

Emergency Drugs for the Oral and Maxillofacial Surgeon Office



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KEYWORDS

- Emergency drugs • IV sedation • Management of airway emergencies
- Management of sedation emergencies

KEY POINTS

- Oral surgeons and staff should be prepared for perioperative emergencies.
- Prompt recognition and preparedness are the most important factors in managing emergencies in the oral surgery office.
- Emergency drugs along with their mechanism of action, dosages, and preparations should be well known to the oral surgeon and team.

INTRODUCTION

For more than 90 years, office-based anesthesia has been a part of the history, training, and practice of oral and maxillofacial surgery (OMFS).^{1,2} There may be a significant component of fear, anxiety, and pain that should be alleviated in order to carry out procedures comfortably for patients.

Every oral surgeon should recognize that medical emergencies may transpire during the course of practice and office-based anesthesia. These emergencies could be connected to surgical management, anesthesia administration, or patient risk factors.³ Medical emergencies can easily evolve into a life-threatening emergency without prompt recognition and treatment. It is for this reason emergency medications should be present and available in the oral surgery office.

Oral surgeons who use advanced anesthesia, like moderate sedation, in addition to deep sedation/general anesthesia must be skilled in diagnosis and management of emergencies, which may result from their usage.⁴ Resuscitative equipment (**Box 1**), oxygen, and other resuscitative medications should be accessible for immediate use.^{5,6}

This list is a suggested list of the core emergency drugs and a of suggested emergency medications for those doing advanced anesthesia. Always check with your state dental board for the mandatory emergency medications you must have in your office.⁷

CORE EMERGENCY DRUGS

Oxygen

Oxygen is used for the treatment of hypoxemia, which is common in numerous medical emergencies.⁸ This underlines the significance and need for a supplemental oxygen delivery system.⁹ Multiple routes are available for delivery. The oral surgery office should also be equipped with a bag-valve mask with full face mask to allow for positive-pressure ventilation.¹⁰

Nitroglycerin

Nitroglycerin is used for relief of acute chest pain with history of angina, or undiagnosed angina with symptoms of myocardial infarction. It is an antianginal that stimulates cyclic guanosine monophosphate production, which relaxes vascular smooth muscle specifically in the coronary arteries

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Box 1**List of resuscitative equipment**

Source of oxygen and equipment to deliver positive pressure ventilation

Stethoscope

Respiratory support equipment

- Magill forceps or other suitable instruments
- Laryngoscope and suitable blades
- Endotracheal tubes with stylets
- Oral and nasal airways
- Supraglottic airway device (laryngeal mask airway)

Blood pressure cuff with automatic monitor

Electrocardiograph

Automated external defibrillator

Pulse oximeter

Capnography monitor

Equipment to establish IV access and appropriate fluids

Equipment to establish intraosseous access

in the presence of an anginal attack. The usual dose of nitroglycerin is 1 sublingual (0.4 mg) tablet or 1 spray (0.4 mg) from a nitroglycerin spray atomizer every 5 minutes. Common side effects are headaches, dizziness, and flushing. Nitroglycerin is contraindicated for patients with hypotension and should not be given to patients taking medication for erectile dysfunction, such as sildenafil (Viagra), tadalafil (Cialis), and vardenafil (Levitra) because of risk of severe hypotension, tachycardia, and cardiovascular collapse.^{11,12}

Aspirin

Aspirin is used for suspected myocardial infarction or ischemia. It is an antiplatelet and works by inhibiting prostaglandin synthesis and irreversibly inhibits platelet aggregation. Dosage is one 325 mg nonenteric-coated aspirin tablet, which is chewed for 30 seconds and swallowed. Aspirin should not be given to people with recent bleeding peptic ulcer or history of aspirin allergy.¹³

