The "Point of Care" section answers everyday clinical questions by providing practical information that aims to be useful at the point of patient care. The responses reflect the opinions of the contributors and do not purport to set forth standards of care or clinical practice guidelines. Readers are encouraged to do more reading on the topics covered. If you would like to submit or answer a question, contact editor-in-chief Dr. John O'Keefe at jokeefe@cda-adc.ca.

QUESTION 1

A large proportion of the patients who undergo teeth-whitening procedures in my office experience sensitivity. How can I minimize this side effect?

Background

The incidence of sensitivity during dental whitening procedures is high. Haywood and others[1] reported an incidence of tooth sensitivity of 53% using 10% carbamide peroxide in custom-fitted trays. Haywood[2] has also reported an overall general sensitivity rate to whitening of 75% of patients. Browning and others[3] reported that 67% of patients experienced transient sensitivity during bleaching. Transient tooth sensitivity in the presence of hydrogen peroxide or carbamide peroxide is related to both dose and time: the higher the dose or concentration of the whitening agent and the longer the teeth are exposed, the greater the risk of tooth sensitivity. If such sensitivity occurs, the easiest way to address the problem is to decrease the treatment time or the dosage of hydrogen peroxide or carbamide peroxide. For whitening agents delivered with a tray, it is critical to trim the tray accurately, not only to ensure that it accurately reflects the position of the gingiva, but also to position the tray border at the cemento-enamel junction.

Strategies to Reduce Sensitivity

Many whitening products, such as Opalescence (Ultradent, South Jordan, Utah) contain water to decrease the dehydrating effects of the agent on tooth structure, which can cause sensitivity. Fluoride and potassium nitrate are included in several products to decrease the risk of tooth sensitivity. Fluoride acts by accelerating the formation of new mineral, which combines calcium, phosphate and fluoride to form a low soluble veneer.[4] Potassium nitrate penetrates the dentinal tubules and depolarizes the nerves, decreasing the painful stimulus.[5]

The inclusion of potassium nitrate in whitening products has had mixed reviews in the literature. Browning and others[3] reported that 36% of the patients in their study experienced sensitivity even if potassium nitrate and sodium fluoride had been added to the whitening gel. Gerlach and others[6] observed sensitivity in 13% of patients who used 6% hydrogen peroxide bleaching strips and in 22% of patients who used 5% carbamide peroxide with potassium nitrate in a custom tray. Comparing NiteWhite Excel 2Z (Discus Dental, Culver City, Calif.) and Rembrandt Xtra-Comfort (Den-Mat Corp., Santa Maria, Calif.), Pohjola and others[7] reported that all of the subjects had some degree of sensitivity. Tam[8] found that 10% carbamide peroxide with potassium nitrate and fluoride produced less tooth sensitivity than the control substance after 2 weeks of bleaching at home.

However, treating the teeth with potassium nitrate *before* whitening seems to decrease sensitivity dramatically. Brushing with potassium nitrate dentifrice such as Sensodyne (GlaxoSmithKline, Parsippany, N.J.)[9] or applying potassium nitrate–fluoride gel in custom-fitted trays before whitening can reduce the sensitivity in a majority of patients.[1] Potassium nitrate gels for use in bleaching type trays include UltraEZ (Ultradent), Den-Mat Desensitize (Den-Mat Corp.) and Relief (Discus Dental). An example of tray-delivered fluoride ion is FlorOpal (Ultradent) which results in slower but longer-lasting desensitization than with potassium nitrate.

Because sensitivity is experienced by such a large percentage of patients, it is best to identify those most likely to experience discomfort before treatment. Does the patient have deep Class V abfraction lesions? Does the patient have discomfort with heat, cold, sweets or air flow over the teeth? Does the patient avoid certain foods because of sensitivity? Does the examination reveal active caries or leaking restorations? For these patients, it is best to apply desensitization beforehand and treat any decay or defective restorations, even tem-

porarily, until the final tooth colour is achieved. Desensitization may be achieved by potassium nitrate, fluoride gels, oxalates or dentin bonding agents. If the patient's teeth are desensitized before treatment begins, it is more likely that he or she will continue the process, with minimal side effects, until the desired colour is achieved.

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QUESTION 2

Which benzodiazepine approaches the ideal for oral sedation in dentistry?

Background

Anxiety and fear of dentistry constitute a barrier to attendance for dental care. Oral sedation is a convenient technique for reducing the anxiety experienced by some, but not all, patients with dental phobia. Other choices include sedation with nitrous oxide and oxygen, hypnosis, intravenous sedation and general anesthesia. Each technique has risks and benefits for the patient. Oral sedation is useful as part of a stress reduction protocol for some medically compromised patients (e.g., those with ischemic heart disease) during stressful dental procedures. Patient safety is a primary concern for any dental practitioner using oral sedation,[1] and all practitioners using such sedation should receive appropriate training. Children present a unique management problem, because their response to oral sedation may be unpredictable.

