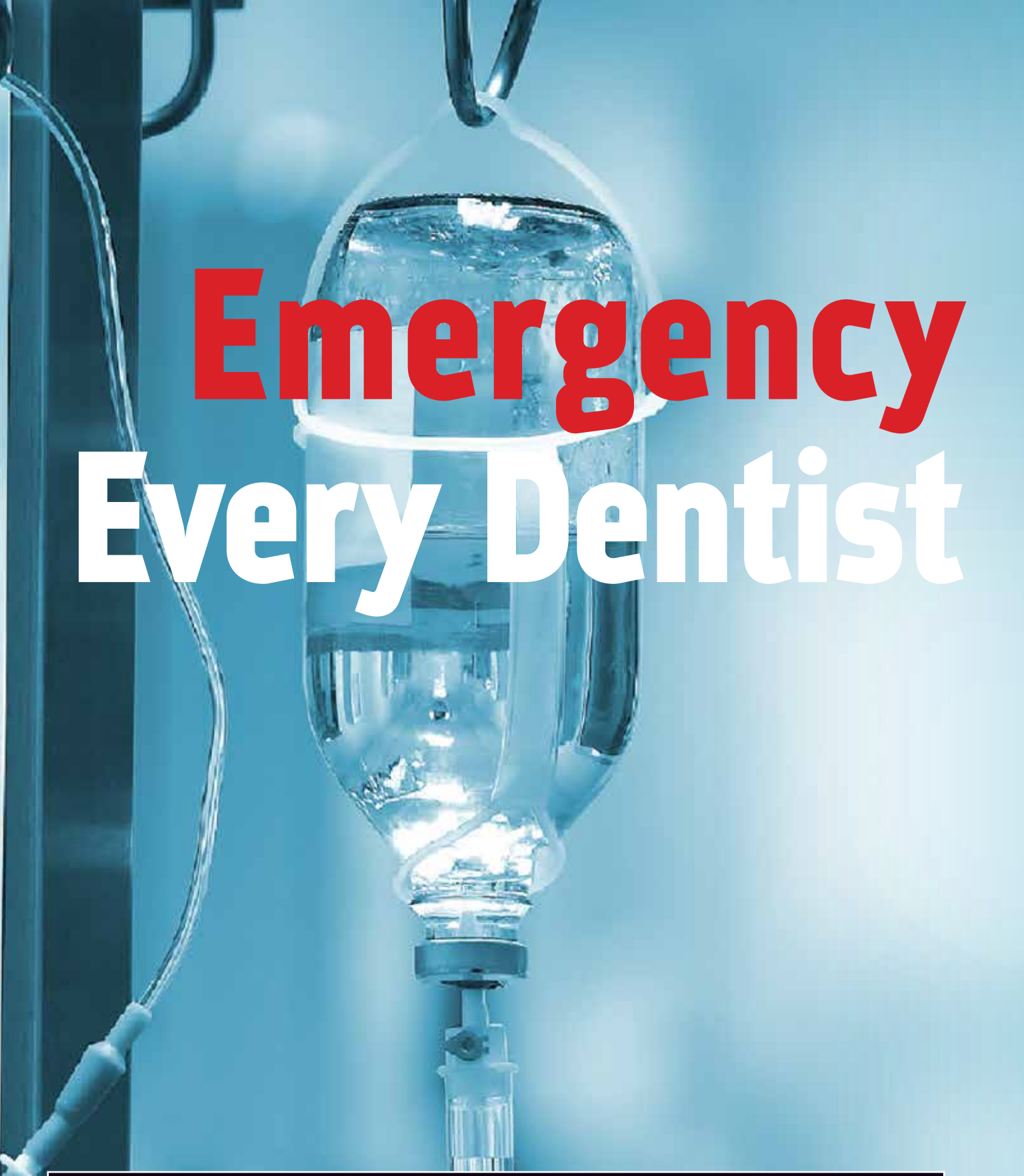
Emergency Every Dentist



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Medications Should Know

Part 2: Atropine/glycopyrrolate, ephredrine and epinephrine

Course description

"Emergency Medications Every Dentist Should Know" is a four-part continuing education series that covers the most common emergency medications found in most proprietary dental emergency medication kits. Every dentist should periodically review the uses of emergency medications and be familiar with these medications themselves, then share this information with his or her staff.

