

## **Sleep Board Review Question: Nocturnal Hypoxemia in COPD**

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Question: Which of the following is the strongest predictor of nocturnal hypoxemia in patients with chronic obstructive pulmonary disease (COPD)?

1. Forced expiratory volume in 1 second (FEV1)
2. Age
3. Daytime Oxygen Saturation
4. Radiological severity of COPD

**Correct!**  
**3. Daytime oxygen saturation.**

Several physiological factors can contribute to a decrease in oxygen saturation during sleep (Table 1). Most of these changes are more pronounced during rapid eye movement (REM) sleep compared to Non REM (NREM) sleep.

**Table 1. Physiological Changes During Sleep That Can Contribute to a Decrease in Oxygen Levels.**

Increase in upper airway resistance
Decrease in hypoxic and hypercapnic ventilatory Response
Decrease in tone and activity of respiratory muscles
Reduction in tidal volume
Reduction in functional residual capacity
Altered ventilation-perfusion relationship

Chronic obstructive pulmonary disease (COPD) is associated with diverse sleep disorders. There is a high prevalence of insomnia disorder in patients with COPD (1). The incidence of restless legs syndrome is also higher in those with a history of obstructive lung disease (2). While the prevalence of sleep apnea does not appear to be higher in those with COPD than in general population (3), nocturnal hypoxemia occurs commonly in patients with COPD (4). The physiologic changes reported in Table 1 are more pronounced in patients with COPD. Pronounced alveolar hypoventilation and ventilation-perfusion mismatch significantly contribute to nocturnal hypoxemia (5,6). Daytime oxygen saturations (SaO<sub>2</sub>) play a prominent role in predicting nocturnal hypoxemia (7). Patients with lower daytime saturation, and hence, resting oxygen levels on the steep portion of the oxyhemoglobin dissociation curve, endure a more pronounced drop in oxygen saturation with a similar decrease in arterial oxygen tension (PaO<sub>2</sub>) as compared to a person with higher resting oxygen levels on the higher, flatter portion of the oxyhemoglobin dissociation curve.

Several studies have been done to identify the predictors of nocturnal desaturation in COPD patients. Many of these have found PaO<sub>2</sub> and SaO<sub>2</sub> to be independent predictors of desaturation during sleep (8-10). However, not all studies have confirmed this relationship between awake SaO<sub>2</sub> and oxygen saturation during sleep (11). Other factors such age, FEV<sub>1</sub>, radiological severity of COPD have been assessed, but not consistently been found to be strong predictors of nocturnal hypoxemia.

**References**

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