The ideal oral sedative agent should alleviate fear and anxiety, but it should not suppress the patient's protective reflexes. The ideal drug is rapidly effective, free from side effects, predictable in duration and action, and quickly metabolized and excreted. It should not produce active metabolites and should have an active half-life of about 45–60 minutes.

Benzodiazepines

Various classes of drug (e.g. barbiturates, antihistamines and narcotics) have been used for oral sedation in dentistry, but benzodiazepines (BZDs) are now the most commonly used agents for adult patients. BZDs enhance the action of the neurotransmitter γ-aminobutyric acid (GABA), a compound that promotes an overall calming effect on the central nervous system.[2] BZDs influence emotional reactions, memory, thinking, control of consciousness, muscle tone and coordination.

BZDs used for oral sedation typically include diazepam, alprazolam, lorazepam, temazepam and triazolam. Midazolam (taken orally or intranasally) also has a role in pediatric oral sedation. A disadvantage of some BZDs is the risk of addiction associated with long-term use, but this is not usually an issue in dental practice. The pharmacokinetics of BZDs vary considerably (**Table 1**); these properties influence each drug's suitability for oral sedation in a general practice setting. Triazolam and midazolam are classified as short-acting; alprazolam, lorazepam and temazepam as intermediate-acting; and diazepam as long-acting.[3,4]

BZDs are readily absorbed from the gastrointestinal tract. Triazolam and lorazepam are absorbed more effectively if taken sublingually. Alprazolam tastes bitter if given sublingually. Triazolam and diazepam (taken orally) have a rapid onset of action (less than 1 hour) whereas the other BZDs listed in **Table 1** take between 1 and 3 hours. It is clearly disadvantageous for a patient to wait that long for a drug to achieve onset of action. Triazolam takes the least time to reach peak plasma concentration (1–2 hours), whereas lorazepam takes 2–4 hours. Thus, in clinical practice, a patient might complain of inadequate

Table 1 Pharmocokinetics of benzodiazepines used in oral sedation

	Time to peak concentration (h)	Onset of action	Active metabolites	Approx. half-life (h) of parent compound and active metabolite(s)
Alprazolam	1–2	Intermediate	Yes	12–15
Diazepam	0.5–2	Fast	Yes	100
Lorazepam	2–4	Intermediate	No	10–20
Temazepam	2–3	Intermediate	No	10–20
Triazolam	1–2	Fast	No	1.5–5

Derived from data at the Vancouver Coastal Health Web site, http://www.vhpharmsci.com/VHFormulary/Tools/Benzodiazepines-comparison.htm,[3] and from the Compendium of Pharmaceuticals and Specialties.[4]

sedation at the start of the appointment if lorazepam has been used, despite adequate dosing.

Some BZDs are metabolized to an active form of the parent compound, a process that influences the half-life of the drug (**Table 1**). For example, diazepam is metabolized to 1 major active metabolite (desmethyldiazepam) and 2 minor active metabolites, 3-hydroxydiazepam (temazepam) and 3-hydroxy-*N*-diazepam (oxazepam) in plasma. The half-life of diazepam can range from 1 to 4 days.[5] Triazolam, classified as a short-acting BZD, has the shortest half-life (1.5–5 hours) of the BZDs listed in **Table 1**.

In summary, triazolam is the BZD that most closely fulfills the criteria of an ideal sedation agent. A typical adult dose for oral sedation before dental procedures is 0.25–0.5 mg, taken 1 hour before the appointment.[5] However, caution should be exercised with all BZDs to ensure careful titration and to avoid oversedation, because the individual response to an oral dose is highly variable. This is especially true of elderly or medically compromised patients, for whom the initial dose should be 0.125 mg.

From a practical standpoint, it is prudent to have the patient attend the dental office 30 minutes before the dental appointment if possible, so that he or she can be monitored closely. A responsible adult must escort the patient home after the appointment and should be present at all times until the effects of the sedation drug have worn off. The patient should not drive a car until the next day. The patient should also be cautioned to avoid using power tools or appliances (e.g., an electric blender).

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QUESTION 3

How should I manage a patient who suffers chest pain consistent with angina in the dental office?

