Naloxone
Opioid pain medications are commonly prescribed to treat acute and chronic pain. They are often misused for recreational purposes which can lead to heroin abuse. Opioid overdoses, including heroin, can result in CNS and ventilatory depression, bradycardia, and hypotension. End-organ injury or death from opioid overdose is due to hypoxic injury from opioid-induced ventilatory depression.

**Mechanism/Indications:** Naloxone is a pure competitive opioid receptor antagonist. The indication for naloxone administration is to reverse opioid-induced ventilatory depression, which can be life threatening. Reversal of CNS depression alone without ventilatory depression has limited clinical benefit. However, diagnostic use of naloxone (e.g. in comatose patients) occurs frequently in both pre-hospital and hospital settings. Caution should be taken in individuals who are opioid dependent as naloxone may induce opioid withdrawal syndrome. Naloxone may not reverse CNS depression in mixed overdoses. Naloxone administration in mixed or unknown overdose may cause nausea and/or vomiting in opioid dependent patients without reversing the CNS depression (even at the standard dose of 0.4 mg), placing them at risk of aspiration. Thus naloxone should be used with caution in a suspected mixed or unknown overdose. In apneic patients, bag-valve mask assisted ventilation should be performed while naloxone becomes available. Naloxone has also been used for clonidine intoxication with mixed success rates.

**Dosing:**

**Adults and Children >6 years old without opioid dependence:**
- Initial dose: 0.4 mg IV every 2-3 minutes to reverse ventilatory depression. Naloxone can also be given intramuscularly, subcutaneously or intranasally. Nebulized naloxone has also been used but the patient must have sufficient ventilatory effort. Naloxone is not bioavailable when administered orally.
- Intranasal naloxone dose: 2mg via intranasal atomizer, dose divided equally between both nostrils with 1ml max per nare.
- Repeat dose: 0.4 to 2 mg every 2-3 minutes up to 10 milligrams can be administered. Larger doses may be required for some opioids. If no response is seen after 6 to 10 mg, opioid intoxication is unlikely. Naloxone has a short duration of action (20-90 minutes); therefore, repeat doses may be needed for longer-acting or extended release opioid overdoses. Patients should be observed for a minimum of 2 hours (e.g. for short acting opioids & heroin) for recurrence of ventilatory depression after naloxone administration.

**Opioid-Dependent Individuals >6 years old:**
- Initial dose: 0.04 mg IV every 1-2 minutes to reverse ventilatory depression. May increase dose to 0.4 mg and 2 mg IV if no clinical response is observed.

**Children ≤6 years old:**
- Initial dose is 0.01 mg/kg to 0.1 mg/kg, or 0.4 mg IV every 2-3 minutes. May repeat naloxone dosing at 0.01 mg/kg to a maximum of 10 mg.

**Children ≤ 6 years old with opioid dependence** (including neonates born to opioid-dependent mothers):
- 0.001 mg/kg IV with concomitant supportive care.
Naloxone (continued)

Intravenous Infusion—for symptom recurrence due to long-acting opioids:
- Initiate continuous naloxone infusion if the patient experiences recurrence of opioid intoxication requiring multiple administrations of naloxone. Infuse 2/3rd of the response naloxone dose per hour. For example, if a total of 0.12 mg of naloxone was required to reverse the ventilatory depression, start the IV infusion at 0.08 mg/hour and titrate to the patient’s clinical response.

Precautions in Populations:
- Opioid tolerant/dependent individuals: low-dose naloxone should be used to minimize the risk of precipitating opioid withdrawal symptoms, e.g. nausea, vomiting, acute agitation, and rarely seizure, acute lung injury and cardiac dysrhythmia.
- Pregnant women: smallest dose of naloxone should be used to reverse life threatening opioid intoxication. Naloxone detoxification in pregnant opioid addicts could result in opioid withdrawal in the fetus, fetal distress, meconium staining, or fetal death.
- Post-operative patients: cardiovascular adverse effects have occurred in post-operative patients with underlying cardiac disorders in the setting of naloxone-induced opioid withdrawal.

Contraindications:
- Hypersensitivity to naloxone

Adverse Effects:
- Naloxone administration to patients without exposure to opioids has no pharmacological effect or adverse drug reaction. Adverse effects are related to naloxone-induced opioid withdrawal and include flushing, sweating, nausea/vomiting, trembling, tachycardia, agitation and delirium. Serious effects are rare but can include acute lung injury, chest pain and seizures.

For more on naloxone: