Management Acute Opiate Overdose in Critical Care Unit

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INTRODUCTION

Opioid overdose (OOD) occurs when the central nervous system and respiratory drive are suppressed because of excessive consumption of the drug.

Symptoms of OOD include drowsiness, slow breathing, pinpoint pupils, cyanosis, loss of consciousness, and death.

Emergency medical services and the emergency department often perform initial management of OOD. Thereafter, some patients require intensive care management because of respiratory failure, metabolic encephalopathy, acute kidney injury, and other organ failure.

INTRODUCTION

Worldwide, approximately 69,000 people die of OOD each year.

In the United States, death from OOD has increased almost 5-fold from 2001 to 2013. OOD leading to intensive care unit admission has increased by 50% from 2009 to 2015.

At the same time, the mortality associated with these admissions has doubled. Thus, it is essential to discuss and review the management strategies of OOD in critically ill patients.

CLINICAL PRESENTATION AND DIAGNOSIS OF OPIOID OVERDOSE

An OOD can be easily identified by a combination of 3 symptoms called the OOD triad, namely unconsciousness, respiratory depression, and pinpoint pupils.

Common OOD symptoms are respiratory and mental depression, miosis, mydriasis (if hypoxic), nausea or uncontrolled vomiting, and atypical snoring. Less common symptoms include acute lung injury, QT prolongation, seizure, bowel obstruction, and noncardiogenic pulmonary edema.

CLINICAL PRESENTATION AND DIAGNOSIS OF OPIOID OVERDOSE

Decreased respiratory drive is one of the **most dangerous** side effects of OOD and is the reason that opioids are responsible for a high proportion of drug overdose deaths.

Negative pressure pulmonary edema can occur because of fluid extravasation secondary to increased negative intrathoracic pressure from breathing against a closed glottis.

Acute lung injury may arise from sympathetic vasoactive response after reversal of intoxication resulting in leakage from pulmonary vessels causing noncardiogenic pulmonary edema.

INITIAL MANAGEMENT

Primary treatment focuses on the **stabilization of the cardiopulmonary** status.

Airway management and the continuous assessment of oxygenation and ventilation, along with administration of naloxone, is the standard of care for emergency medical services personnel treating OOD.

ETIOLOGY OF ADMISSION TO THE INTENSIVE CARE UNIT

Patients with OOD can develop respiratory depression requiring intubation and thus, may warrant further management in the ICU.

Other pulmonary complications of OOD causing **respiratory failure** are noncardiogenic pulmonary edema and aspiration pneumonitis.

Present with ***hypothermia*** and profound ***hypotension*** requiring vasopressor support. Opioid poisoning can lead to elevated serum aspartate aminotransferase and creatinine kinase levels, myoglobinuria, hypocalcaemia, and hypophosphatemia because of drug-induced myopathy causing rhabdomyolysis.

ETIOLOGY OF ADMISSION TO THE INTENSIVE CARE UNIT

Patients may end up in **acute renal failure** and require **hemodialysis**.

Patients with rhabdomyolysis and acute renal failure are also at an elevated risk of **arrhythmias** either because of hyperkalemia or direct effect of opioids such as oxycodone and methadone.

Drugs such as meperidine and tramadol can cause breakthrough **seizures** that may require intubation for airway protection.

Acute liver failure resulting in hepatic encephalopathy can occur from coingestion with acetaminophen.

Rarely, **anaphylactic and hypersensitivity reactions** may occur with acetaminophen and oxycodone.

CRITICAL CARE MANAGEMENT OF OPIOID OVERDOSE

Once the cardiopulmonary status of the patient has been stabilized, the primary focus of treatment is on the reversal of the opioid.

Naloxone is a competitive antagonist of the mu opioid receptor and is used to reverse the effects of opioids. It reverses and blocks the action of opioids. Naloxone is useful in reducing respiratory and mental depression.

It is available to be used through intravenous (IV), intramuscular (IM), subcutaneous (SC), intranasal, endotracheal, nebulized/inhalational, and buccal or sublingual routes.