Background to the Problem

Angina pectoris is chest pain that is classically retrosternal and often, but not always, radiates to the left arm or mandible. It may manifest as a sensation of intense pressure, or it may be more vague, mimicking indigestion. Angina occurs when narrowed atherosclerotic coronary arteries do not supply enough oxygenated blood to an area of cardiac muscle in the presence of increased demand for oxygen. Demand may be increased by exercise or stress, including the stress commonly experienced by patients during a dental appointment. The resulting imbalance between demand for and supply of oxygen leads to pain and possibly muscle damage. Myocardial infarction (MI) occurs when the heart muscle is permanently damaged by the lack of oxygen to the heart. These acute coronary syndromes really represent a continuum that begins with angina, which is reversible, and extends to infarction, which is permanent cell death.

Management of the Problem

The management of all medical emergencies should begin with an ABCD approach: airway, breathing, circulation, diagnosis and/or drug and/or defibrillation (**Box 1**).

Patient with Known History of Angina or Myocardial Infarction

A patient with a history of angina will recognize an acute angina attack. If this occurs, the patient should be positioned comfortably and ABCs assessed rapidly so that the pain can be dealt with quickly.

A: Assess the airway: The patient should be able to speak, which indicates that the airway is open. In this case, nothing further needs to be done with regard to the airway.

B: Assess breathing: Breathing should be adequate, but the dentist should also assess the potential for hyperventilation, to rule out chest pain secondary to hyperventilation or an anxiety attack.

C: Assess the circulation: While waiting for nitroglycerin to take effect (see point D, below), the dentist should measure pulse and blood pressure.

D: Administer drug therapy: Acute angina is the most likely diagnosis, and the drug to use is nitroglycerin.

Nitroglycerin administration is the key to management in a patient with angina. This medication is formulated as either a tablet or a spray, both of which should be placed sublingually. For emergency purposes nitroglycerin is available as 0.3-, 0.4-, or 0.6-mg tablets or as a spray (0.4 mg per metered dose). Any of these doses may be selected. If the patient has his or her own nitroglycerin, this may be used for the initial dose. Relief should result within 1 to 2 minutes after administration.

Once the first dose of nitroglycerin has been administered, 100% oxygen should be given through a clear mask.

If the initial dose of nitroglycerin does not relieve the symptoms, then a second and, if needed, a third dose of the

Box 1 Algorithm for management

Known history of angina	No history of angina
1. ABCs and O_2	1. ABCs and O_2
	2. call 911 (assume MI)
2. nitroglycerin	3. nitroglycerin
if no relief after 3–5 minutes:	
3. repeat nitroglycerin	4. repeat nitroglycerin
if no relief after 3–5 minutes:	
4. repeat nitroglycerin	5. repeat nitroglycerin
if no relief after 3–5 minutes:	
5. call 911 (assume MI)	
6. ASA 160 or 325 mg	6. ASA 160 or 325 mg
7. if available: • morphine 2 mg IV[a] titrated prn or 5 mg IM[b] or • N_2O:O_2	7. if available: • morphine 2 mg IV[a] titrated prn or 5 mg IM[b] or • N_2O:O_2

ABC = airway, breathing and circulation, MI = myocardial infarction, ASA = acetylsalicylic acid.
[a]For dentists comfortable administering IV.
[b]Dosage varies depending on individual patient factors.

drug may be given, with 3 to 5 minutes between consecutive doses. If the patient's own medication was used for the first dose, switch to the fresh nitroglycerin supply in the emergency kit, to rule out the possibility that the patient's own nitroglycerin has expired (which may occur if the patient opened the bottle more than 3 months previously and exposed the drug to air or light).

Contraindications to nitroglycerin include systolic pressure of less than 90 mm Hg or recent use of an erectile dysfunction agent (Viagra [sildenafil] or Levitra [vardenafil] within the previous 24 hours or Cialis [tadalafil] within the previous 48 hours).

If the pain does not dissipate after 3 doses, the diagnosis of angina must be changed to MI, and a 911 or other relevant emergency call should be placed. Acetylsalicylic acid (Aspirin) should be given, as either a 160- or a 325-mg tablet (to be chewed before swallowing or swallowed directly).

If MI is diagnosed, an analgesic should be given. Advanced cardiac life support recommendations list morphine as the analgesic of choice for this purpose. If the dentist does not wish to keep morphine in the office, then nitrous oxide and oxygen, titrated to effect, is a reasonable second choice.

Patient with No Known History of Angina or Myocardial Infarction

If there is no history of ischemic heart disease, the protocol is the same, except that the emergency medical system (911) should be called immediately, as the patient needs to be transferred and assessed in hospital.