Objectives

- Learn when to use atropine, epHEDrine, and epINEPHrine medications.
- Review the physiology of atropine, epHEDrine, and epINEPHrine effects.
- Learn the routes of administration to administer atropine, epHEDrine, and epINEPHrine to patients.
- Continue to develop a, "Quick & Dirty Cheat Sheet" for your dental office emergency kit.

by Allan Schwartz, DDS, CRNA

Dr. Allan Schwartz, DDS, CRNA, is a 1980 graduate of Baylor College of Dentistry in Dallas. He attended a general practice residency in general dentistry from the Jewish Hospital of St. Louis, Missouri, from 1980 to 1981, and in 1990 earned a bachelor's in nursing from St. Louis University. After graduating from the Washington University School of Nurse Anesthesia in St. Louis in 1994, he began practicing as a certified registered nurse anesthetist.

Schwartz is a licensed dentist with a certificate issued by the Missouri Dental Board in deep sedation/general anesthesia. He is the author of several anesthesia and nursing journal articles, and has written chapters of four nurse anesthesia textbooks and a medical dictionary. More of his courses are available on sedationconsult.com.

Disclosure:
The author declares that neither he nor any member of his family has a financial arrangement or affiliation with any corporate organization offering financial support or grant monies for this continuing dental education program.

Introduction

Drawing up and properly labeling one's own medications, as well as always having control of them, are standards of care in anesthesia. State dental boards are strict about adherence to safe practices for the handling of medications given to patients.

The Joint Commission, the Institute for Safe Medication Practices, the Food and Drug Administration, the Anesthesia Patient Safety Foundation and the American Association of Nurse Anesthetists provide guidelines for properly drawing up and labeling medications.

"Tall-man" labeling, also called "mixed case lettering," highlights quick reading of the similarities and dissimilarities of drug names. Tall-man lettering draws attention to similar drug names, resulting in fewer mix-ups in medication labeling and increased safe administration to patients.

Examples:

- ePHEDrine/EPINEPHrine
- fentanyl/SUFentanil
- HYDROmorphone/Morphine

Today, all medication labels on syringes must contain:

- The name of the drug (e.g., Fentanyl)
- Concentration of the drug (e.g., 50 mcg/ml)
- Date the drug was drawn (e.g., 8/19)
- Initials of the person drawing the drug
- Time the drug was drawn

Dentists must keep drawn-up medications safe and secure from tampering. You are responsible for the fidelity of the medications administered to your patients.

Anatomy and physiology of the autonomic nervous system

To understand the pharmacodynamics of these medications, a recap of the autonomic nervous system is necessary.