The half-life of naloxone is approximately 30–90 minutes.

CRITICAL CARE MANAGEMENT OF OPIOID OVERDOSE

Some patients may require repeated doses of naloxone because of its relatively short half-life compared with that of opioids.

Naloxone administration may be repeated without harm if required. Dosing of naloxone should be performed carefully with repeated dose escalation to avoid provoking severe opioid **withdrawal**.

Patients with very low respiratory rates or apnea should receive 0.4–2 mg IV/IM/SC as an initial dose, and must be ventilated by bag-valve mask and provided with oxygen supplementation.

Patients who develop cardiorespiratory arrest should get at least 2 mg of naloxone. Dose (0.005–0.01 mg/kg) may be repeated every 2–3 minutes as needed, based on response.

CRITICAL CARE MANAGEMENT OF OPIOID OVERDOSE

Alternate diagnosis should be considered if there is **no response** after 10 mg naloxone.

If the patient starts to get more **lethargic and respiratory rate decreases**, the infusion should be restarted. The goal of the treatment is to achieve a ***stable mental status*** and ensure ***adequate ventilation***.

If signs of withdrawal are seen, the infusion should be stopped.

Capnography can be used to monitor ventilator effort in OOD patients on mechanical ventilation.

CRITICAL CARE MANAGEMENT OF OPIOID OVERDOSE

Sodium bicarbonate at an initial bolus dose of 1–2 mEq/kg intravenously should be given for OOD associated **wide complex arrhythmias**. Patients

Who develop ***pulmonary edema*** or ***acute respiratory distress syndrome*** should be managed with adequate oxygenation, prone positioning, and low tidal volume ventilation while using high positive end expiratory pressure for alveolar recruitment.

CRITICAL CARE MANAGEMENT OF OPIOID OVERDOSE

Acid–base disorders are common in patients with OOD because of central respiratory depression that causes CO_2 retention leading to ***respiratory acidosis***. These patients may require noninvasive or invasive ventilation to treat the hypercapnia. OOD can also cause vomiting and diarrhea that can manifest with ***metabolic alkalosis*** and ***metabolic acidosis***, respectively.

Patients presenting with **rhabdomyolysis** need aggressive fluid resuscitation.

Urgent fasciotomy may be required for those who develop ***compartment syndrome*** from **acute myopathy**.