Epinephrine 1:1000

Epinephrine 1:1000 is used for anaphylaxis, for bronchospasm, and as a cardiac stimulant during cardiac arrest. It is a sympathomimetic drug that activates alpha- and beta-adrenergic receptors. It increases heart rate and myocardial contractility. It also causes vasoconstriction and bronchial

dilation and stabilizes mast cells. For anaphylaxis, the adult dose of epinephrine is 0.3 mg (1:1000), and the children's dose is 0.15 mg (1:2000) intramuscular (IM) via autoinjector for anaphylaxis. An IM preparation can also be made by drawing up 0.3 mL from a vial of 1 mg/mL (1:1000) into a syringe for use for adults with anaphylaxis (Fig. 1). The epinephrine 1:10,000 concentration is designed for intravenous (IV) administration. Caution should be used, as it may cause tachydysrhythmias. It also decreases placental blood flow and may induce premature labor.^{14,15}

Albuterol

Albuterol is used for bronchospasm and wheezing secondary to an acute asthmatic episode. It is a bronchodilator that stimulates beta-2 adrenergic receptors, causing bronchodilation. Albuterol is available in a metered-dose inhaler and can be used 2 to 3 times every 1 or 3 minutes as needed.¹⁶

Aromatic Ammonia

Aromatic ammonia is used for syncope/fainting/loss of consciousness. It is a respiratory stimulant, and when crushed, releases a noxious odor that stimulates the respiratory and vasomotor centers of the medulla. Return to consciousness is typically achieved by placing patients in the Trendelenburg position, with administration of oxygen and by using aromatic ammonia.¹⁷

Diphenhydramine

Diphenhydramine is used for allergic reactions/anaphylaxis. It is an antihistamine that antagonizes histamine at the H-1 receptor. It causes sedation and has an anticholinergic effect. Diphenhydramine can be given 50 mg IM or IV.¹⁸

Glucose (Dextrose 50%)

Glucose (dextrose 50%) is used to increase glucose levels in hypoglycemic states. Simple sources may be used, such as orange juice, cola, or granulated sugar, in conscious patients. The oral formulation should not be given to unconscious patients because of risk of aspiration. If patients are unable to swallow, IV access should be obtained, and dextrose 50% in water can be given or by IM injection of glucagon.¹⁹

Emergency Medications for Advanced Anesthesia

The American Association of Oral and Maxillofacial Surgeons Committee on Anesthesia recommends that the oral surgery office maintain supplies of the following medications: vasopressors,

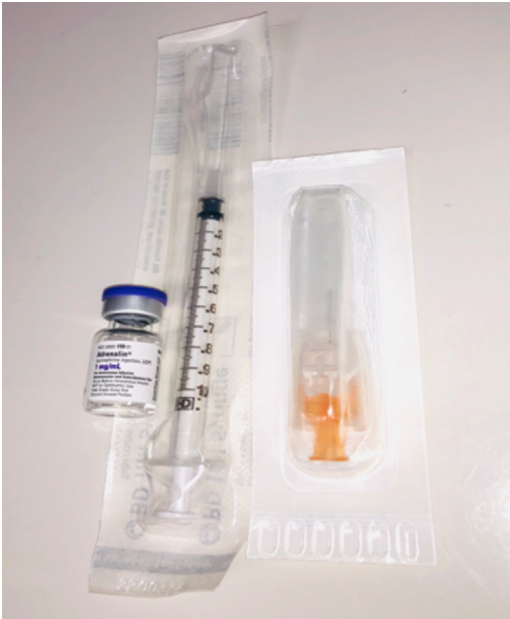


Fig. 1. Preparation of 0.3-mg solution of epinephrine.

corticosteroids, bronchodilators, muscle relaxants, narcotic antagonists, benzodiazepine antagonists, antihistamines, antiarrhythmics, anticholinergics, coronary artery vasodilators, antihypertensives, and drugs for treatment of malignant hyperthermia.²⁰

