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Sleep-disordered breathing and the patient undergoing endoscopy: Considerations for optimization of periprocedural care

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ABSTRACT

A significant proportion of patients undergoing ambulatory procedures is at risk for sleep-disordered breathing (SDB). Obstructive sleep apnea is the most common diagnosis, but other types such as opioid-related central apnea are important variants. Long-term cardiovascular, neurologic, and related sequelae of untreated SDB are significant such that screening at-risk patients with low-tech bedside tools such as STOP-BANG is warranted. Patients with presumptive SDB should be educated about the disease and referred for specialty evaluation and formal diagnosis. Those with known or presumptive moderate-to-severe disease warrant a special clinical pathway that may include sedation by an anesthesia provider with airway rescue experience and familiarity with a broader range of sedative-hypnotic medications, the availability of respiratory therapy support for periprocedural use of continuous positive airway pressure devices, and heightened vigilance and monitoring in the recovery suite.

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1. Overview: Scope of the problem

Sleep-disordered breathing (SDB) is of direct relevance to the gastrointestinal (GI) proceduralist, the anesthesiologist, and the periprocedure care team from both acute episode-of-care and population health perspectives.

SDB encompasses a spectrum of clinical disorders associated with intermittent hypoxemia caused by hypoventilation or periodic apnea and includes obstructive sleep apnea (OSA), central sleep apnea, snoring, upper airway resistance syndrome (UARS), and Cheyne-Stokes respiration. The exact prevalence of SDB is unknown but increasing, and greater than 10% of the general population may have moderate-to-severe OSA. In select subsets of patients, this number is likely much higher. For example, OSA in the bariatric surgery population may be as high as 85% [1]. OSA is the most prevalent and well-studied subtype, but chronic opioid therapy and heart failure are commonly associated with central apnea or Cheyne-Stokes respiration, respectively. The sleep-disordered breathing in heart failure registry reports that up to 46% of patients with heart failure have concomitant moderate-to-severe SDB [2].

Untreated OSA is associated with excessive daytime sleepiness, lost personal and professional productivity, and increased risk of accidents. From a medical perspective, SDB contributes to treatment-resistant hypertension, chronic intermittent hypoxia, right and left heart failure, arrhythmias, most notably atrial fibrillation, and cerebrovascular disease. Unfortunately, most of the patients with SDB are unaware of the diagnosis, have never been formally assessed, and are therefore unable to reduce their individual risk of short-term and long-term sequelae. This presents an opportunity for clinicians involved in procedural care to screen patients, provide patient education, and refer for follow-up. The American Academy of Sleep Medicine has recently highlighted improved detection and diagnosis as an important national quality improvement goal [3].

The contribution of SDB to increased risk of complications in the immediate perioperative period has not been clearly defined. In a large single-center study of surgical patients with a high score using a bedside screening tool, patients with untreated OSA had higher 1-year mortality than patients with both non-OSA and treated OSA [4]. In the acute surgical setting, OSA has been associated with increased pulmonary complications including the need for ICU admission, telemetry monitoring, and overall increased consumption of resources [5].

There are no published data on the rate of unplanned admission from the ambulatory GI center of patients with OSA or likely OSA as compared with matched controls, and there are conflicting data on adverse events during sedation for GI procedures in this population. Respiratory events, many with severe morbidity, are overall the most common complication reported during

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procedural sedation [6]. An increasing number of perioperative medico-legal claims involve sleep apnea–related concerns [7]. Patients with higher American Society of Anesthesiologists (ASA) class (OSA contributes to higher class) are at elevated risk of sedation-related adverse events. [8] Opioid-related ventilatory impairment is a common theme in reported periprocedural respiratory events [9]. Acute and chronic opioid therapy are associated, in dose-dependent fashion, with central apnea, and this could complicate periprocedural care [10,11]. Periprocedural risk assessment, patient education, appropriate selection of sedative agents, and careful attention to monitoring, staffing, and recovery affords the opportunity to optimize care. Moreover, preprocedure classification of high risk of SDB may affect the type of sedation scheduled (ie, nurse-administered, computer-assisted, or anesthesia-delivered sedation).

Preprocedure assessment—Known SDB

Some patients carry a formal diagnosis of SDB. This would generally have been accomplished by a formal sleep study or polysomnogram (PSG). Increasingly, these are performed as home sleep studies rather than in the sleep lab. The PSG should be reviewed as part of the preprocedural assessment. Details of specific interest include the apnea-hypopnea index (AHI), the oxygen desaturation index (ODI), and the respiratory disturbance index. These give a window into the nature and severity of the dysfunction. Briefly, the AHI measures the frequency of apnea and hypopnea episodes as a function of sleep time according to codified criteria. The American Academy of Sleep Medicine categorizes OSA as severe (AHI ≥ 30, Moderate AHI > 15, or Mild AHI > 5). The respiratory disturbance index is more sensitive as it includes AHI as well as respiratory event–related arousals. Respiratory event–related arousals are respiratory events that occur during sleep and include periods of apnea or hypopnea that are of lesser magnitude and shorter duration than typical respiratory events. The ODI includes the number of oxygen saturation drops $> 3\%$ per sleep hour and measures the lowest saturation reached during sleep (sleep nadir) or the cumulative sleep time spent in a desaturated state.