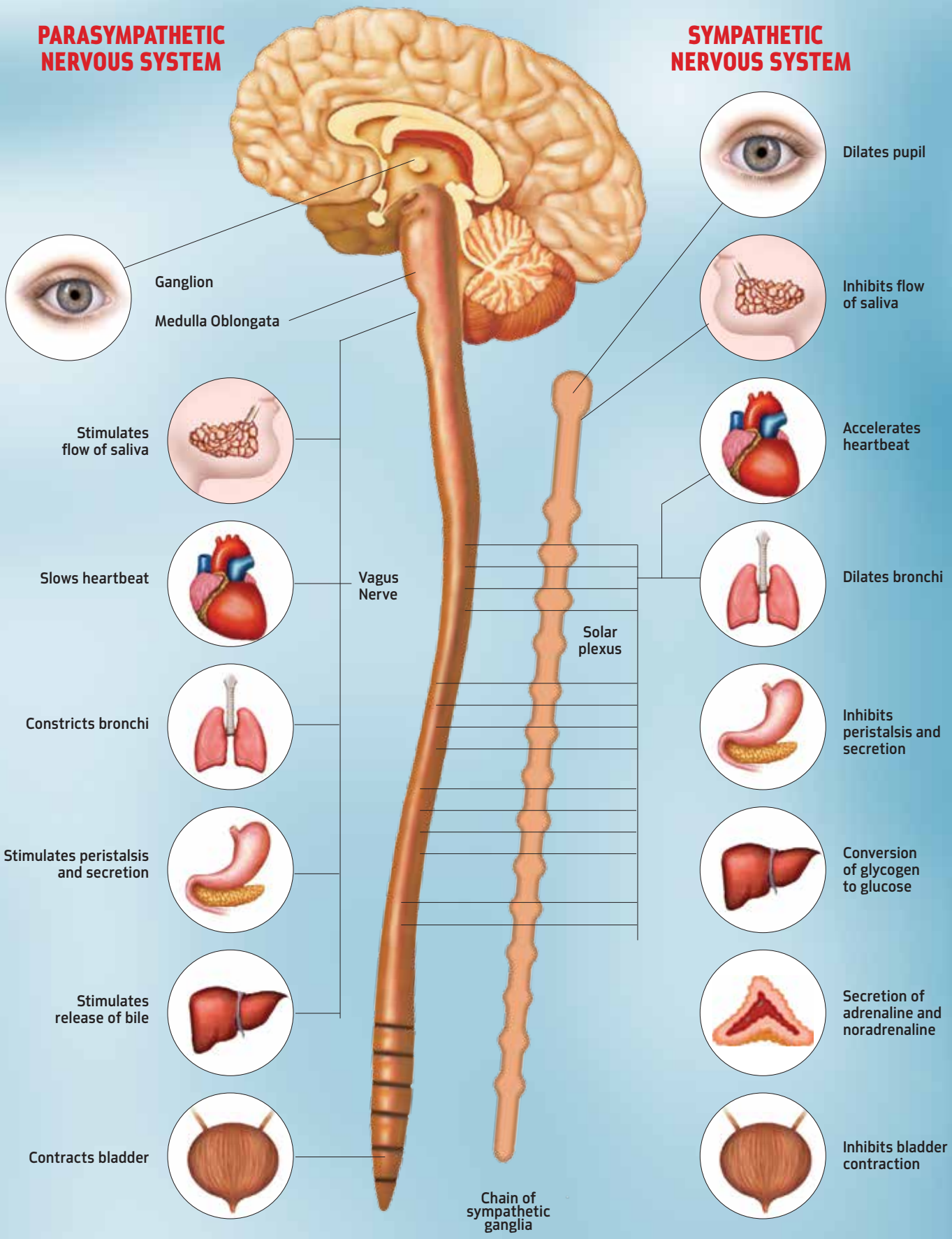
The autonomic nervous system has powerful control of our organ functions and keeps our systems in a state of normalcy, especially the heart. The sympathetic and parasympathetic systems comprise the autonomic nervous system, and each component system acts to counterbalance the effects of the other.

The medications described in this article act to either block or stimulate receptors in the autonomic nervous system. These medications create an imbalance or predomination of one system's physiological effects over the other.

The sympathetic nervous system (SNS) is a chain of ganglia that runs bilaterally along the length of the spinal cord. The neurotransmitter found within the SNS is norepinephrine. Stimulation by the SNS produces fight-or-flight responses: Heart rate accelerates; bronchi of the lungs dilate; peristalsis is inhibited; pupils dilate; glycogen is converted to glucose; adrenal release of epinephrine and norepinephrine is stimulated; salivary flow is inhibited, as is bladder contraction.

PARASYMPATHETIC NERVOUS SYSTEM

SYMPATHETIC NERVOUS SYSTEM



The parasympathetic nervous system (PNS) is less anatomically defined because it involves several nerves, predominantly the vagus nerve (cranial nerve X). Vagus means "wandering" in Latin, and the vagus nerve fittingly wanders to and from various organs. Stimulation by the PNS produces: deceleration of the heart rate; constriction of the bronchi and pupils; stimulation of digestion by increasing peristalsis, salivary flow and bile production; and contraction of the bladder.

The sympathetic and parasympathetic nervous systems produce the exact dissimilar effects at end organs as discussed above.

Atropine/glycopyrrolate

Atropine and glycopyrrolate (Robinul) are classified as anticholinergic medications. They are administered when parasympathetic stimulation effects must be blocked to provide homeostasis for the patient. Some examples:

- A patient with symptomatic bradycardia, with subsequent decreased cardiac output with hypotension.
- A salivating patient, where salivary flow from the reflex digestive process could create a wet intraoral environment that would compromise dental restoration placement.

Atropine has a tertiary amine molecular structure, which allows it to cross the blood/brain barrier. Effect of central nervous cholinergic blockade are:

- Memory impairment
- Attention deficit
- Confusion
- Impaired concentration

Glycopyrrolate has a quaternary amine molecular structure, which does not penetrate the blood/brain barrier. Both medications are used in dentistry to treat symptoms of the PNS predominance.