VASOPRESSORS

Ephedrine

Ephedrine is an adrenergic agonist used to manage moderate to severe hypotension when patients are also bradycardic. Ephedrine displays both alpha-1 and beta-1 adrenergic agonism. Ephedrine causes increased peripheral vascular resistance, positive cardiac chronotropy, and positive cardiac inotropy. Ephedrine can be prepared by diluting a 50-mg/mL vial in 9 mL of saline to make a 5-mg/mL solution. Typical dosing is a 5-mg bolus titrated to the desired effect.²¹

Phenylephrine

Phenylephrine is an adrenergic agonist used to manage hypotension when patients have tachycardia or normal heart rate. Phenylephrine is a selective alpha-1 agonist, which results in peripheral vasoconstriction and increased blood pressure. Reflex bradycardia typically accompanies administration. Phenylephrine can be prepared by diluting a 10-mg/mL vial in 9 mL of saline; 9 mL of this solution can be discarded, and an additional 9 mL of saline can be added to create a 0.1-mg/mL

solution. Alternatively, the 10-mg/mL vial can be added to a 100-mL bag of saline to also obtain the desired 0.1-mg/mL solution (Fig. 2). Typical dosing is 0.1 mg/mL titrated to the desired effect.²²

CORTICOSTEROID

Dexamethasone

Dexamethasone is a synthetic adrenal corticosteroid used as an antiemetic and for treatment of severe allergies, pruritus, asthma, bronchospasm, and postoperative edema. It can provide membrane-stabilizing effects, reduce leukotriene formation, and reduce histamine release from mast cells. There is a slow onset of action. A typical dose is 4 to 12 mg IV. Caution should be used for patients with preexisting infection, peptic ulcer, or hyperglycemia.²¹

Hydrocortisone

Hydrocortisone is a corticosteroid with similar indications and anti-inflammatory properties as dexamethasone. It is the preferred corticosteroid for management of acute adrenal insufficiency. The typical dose is 125 mg.²³

MUSCLE RELAXANTS

Succinylcholine

Succinylcholine is a depolarizing neuromuscular blocker used for management of laryngospasm after other methods have proved unsuccessful. It helps relax the vocal cords and causes general muscle paralysis. It binds directly to postsynaptic acetylcholine receptor endplates, leading to fasciculations followed by muscular paralysis. It has a very rapid onset (45–60 seconds) and short duration of action (4–6 minutes). A typical dose is 0.1 to 0.2 mg/kg or 20 mg IV to break the spasm. It will require ventilation support. There is a lack of fade in train-of-four response. It should not be used whenever hyperkalemia is possible, such as muscular dystrophy or other myotonias, in muscle denervation, cerebral palsy, multiple sclerosis, or burn patients. An increase in potassium from succinylcholine use in hyperkalemic conditions may lead to cardiac arrest. It is a trigger for malignant hyperthermia and can result in prolonged paralysis in patients with pseudocholinesterase deficiency. It has a shelf life of 2 weeks.²⁴

Dantrolene

Dantrolene is used for the treatment of malignant hyperthermia crisis. It is required in any clinic that uses known triggers like sevoflurane, isoflurane, desflurane, and succinylcholine. It interferes

titrated to effect with a maximum of 0.8 mg. Formulation is usually 0.4 mg/mL in a 1-mL vial, which can be diluted with normal saline in a 10-cc syringe for a 0.1-mg/mL solution. Caution should be used, as use may result in significant release of catecholamines resulting hypertension, seizures, ventricular tachycardia, ventricular fibrillation, or fluid shift triggering pulmonary edema.²⁸

Flumazenil

Flumazenil is used for management of benzodiazepine overdose, resulting in unconsciousness in planned moderate sedation, postoperative drowsiness, central nervous system depression, respiratory depression, or emergence delirium. It reverses the sedation, anxiolysis, amnesia, muscle relaxation, and anticonvulsant effects of benzodiazepines by inhibiting GABA receptors. Patients should be monitored in office for at least 1 hour to rule out re-sedation. A typical dose is 0.1 to 0.2 mg titrated to effect. It should not be given to patients with a seizure disorder managed by benzodiazepines.²¹