ODI greater than 10 is associated with, but not diagnostic for, moderate-to-severe sleep apnea. The ODI may be more feasible to measure as a part of preprocedure evaluation as it relies on routine pulse oximetry rather than more elaborate sleep laboratory testing but is not yet fully validated [12]. Central apnea may be noted in the sleep study and is an important component of SDB in some patients. Central apnea, in contrast to obstructive apnea, is the complete cessation of respiratory drive as mediated by the interplay of brainstem respiratory generators, thalamic integration, and cortical arousal mechanisms. Central apnea is not relieved by continuous positive airway pressure (CPAP), is enhanced by opioid therapy, and requires arousal or a back-up ventilation support for rescue. The sleep study may also comment on a positional component to the breathing pattern. Patients may demonstrate less obstruction in the lateral decubitus position compared with supine position [13]. This is advantageous during the GI procedure and should also be used in the recovery area and during discharge education.

Most patients diagnosed with sleep apnea are prescribed noninvasive ventilation (NIV). This is usually CPAP. The use of CPAP is associated with significant improvements in function (eg, daytime sleepiness) as well as objective physiologic measures such as blood pressure control. Despite being the gold standard therapy for OSA, compliance with recommended CPAP therapy is low. Automatic positive airway pressure and adaptive servo ventilation are variants of NIV that incorporate a back-up rate and adjustable pressure support. These may be prescribed to patients with central apnea, UARS, or Cheyne-Stokes breathing [14]. After initial diagnosis, a follow-on sleep study is typically performed to titrate NIV parameters, and these can be retrieved from the record review. Patient compliance with the recommended regimen should be established during the patient interview. Noncompliant patients are less likely to benefit (ie, tolerate) from CPAP in the PACU or the inpatient ward. However, when used, the prescribed parameters should guide mode and extent of respiratory support during and after the procedure.

Suspected SDB

Most of the patients with sleep-disordered breathing are undiagnosed. This is a public health challenge given the long-term sequelae of untreated disease. The preprocedure assessment affords an opportunity to screen patients for planning of procedural sedation, patient counseling, and referral for formal sleep testing and specialist evaluation. An ideal screening tool would be easy to implement at the bedside, cost-effective, and have both high sensitivity and specificity to detect the spectrum of SDB reliably while appropriately excluding low-risk patients. The ideal bedside screening tool has yet to be developed. Despite this, it is reasonable to screen all patients with the current state-of-the-art. The most validated screening tool is the STOP-BANG questionnaire [15,16]. STOP-BANG screening includes 8 components (Figure 1).

Assessment can be performed rapidly at the bedside without anesthesia expertise or diagnostic equipment. STOP-BANG has a high sensitivity for diagnosing patients with sleep apnea, but may be less sensitive for detecting sleep SDB not associated with apnea such as UARS. A gray area regarding STOP-BANG is the cutoff used for diagnosis. Originally, the screening tool was developed using a cutoff of 3 of 8 positive criteria. This low cutoff point is probably overly sensitive and would subject a high percentage of patients to either additional testing or unnecessary specialized clinical management pathways. From an applied clinical perspective, identification of the patients at highest risk of severe OSA is the most relevant in the immediate periprocedural context. STOP-BANG specificity linearly improves (and the likelihood of a false-positive screen declines) as the cutoff increases from 6-8. The probability of severe sleep apnea is 65% with a score of 7/8 in a surgical population [16]. Very recently, a new score (DES-OSA) based on a novel weighting algorithm for common morphologic inputs such as Mallampati score, thyromental distance, and BMI was reported to have a sensitivity and specificity greater than 75% to predict OSA in a small European study [17]. The combination of the 2 tools has not been evaluated but may hold promise.

The STOP-BANG score is not diagnostic, but can guide sedation scheduling and planning. Each ambulatory suite will want to determine an appropriate cutoff to use in screening and how to apply the information to clinical management and resource

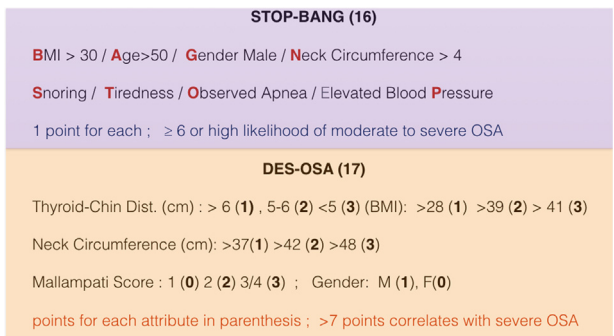

Figure 1. Bedside screening tools.

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