overweight places extra stress on the body and can lead to insulin resistance and type 2 diabetes. Because of the direct connections between OSA and diabetes, treating OSA not only helps patients feel better and lose weight, but it also improves their blood glucose levels by lowering insulin resistance and reducing the risk of complications from diabetes.

Sleep apnea can endanger the welfare of patients, as well as others. Sleepiness and fatigue from untreated OSA impair coordination, reaction times, and the ability to think and concentrate, causing or contributing to an increased likelihood of motor vehicle and workplace accidents. In fact, sleep-deprived individuals perform as badly or worse on a hand-eye coordination task as those who are moderately intoxicated.

According to the National Highway Traffic Safety Administration, sleepy drivers are responsible for an estimated 100,000 nonfatal injuries and 1,500 traffic fatalities each year. Research indicates that proper treatment of OSA reduces the incidence of fall-asleep crashes to the level of those involving the general population. In short, driver fatigue can be as dangerous and as preventable as drunk driving.

Who's at risk?
Several characteristics have been identified that place individuals at high risk for OSA:

- **weight**: People who are overweight (body mass index of 25 to 29.9) and obese (body mass index of 30 and above)
- **sex**: Men are twice as likely to develop sleep apnea as women
- **neck circumference**: Individuals with a short, wide neck (17 inches or more for men; 16 inches or more for women)
- **age**: Middle-aged and older adults
- **lifestyle**: Drinking alcohol before bedtime and smoking tobacco
- **genetics**: Sleep apnea is known to run in families

**did you know?**
In the past, sleep was classified into four NREM stages. In 2007, the American Academy of Sleep Medicine combined stages 3 and 4 into a single N3 stage because there was no significant functional difference between the two.

- **race and ethnicity**: Higher incidence among Blacks, Pacific Islanders, and Hispanics
- **physical features**: Large tongue, large tonsils, recessed chin, low-hanging soft palate, and a deviated septum.

The gold standard diagnostic test for OSA is an overnight sleep study, called a polysomnogram (PSG). This test records the number of apneas and hypopneas the patient experiences to diagnose the severity of the sleep disturbance. A PSG monitors brain waves with an EEG to determine the stage of sleep and other body functions, including eye movement, skeletal muscle activity, heart rhythm, respiratory effort, and oxygen levels.

After completing the PSG, the patient’s OSA can be categorized as mild, moderate, or severe. These classifications are based on the apnea-hypopnea index (AHI), which is defined as the total number of apneas and hypopneas divided by the total sleep time. Mild OSA has an average AHI of 5 to 15 respiratory events/hour; moderate, 15 to 30; and severe, more than 30.

An alternative to a PSG is a home-based sleep test with a portable monitor. The home monitor records some of the same information as a PSG, such as the amount of oxygen in the patient’s blood, how much air is moving through his or her nose while breathing, heart rate, and chest movements that show whether the patient is making an effort to breathe.

**Breathe in the air**
The most effective treatment for moderate-to-severe OSA is nighttime positive airway pressure therapy. A continuous positive
Airway pressure machine is the most common, but there are other types of machines, including bilevel positive airway pressure, autotitrating, and variable positive airway pressure. These machines deliver a constant flow of pressurized air into a face or nasal mask. The air blows into the back of the throat, splinting open the airway and preventing the soft tissue in the throat from collapsing.

Patients with mild OSA may try positional therapy, oral appliances, or weight loss. Assuming a side-lying position while asleep or raising the head of the bed may help reduce airway obstruction, but in more severe cases, the airway collapses no matter what position the sleeper chooses. Oral appliances are similar to sports mouth guards and are used to move the jaw forward to open the airway. Weight loss decreases the amount of excess tissue in the throat, and significant weight loss may be enough to overcome the symptoms of OSA. However, lifelong compliance and healthy weight maintenance are necessary to avoid recurrence.

There are a few surgical interventions available to treat sleep apnea. The most common surgery is uvulopalatopharyngoplasty (UPPP). In UPPP, excess tissue in the throat is removed to widen the airway. Although this procedure is often effective in treating snoring, its success rate in treating OSA is about 50% because the obstruction can be from multiple sites along the airway. No pharmacologic treatment is available to treat the obstruction associated with OSA.