Anticholinergics

Anticholinergics is used for management of hemodynamically significant bradycardia, dizziness or motion sickness-related symptoms, and increased salivation. The target of anticholinergic medications is muscarinic receptors. When activated, these receptors cause parasympathetic effects on specific organs. The primary anticholinergic medications are atropine, glycopyrrolate, and scopolamine. Atropine has the fastest onset and blocks vagal stimulation to the heart, allowing for unopposed sympathetic stimulation. This makes it the drug of choice for hemodynamically unstable bradycardia with a typical dose of 0.5 mg IV titrated to effect. It also can be used in smaller doses of 0.01 mg/kg to counteract the hypersalivation effect of ketamine during procedural sedation. It should not be given to patients with ischemic heart disease, acute narrow-angle glaucoma, prostatic hypertrophy, urinary retention, acute hemorrhage, or hyperthyroidism. Physostigmine, a cholinesterase inhibitor, can reverse anticholinergic syndrome (emergence delirium) encountered with use of scopolamine, benzodiazepines, or diphenhydramine.²¹

ANTIHYPERTENSIVE AGENTS

Esmolol

Esmolol is a beta-1 selective antagonist with a very short duration of action. It decreases the force and rate of heart contractions. A typical dose is 20 mg

titrated to effect. The duration of action is under 20 minutes. It can be used for management of hypermetabolic state. Caution should be used with patients with asthma and chronic obstructive pulmonary disease.²¹

Labetalol

Labetalol is a selective alpha-1 blocker and nonselective beta-blocker. It has intrinsic sympathetic activity and will not decrease resting cardiac function as much as esmolol. It lowers blood pressure by blockade of alpha-1 receptors in vascular smooth muscle and beta-1 receptor in the heart. The dosage is 20 mg titrated to effect. Duration of action is 2 to 18 hours. Caution should be used in patients with asthma, bradycardia, and congestive heart failure. Any patient given antihypertensive should be assessed carefully before discharge for risk of orthostatic hypotension.²¹

Hydralazine

Hydralazine is a direct-acting smooth muscle relaxant used to treat hypertension. It acts as a vasodilator to decrease peripheral resistance and lowers the blood pressure and decreases afterload. It can cause reflex sympathetic stimulation, which increases the heart rate and cardiac output. A typical dose 5 mg IV titrated up to 25 mg. Onset is 5 minutes with a duration 2 hours. It can be used for patients with asthma and can cause flushing, hypotension, headache, and nausea/vomiting. It should not be given to patients with tachycardia, coronary artery disease, constrictive pericarditis, lupus, pulmonary hypertension, high-output heart failure (thyrotoxicosis), dissection aortic aneurysm, or porphyria.²⁹

ANTIARRHYTHMIC

Amiodarone

Amiodarone is used for the treatment of ventricular fibrillation, pulseless ventricular tachycardia refractory to defibrillation and epinephrine administration, and stable ventricular tachycardia. It is also used for Wolff-Parkinson-White syndrome with reentry phenomenon. It works by blocking potassium channels by slowing down conduction in the atrioventricular (AV) node and increasing threshold for ventricular fibrillation. In cardiac arrest algorithm, it is given as a 300-mg bolus. It should not be given with other antiarrhythmics or beta-blockers, as it may cause sinus arrest.³⁰

Adenosine

Adenosine is used for the treatment of paroxysmal supraventricular tachycardia. It works by slowing

conduction in the AV node and interrupting the reentry pathways. A typical dose is 6 mg push. It has a very rapid onset and may cause transient sinus bradycardia or asystole with administration. It may also cause chest pain, hypotension, flushing, and bronchospasm. It should not be given to patients with asthma or those taking dipyridamole or theophylline.³¹

DIURETICS

Furosemide (Lasix)