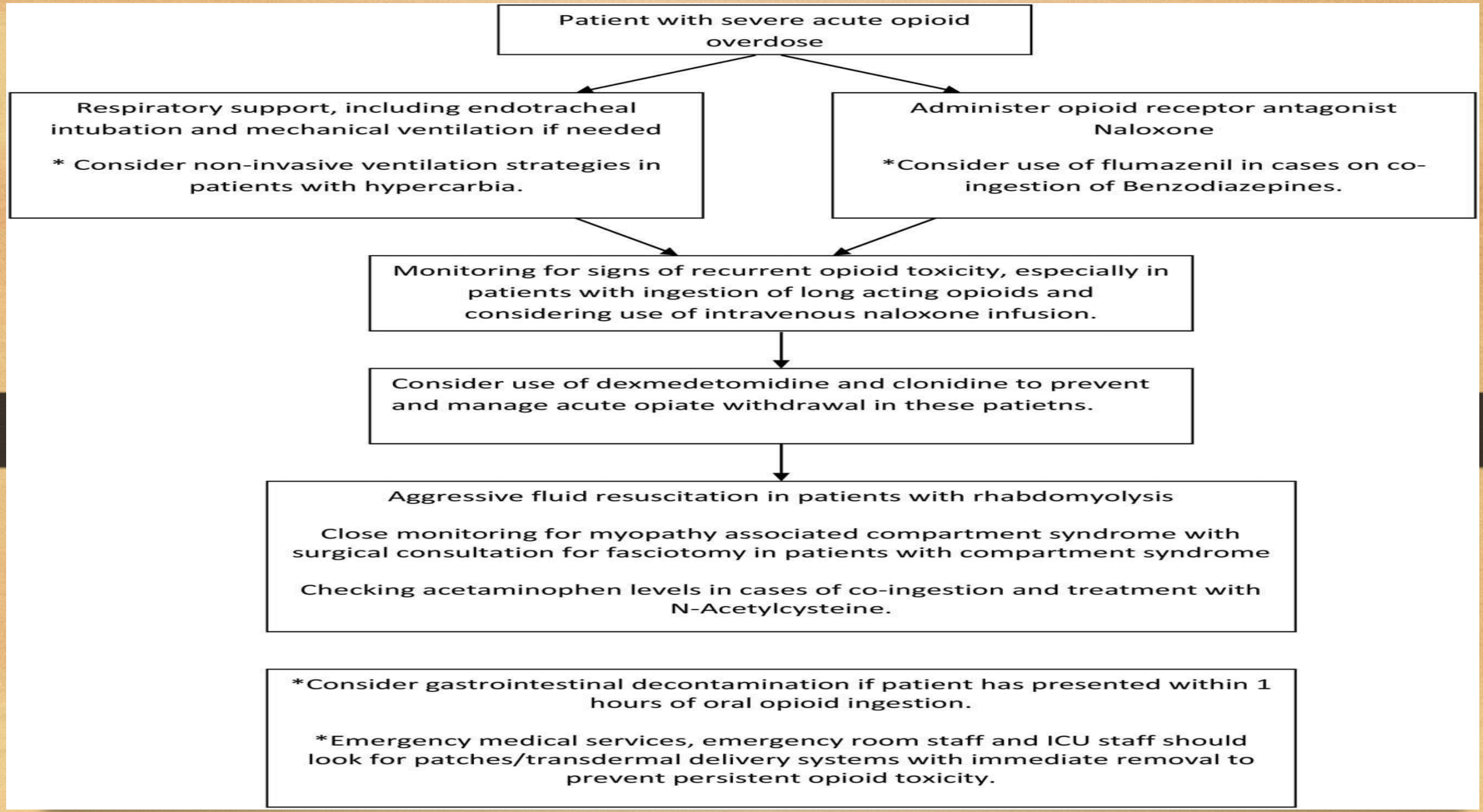
CRITICAL CARE MANAGEMENT OF OPIOID OVERDOSE

Chronic opioid use suppresses catecholamine release in the body. When patients are admitted to the ICU for management of OOD, it results in an abrupt discontinuation of opioids, causing a rebound increase in ***noradrenergic*** signal leading to signs and symptoms of opioid withdrawal.

Clonidine was the first alpha-agonist used to manage opioid withdrawal and is widely studied in heroin detoxification regimen.

Dexmedetomidine is an IV, highly selective alpha 2-agonist that is commonly used as a sedative in the ICU.

It has been reported to facilitate opioid detoxification and help acute withdrawal symptoms in patients with chronic opioid use.


Patient with severe acute opioid overdose
Respiratory support, including endotracheal intubation and mechanical ventilation if needed
* Consider non-invasive ventilation strategies in patients with hypercarbia.
Administer opioid receptor antagonist Naloxone
*Consider use of flumazenil in cases on co-ingestion of Benzodiazepines.
Monitoring for signs of recurrent opioid toxicity, especially in patients with ingestion of long acting opioids and considering use of intravenous naloxone infusion.
Consider use of dexmedetomidine and clonidine to prevent and manage acute opiate withdrawal in these patietns.
Aggressive fluid resuscitation in patients with rhabdomyolysis
Close monitoring for myopathy associated compartment syndrome with surgical consultation for fasciotomy in patients with compartment syndrome
Checking acetaminophen levels in cases of co-ingestion and treatment with N-Acetylcysteine.
*Consider gastrointestinal decontamination if patient has presented within 1 hours of oral opioid ingestion.
*Emergency medical services, emergency room staff and ICU staff should look for patches/transdermal delivery systems with immediate removal to prevent persistent opioid toxicity.