Atropine used to be found in the American Heart Association's Advanced Cardiac Life Support (ACLS) algorithms for cardiac arrest and symptomatic bradycardia; it has been removed and replaced by EPINEPHrine. ACLS algorithms were updated in 2015. Check the heart association website to be current with the new ACLS algorithms.

ePHEDrine

The anesthetic medication ePHEDrine is used to raise both blood pressure and heart rate. EPHEDrine indirectly releases the neurotransmitter norepinephrine from the secretory vesicles found at the nerve ending at the synapse. Norepinephrine produces potent α and β receptor stimulation. This stimulation produces the physiological responses of arteriolar vasoconstriction (increase in blood pressure), tachycardia and relaxation of bronchiolar smooth muscle.

Because ePHEDrine releases synaptic vesicles of norepinephrine, repeated dosing can deplete these vesicles before replenishment can occur, an effect called tachyphylaxis. Tachyphylaxis results in the progressively decreased effectiveness of the drug through repeated doses.

EPINEPHrine

EPINEPHrine, or adrenalin, is a potent α and β receptor stimulus, with

'QUICK AND DIRTY CHEAT SHEET'

for Your Dental Office Emergency Area

Oxygen Rapid effects, easily available. Delivered via nasal cannula, simple face mask, ambu bag/mask or endotracheal tube.

Atropine Anticholinergic. Used for bradycardia with hypotension from vagal nerve stimulation.

- **Adult dose:** 0.4mg–1mg, intravenous
- **Children's dose:** 0.01–0.2mg/kg for children who weigh more than 5kg, minimum dose of 0.1mg

EPHEDrine Causes indirect release of norepinephrine. Used to increase heart rate (beta 1) and increase blood pressure (alpha 1).

- **Adult dose:** 5–25mg intravenously to effect, may be repeated in 5–10 minutes
- **Children's dose:** 0.2–0.3 mg/kg/dose

EPINEPHrine Potent alpha 1, beta 1, beta 2 stimulation. Used for acute allergic reaction.

- **As a bronchodilator:** 0.3-0.5mg subcutaneously (0.3–0.5ml of 1:1000) every 20 minutes for three doses. Primatene Mist is a great source of nebulized EPINEPHRINE for inhalation.
- **For hypersensitivity reaction:** 0.3-0.5mg subcutaneously or intramuscular (0.3–0.5ml of 1:1000) every 15–20 minutes for three doses. (Intramuscular dosing is preferred.)
- **For hypotension:** 5–10mcg intravenous boluses titrated to an acceptable blood pressure. 100mcg intravenous over five minutes. Intravenous infusion: 1-4 mcg/minute. ***Also, see ACLS algorithms.***

Albuterol Beta 2 agonist. Use to dilate bronchial smooth muscle.

- **Dose:** Two puffs given to effect; repeat as necessary.

Inhaled spirits of ammonia Pungent mixture of alcohol and ammonia. Use to rapidly stimulate respiration.

- **Dose:** Crush 0.3ml glass ampule and place under the nose.

Aspirin Dose 160–325mg by mouth. Chewable baby aspirin works well for adults.

Nitroglycerin Tablet dose one tablet (0.4mg) sublingual every five minutes until symptoms are relieved. No more than three tablets every 15 minutes. Spray dose 0.4mg/spray, instead of tablet dose.

Sugar/glucose Quickly swallow a teaspoon or tablespoon's worth (amount does not matter at this point) of sugar/glucose from the tube. Repeat until symptoms subside. Sugared soda and cake frosting in a tube also work well.

Diphenhydramine Can cause dizziness, drowsiness or sedation.

- **Dose:** 10–50mg intravenous or intramuscular, not to exceed 400mg per day. Single doses up to 100mg may be used if needed.

Solu-Cortef Perioperative replacement for patients who are taking steroid medications to prevent cardiovascular collapse, or to treat anaphylactic shock.

- **For perioperative replacement:** 100–250mg intravenous or intramuscular, before the dental procedure.
- **For anaphylactic shock:** 500mg–2gm intravenous or intramuscular, every 2–6 hours.

Diazepam Intravenous onset is immediate; intramuscular onset may take 15–30 minutes.

- **Dose:** Give 5–10mg intravenous or intramuscular at 2mg/minute.

Midazolam Use for seizures is an unlabeled use but effective. Because of probable sedation, be prepared to support the airway and monitor vital signs until help arrives.