Furosemide (Lasix) is used to treat fluid buildup due to congestive heart failure, acute pulmonary edema, acute decompensated heart failure, and resistant hypertension. It is also used to prevent kidney injury during malignant hyperthermia. It is a loop diuretic that works on the thick ascending limb of loop of Henle. A dose is typically 0.5 to 1 mg/kg IV over 1 to 2 minutes for acute pulmonary edema and hypertensive crisis. Onset of action is 5 minutes after IV administration, and duration is 2 hours. Oral administration of Lasix will “last 6 hours,” hence the name. It should not be used in patients with lupus, liver disease, renal impairment, and sulfa allergies. It can cause electrolyte imbalance, hypotension, and ototoxicity.²¹

Antiemetics

Antiemetics are used for treatment of nausea and vomiting after procedural sedation. It is important to know the known risk factors, like younger age, female sex, nonsmoker, and history of postoperative nausea vomiting. Also, high risks are obesity, gastroesophageal reflux disease, gastroparesis, and diabetes. It is important to limit known triggers like N₂O, fentanyl, and etomidate.²¹

Ondansetron

Ondansetron is used to prevent nausea and vomiting after procedural sedation. It is a 5-HT₃ receptor antagonist that acts on both peripheral vagal nerve terminals and central chemoreceptor trigger zone of the area postrema in the medulla. Dose is usually 4 mg IV. It is associated with prolonged QT interval, which may lead to torsades de pointes. It should not be given to patients with congenital long QT syndrome and congestive heart failure.²¹

Metoclopramide

Metoclopramide is used to prevent nausea and vomiting after procedural sedation. It is a dopamine D₂ receptor antagonist that acts on the chemoreceptor trigger zone in the central nervous system. The dose is 10 mg. It can cause movement disorders like tardive dyskinesia. It should

not be used in patients with Parkinson disease. It can also trigger neuroleptic malignant syndrome (NMS), characterized by high fever, confusion, rigid muscles, and autonomic imbalance. The management for NMS is stopping the offending agent, rapid cooling, dantrolene, and benzodiazepines.²¹ One may also consider supplementing with additional known antiemetics like Decadron, propofol, and scopolamine transdermal patch.

SUMMARY

Anxiety control and patient comfort are integral parts of the OMFS practice. Knowledge of emergency drugs is part of a safe anesthesia practice, which includes proper patient selection, anesthesia technique, drug regimen, monitoring, and emergency preparedness.

This article focuses on describing many of the characteristics and properties of drugs that are helpful in the treatment of anesthetic emergencies in the OMFS office. This list should not be considered mandatory or all-inclusive.

Any OMFS office should be prepared to deal with emergencies. The provider should be cognizant of the drugs discussed in this article. Knowledge of the indication and appropriate use of the drugs described provides a sound basis for the management of adversity that may arise during sedation or anesthesia in an outpatient OMFS office.

CLINICS CARE POINTS

- A list of core emergency drugs includes oxygen, nitroglycerin, aspirin, epinephrine, albuterol, aromatic ammonium, diphenhydramine, and glucose.
- American Association of Oral and Maxillofacial Surgeons Anesthesia committee recommends the oral surgery office maintain supplies of the following medications: vasopressors, corticosteroids, bronchodilators, muscle relaxants, narcotic antagonists, benzodiazepine antagonists, antihistamines, antiarrhythmics, anticholinergics, coronary artery vasodilators, antihypertensives, and drugs for treatment of malignant hyperthermia.
- Triggers for malignant hyperthermia include sevoflurane, isoflurane, desflurane, and succinylcholine.
- Malignant hyperthermia can be treated with dantrolene or Ryanodex.

- Sugammadex can reverse neuromuscular blockade of Rocuronium.
- Naloxone can reverse overdose of fentanyl.
- Flumazenil can reverse overdose of versed.
- Physostigmine can reverse anticholinergic syndrome (emergence delirium) from use of glycopyrrolate.
- Basic life support, advanced cardiovascular life support, and pediatric advanced life support algorithms and guidelines should be routinely reviewed and readily available.

DISCLOSURE

The authors have nothing to disclose.

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