Untreated, the detrimental effects of OSA typically progress over time. With appropriate treatment, however, patients enjoy immediate reduction in snoring, apneas, and the arousal responses caused by hypoxic respiratory events. With adequate quality sleep restored, patients feel dramatically better. Excessive daytime sleepiness is replaced with energy and alertness, which improves quality of life and reduces the likelihood of accidents. Successfully treated patients also benefit from reduced cardiovascular disease and diabetes risk.

**Care of the hospitalized patient**

It goes without saying that hospitalization in and of itself is the cause of heightened anxiety in many patients. Disruption of sleep resulting from such things as physical pain, emotional distress, environmental noise, and breathing-related sleep disorders are significant stressors that can negatively affect recovery. Acute care nurses have the opportunity to recognize symptoms of breathing-related sleep disorders and may be the first to identify patients with possible sleep apnea.

Outside the hospital setting, recognition of sleep disorders is often missed, particularly in those who live alone, because patients don’t remember being aroused from sleep by obstructed breathing. Even for patients who live with others, lack of knowledge that loud and persistent snoring is a symptom of a significant health problem prevents family members from discussing it with the patient’s primary care provider. Too many people dismiss snoring as a harmless, albeit annoying, habit.

The initial nursing assessment is a critical first step in any patient’s admission to an acute care setting. The purpose of this assessment is to evaluate the patient’s health status, identify current or potential problems, and provide an in-depth comprehensive database that serves as a baseline for evaluating changes in the patient’s condition. A thorough evaluation of the patient’s sleep status should be included in the nursing assessment.
This evaluation begins with a detailed inquiry into patterns of sleep, amounts of sleep, sleeping positions, reported snoring, use of sleep aid medications, and personal or family history of OSA. Inquire about excessive daytime drowsiness, fatigue-related occupational or motor vehicle accidents, and known sleep problems such as insomnia, nocturia, and nonrefreshing sleep. Ask whether the patient uses tobacco or alcohol, noting the amounts and timing of use. A review of the patient’s current medications should include special attention to sedating drugs because these may cause respiratory depression and potentiate OSA. If possible, the family should be interviewed about snoring and occurrences of apneic episodes at home. Finally, during the physical exam, make note of physical characteristics suggestive of possible OSA, such as obesity, large neck circumference, and a recessed chin.

Because there’s a wide range of positive pressure airway machines and masks, patients with known sleep apnea should be instructed to bring their personal equipment with them to the hospital. If the patient is already using a positive pressure airway machine, inquire about what type of mask he or she uses and what settings the machine is on. Ask the patient about problems using the machine, such as dry nose, irritated facial skin, or air leaks. If needed, respiratory care technicians are valuable in-house resources to assist with adjustments.

What should you do when you identify a patient at risk for OSA? Teach your patients and their families about the risk factors for OSA, the potential detrimental effects of untreated OSA, lifestyle modifications that ameliorate symptoms, and the availability of mechanical interventions to treat unresolved OSA. Encourage patients to adopt a healthy lifestyle, maintain a healthy weight, stop smoking, and avoid alcohol and sedatives before bed.

Closely monitor the patient’s vital signs and use a pulse oximeter as a noninvasive way to monitor blood oxygen levels. Note any apneas or oxygen desaturation occurring during sleep. Administer supplemental oxygen until the patient can maintain adequate oxygen saturation while breathing room air. If not contraindicated, raise the head of the bed or try positioning the patient on his or her side. Aggressive monitoring and management of the patient’s respiratory status is needed with OSA patients who receive sedating medications. Notify the patient’s primary care provider of your findings. Referral to a sleep specialist for a clinical profile consistent with OSA may be appropriate.

**This snore is not a bore**

OSA is a condition of widespread significance. Nurses are in the unique position to recognize symptoms and alert appropriate healthcare professionals of their concerns. By making patients aware of the presence of symptoms, you can initiate treatment that’s potentially lifesaving.

**Learn more about it**


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**did you know?**

Before age 50, men are twice as likely to develop OSA as women. After age 50, the risk for men and women is the same.

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What nurses need to know about sleep apnea

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