

Opioid analgesics depress respiration primarily by reducing responsiveness of the brain-stem respiratory centers to carbon dioxide (CO₂). Therapeutic doses depress all phases of respiratory activity (rate, minute volume and tidal exchange) and may produce irregular breathing. The diminished respiratory volume is primarily due to a slower rate of breathing. Natural sleep produces a decrease in sensitivity to CO₂; the effects of opioids and sleep are additive. When CO₂ accumulates it stimulates central chemoreceptors resulting in a compensatory increase in respiratory rate that can mask the degree of respiratory depression. Therefore, respiratory rate is not a reliable indicator of the degree of respiratory depression.

Opioids depress all phases of respiratory activity including:

- Rate
- Minute volume
- Tidal exchange
- Rhythm

Clinically significant respiratory depression rarely occurs with standard opioid doses in the absence of underlying pulmonary dysfunction. Patients at greater risk for respiratory depression include infants less than 6 months old, opioid-naïve patients, the elderly, and those who have coexisting conditions such as chronic pulmonary disease and major organ failure, or are receiving other CNS depressants. **The combination of opioids with general anesthetics, alcohol, and sedative-hypnotics such as benzodiazepines and antihistamines enhance the risk of respiratory depression.** When respiratory depression occurs, it is usually in opioid-naïve individuals after acute administration of an opioid and is preceded by other signs of CNS depression such as sedation and mental clouding.

UWHC Adult Sedation Assessment Scale

- N= Normal Sleep
1 = Anxious, agitated or restless
2 = Calm, cooperative to tranquil (normal baseline without sedation)
3 = Quiet, drowsy, responds to verbal commands
4 = Asleep, brisk response to forehead tap or loud verbal stimuli
5 = Asleep, sluggish response to increasingly vigorous stimuli
6 = Unresponsive to painful stimuli

[Moderate Sedation = Sedation Score of 4]

If caring for children, use the Pediatric Sedation Scale

Nursing observation is the best method for monitoring sedation level and respiratory status.

Use an age appropriate Sedation Assessment Scale (See box) to monitor sedation level. When possible, the same nurse within a shift should obtain the required serial sedation assessments to better detect signs of progressive sedation. Special monitoring, such as pulse oximetry, is warranted only if

required by preexisting conditions and may warn of significant depression too late. Care must be taken in the interpretation of any pulse oximetry readings. If the patient is receiving supplemental oxygen the added oxygen may mask deterioration in respiratory function. In addition, unless continuous pulse oximetry is used, episodic hypoxemia may be missed.

Treatment

Detection and initial treatment of clinically significant respiratory depression involve nursing observation, decreasing the opioid dose when excessive sedation is detected, rousing the patient, administering oxygen and asking the patient to take deep breaths. No patient has died from opioid-induced respiratory depression while awake.

Naloxone, an opioid antagonist, is indicated in the presence of a sedation score of 5 combined with a respiratory rate less than 8/min. It should be titrated carefully. Giving too much naloxone or giving it too fast can precipitate severe pain that is extremely difficult to control and increase sympathetic activity leading to hypertension, tachycardia, ventricular dysrhythmias, pulmonary edema and cardiac arrest. In physically dependent patients, withdrawal syndrome can be precipitated. Naloxone may precipitate seizures in patients receiving meperidine. **The goal of reversal is to achieve a level of consciousness that sustains respirations. Naloxone should be administered in individual doses of 0.1mg (100 mcg) or less IV push while the patient is continuously monitored (pediatric dose 1-2 mcg/kg).** Patients who are comatose should be endotracheally intubated to protect the airway and allow positive pressure ventilation. Doses of naloxone may be repeated every 3-5 minutes until an adequate level of consciousness is achieved. Naloxone has a shorter half-life and duration (~1 hour) than most opioids and may need to be re-administered (or, rarely, given as a continuous infusion (1-2 mcg/kg/hour)).

When naloxone is necessary, continuous monitoring is required with documentation every 15 min per Policy #8.38 (Adult Sedation) for a minimum of 2 hours or until the patient returns to baseline, whichever is later. This is also considered an adverse event and an occurrence screen should be completed via the Patient Safety Network (PSN).

References:

- Hagle ME et al. Orthopaedic Nursing 2004;23(1):18-29. Qasseem A et al. Annals of Internal Medicine 2006;144:575-580.
- Lawrence VA, et al. Annals of Internal Medicine 2006;144:596-608.
- Estfan B, Walsh D. European Journal of Palliative Care 2006;13(2):50-53.