- **Dose:** 0.15mg/kg intravenous.

wide-ranging stimulation of many organs. It causes rapid heart rate and vasoconstriction of the arterioles, which greatly increase blood pressure. This is the hormone that produces the fight-or-flight response. EPINEPHrine causes relaxation of the bronchiolar musculature, relaxation of the uterus, inhibition of salivary flow, dilation of the pupils, inhibition of peristalsis in the intestines, and glycogen to be broken down into glucose in the liver.

Although EPINEPHrine is rapidly metabolized by monoamine oxidase and catechol-O-methyltransferase, it is used as a medication for the resuscitation from anaphylactic shock and the treatment of acute asthma; in ACLS algorithms it's also used to treat cardiac arrest, pulseless electrical activity and symptomatic bradycardia.

Disclaimer

The intent of this presentation is to familiarize dentists with common dental office emergencies and medications used, the basic physiological basis for each emergency and the rationale for the use of certain medications. No specific outcomes, warranties or guarantees are expressed or implied with the drugs and dosages discussed.

Dentists should refer to recognized pharmacology and physiology textbooks, anesthesia textbooks, a pharmacist or handbooks for the manufacturer's specific recommendations pertaining to the medications discussed. Consult with your state dental board laws and rules regarding sedation and anesthesia; you are responsible for reading and knowing the laws and rules that govern your dental practice. ■

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FDA approved list of commonly confused generic drug names with TALL MAN LETTERS

Drug Name with Tall Man Letters		Confused with
acetaZOLAMIDE	–––	acetoHEXAMIDE
buPROPion	–––	busPIRone
chlorproMAZINE	–––	chlorproPAMIDE
clomiPHENE	–––	clomiPRAMINE
cycloSERINE	–––	cycloSPORINE
DAUNOrubicin	–––	DOXOrubicin
diphenhydrAMINE	–––	dimenhyDRINATE
DOPamine	–––	DOBUTamine
glipiZIDE	–––	glyBURIDE
hydrALAZINE	–––	hydrOXYzine
medroxyPROGESTERone	–––	methylPREDNISolone and methylTESTOSTERone
methylPREDNISolone	–––	medroxyPROGESTERone and methylTESTOSTERone
methylTESTOSTERone	–––	medroxyPROGESTERone and methylPREDNISolone
niCARdipine	–––	NIFEdipine
prednisoLONE	–––	predniSONE
sulfADIAZINE	–––	sulfiSOXAZOLE
TOLAZamide	–––	TOLBUTamide
vinBLAStine	–––	vinCRIStine

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1. "Tall man" lettering promotes safety in dispensing and using medications.
- A. True
- B. False

2. The parasympathetic and sympathetic nervous systems produce opposite effects on the viscera they innervate.
- A. True
- B. False

3. Which of the following is a treatment for anaphylaxis:
- A. Acetylcholine
- B. Norepinephrine
- C. EPHEDrine
- D. EPINEPHrine

4. Which of the following produces less-intense increases of both blood pressure and heart rate:
- A. Acetylcholine
- B. Norepinephrine
- C. EPHEDrine
- D. Atropine

5. Which of the following produces bradycardia:
- A. Acetylcholine
- B. Norepinephrine
- C. EPHEDrine
- D. Atropine

6. Which of the following is a treatment for bradycardia:
- A. Acetylcholine
- B. Norepinephrine
- C. EPHEDrine
- D. Atropine

7. Which of the following is an adrenergic neurotransmitter:
- A. Acetylcholine
- B. Norepinephrine
- C. EPHEDrine
- D. Atropine

8. Which of the following is anticholinergic:
- A. Acetylcholine
- B. Norepinephrine
- C. EPHEDrine
- D. Atropine

9. Which of the following is a treatment for severe bronchial asthma:
- A. Acetylcholine
- B. Norepinephrine
- C. EPHEDrine
- D. EPINEPHrine

10. Which of the following connect an autonomic nerve impulse to the viscera:
- A. Norepinephrine and synapses
- B. Acetylcholine and neurotransmitters
- C. The neuromuscular junction
- D. All of the above

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Emergency Medications Every Dentist Should Know, Part II

by Dr. Allan Schwartz

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13.	Overall, I would rate this instructor (5 = Excellent to 1 = Poor):	5	4	3	2	1
14.	Overall, this course met my expectations	5	4	3	2	1

Comments (positive or negative): _____

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