

ORIGINAL ARTICLE

Preventing Opioid-Induced Respiratory Depression in the Hospitalized Patient With Obstructive Sleep Apnea

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Purpose: To enhance the role of nursing interventions in the management of perioperative opioid-induced respiratory depression (OIRD) in patients with obstructive sleep apnea (OSA).

Design: Narrative review of the literature.

Methods: Literature reviewed with emphasis on recommendations by professional and accrediting organizations.

Findings: Postsurgical OIRD increases hospital stay (55%), cost of care (47%), 30-day readmission (36%), and inpatient mortality (3.4 fold). OSA increases the risk of OIRD and may result in legal claims averaging \$2.5 million per legal claim.

Conclusions: Nursing interventions are essential to improving outcome and reduce cost in the management of postsurgical OIRD in OSA patients.

Keywords: obstructive sleep apnea, positive airway pressure, opioid induced respiratory depression, PACU, sleep disordered breathing.

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OBSTRUCTIVE SLEEP APNEA (OSA) and opioid-induced respiratory depression (OIRD) are inter-related problems that are of concern for regulatory and accrediting organizations. In 2015, The Joint Commission issued a sentinel event alert titled “At risk: Obstructive sleep apnea patients,” which cited many concerns that fall within nursing practice including (1) lack of training for health care professionals to screen for and recognize OSA, (2) failure to assess patients for OSA, (3) failure

to implement appropriate monitoring of patients with risk factors associated with OSA, (4) lack of communication among health care providers regarding patients with OSA or potential risk factors associated with OSA, and (5) lack of postoperative evaluation and treatment for OSA.¹

Patients have been found dead in bed after receiving appropriate opioid medications for pain. According to Benumof² a prototypical patient found dead in bed is middle aged, has severe OSA, underwent orthopaedic, upper airway, or abdominal surgery under general anesthesia and was in an unmonitored bed without continuous positive airway pressure (CPAP) or oxygen. OIRD-related adverse events such as these cost hospitals on average of \$2.5 million per claim.^{3,4}

In 2011, The Joint Commission issued a sentinel event alert titled “Safe Use of Opioids in Hospitals,” which found that the two most common causes of opioid-related adverse events were (1) wrong dose medication error (47%) and (2) improper monitoring (29%). The sentinel alert also listed patient

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characteristics that are associated with increased risk for OIRD, which included (1) sleep apnea or sleep disorder diagnosis, (2) morbid obesity with high risk of sleep apnea, (3) snoring, (4) older age, (5) postsurgery, particularly if upper abdominal or thoracic surgery, (6) increased opioid dose requirement or opioid habituation, (7) receiving other sedating drugs, (8) pre-existing pulmonary or cardiac disease, and (9) being a cigarette smoker.⁵ Understanding the pathophysiology of sleep-disordered breathing and how opioid and sedating medications aggravate this disorder and result in adverse events is important for nurses. Adequate knowledge of the interaction between opioids and sleep-disordered breathing as well as understanding best monitoring practices will improve patient safety and decrease opioid-related adverse events.

Prevalence of Sleep-Disordered Breathing

OSA is the most common type of sleep-disordered breathing (80% to 90%) but can coexist with the two less common types: central sleep apnea and obesity hypoventilation syndrome. OSA is highly prevalent in the general population and most cases (80% to 90%) are undiagnosed. The prevalence of moderate to severe OSA among adults aged 30 to 70 years is estimated to be 13% of men and 6% of women.⁶ This translates to OSA affecting more than 20 million people in the US population. Central sleep apnea is not common in the general population but is common in specific populations such as patient with congestive heart failure (33%) and patients on chronic opioid medications (14% to 60%).⁷ Sleep-disordered breathing is associated with increased risk of adverse outcomes in the perioperative setting.^{3,8} Anesthetic, sedative, and opioid medications enhance respiratory depression and airway collapse and thus can exacerbate all forms of sleep-disordered breathing.

Pathophysiology and Diagnosis of Sleep-Disordered Breathing

OSA is characterized by sleep-induced recurrent episodes of upper airway collapse resulting in oxygen desaturations and arousals from sleep more than five times per hour. Central sleep ap-

nea is characterized by diminished or absent respiratory effort, coupled with the presence of symptoms including excessive daytime sleepiness, frequent nocturnal awakenings, or both. Obesity hypoventilation syndrome is the presence of daytime alveolar hypoventilation (awake, sea-level, arterial PCO₂ greater than 45 mm Hg) among patients with body mass index (BMI) 30 kg/m² or greater in the absence of other causes of hypoventilation. In this condition, the severely overweight patients fail to breathe rapidly enough or deeply enough, especially during sleep, and results in low blood oxygen and high blood carbon dioxide (CO₂) levels. The three types of sleep disorder can occur in the same patient.

The number of respiratory events per hour is used to grade the severity of sleep-disordered breathing.^{9,10} The average hourly number of apnea (90% or more decrease in airflow for apnea of 10-seconds or more) and hypopnea (50% reduction in airflow with 3% or more reduction in SaO₂) events is expressed as the apnea-hypopnea index (AHI).^{9,10} An AHI of 5 to 14 is mild, 15 to 29 is moderate, and 30 and greater is severe. Treating sleep-disordered breathing is important as it is associated with (1) intermittent hypoxemia, (2) hypercapnia, (3) excessive intrathoracic pressure changes from inspiration against an obstructed airway, (4) sympathetic activation, and (5) inflammatory endothelial dysfunction.^{11,12} Endothelial dysfunction can result in increased risk (1) hypertension, (2) congestive heart failure, (3) atrial fibrillation, (4) pulmonary hypertension, (5) right heart failure, (6) diabetes, (7) obesity, (8) cognitive impairment, (9) depression, (10) stroke, (11) dementia, (12) gastroesophageal reflux, and (13) cancer.¹³⁻¹⁸

Perioperative Management of OSA

OSA is associated with increased perioperative mortality, hospital length of stay, cost of care,^{3,19-23} and cardiopulmonary complications that increase admission to intensive care units.²⁴⁻²⁷ As indicated previously, about 80% to 90% of patients with sleep-disordered breathing are undiagnosed, which emphasize the need for screening for sleep-disordered breathing among surgical patients.^{6,28}

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