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Reminder to dentists in British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland

Did you receive a copy of the CD-ROM entitled Medical Emergencies in the Dental Office, *which features material from Dr. Dan Haas? The CD-ROM was distributed by CDSPI in the summer of 2005.*

If you did, and you haven't yet had an opportunity to view it, it may not be too late to complete the accompanying quiz and obtain continuing education credits from your dental regulatory authority. If you have misplaced your copy, unfortunately, there are no further copies available at present.

QUESTION 4

It is time to update my emergency drug kit. Which drugs should I include?

Emergency Preparedness in the Dental Office

Although medical emergencies are thankfully rare in general practice, the dental practitioner must be prepared for the unexpected. A detailed, up-to-date medical history should be available for each patient, to enable the dentist to anticipate a potential emergency. Patients should be asked to bring their medications to each dental appointment in case of an emergency (e.g., salbutamol inhaler for patients with asthma, nitroglycerin for patients with angina). All personnel in the dental office should be competent to perform basic life support (BLS). National and local organizations provide training courses to cardiopulmonary resuscitation (CPR) level C, the national standard for BLS.[1] A dental office can prepare for a medical emergency by ensuring that all staff members are aware of their roles and by conducting periodic emergency simulations.

BLS measures (e.g. ABCs: assessment of airway, breathing and circulation) and assessment of vital signs precede the administration of any emergency drugs. Without training in intravenous (IV) access, drugs for IV administration are superfluous in a dentist's emergency kit. For intramuscular (IM) injection, the deltoideus, vastus lateralis and gluteus maximus muscles provide a large bulk of muscle with minimal risk of damage to or perforation of adjacent nerves and vessels.[2] The masseter muscle is preferred by dentists for IM injection because the anatomy is familiar. An assortment of hypodermic syringes (e.g., 3 and 5 mL) and needles (e.g., 25 gauge × 5/8 inch and 1.5 inch, 20 gauge × 1 inch) are required for IM administration of drugs.

Emergency Drugs

Oxygen in a portable cylinder should be available for administration at any location in the dental office, including the bathroom and the waiting room. A full size E cylinder delivers oxygen at 5 L/min for just over 2 hours. Suitable connecting tubes and well-fitting non-rebreather face masks (in adult and child sizes) are used to deliver oxygen to a conscious patient. A bag-valve-mask device is used to administer oxygen (at about 100%) to an unconscious patient. Disposable Guedel airways provide support for the tongue in an unconscious patient. The pressure in the oxygen cylinder should be checked periodically; replacement is recommended when the pressure has declined to 500 pounds per square inch (3447 kPa) because this pressure will provide oxygen at 5 L/min for only 20–25 minutes.

Table 1 List of recommended emergency drugs for a typical general dental practice

Drug	Dose	Route	Indication
Oxygen	100%	Inhalation	Every medical emergency, except hyperventilation
Salbutamol	2 puffs (200 μg)	Inhalation	Asthmatic bronchospasm
Epinephrine	0.5 mg 0.5 mg	IM IM	Anaphylaxis Asthma unresponsive to salbutamol
Nitroglycerin	0.4 mg	Sublingual (spray)	Pain of angina
Acetylsalicylic acid (ASA)	160 or 325 mg	Chew and swallow	Suspected myocardial infarction (persistent chest pain)
Morphine	5 mg	IM	Chest pain unresponsive to nitroglycerin
Hydrocortisone	100 mg	IM	Adrenal insufficiency or recurrent anaphylaxis
Diphenhydramine	50 mg	IM	Allergic reactions
Sugar cubes	1 or 2 cubes	Chew and swallow	Hypoglycemia, patient conscious
Glucagon	1 mg	IM	Hypoglycemia, patient unconscious

Box 1 Suggested instructions to be included in emergency drug box to assist staff in the event of an emergency

SEVERE ALLERGY / ANAPHYLAXIS

- Position patient supine
- Basic life support measures, oxygen, call 911
- Epinephrine 1:1,000; 0.5 mg IM
- Repeat epinephrine q10min prn
- Diphenhydramine 50 mg IM

For a less severe reaction:

- Diphenhydramine 50 mg IM

ASTHMA (ACUTE ATTACK)

- Position patient upright in chair for maximum comfort
- Salbutamol inhaler, 2 puffs
- Repeat as necessary
- Oxygen

If symptoms worsen, administer:

- Epinephrine 1:1,000, 0.5 mg IM
- Repeat q10min prn

CHEST PAIN

- Position patient in chair according to the patient's choice for maximum comfort

If known history of angina

Basic life support measures, oxygen, call 911

Give nitroglycerin spray and wait 3 minutes
If no relief, repeat nitro, and wait 3 minutes
If no relief, repeat nitro, and wait 3 minutes
If no relief after 3 doses:

Give ASA 325 mg if pain persists unless contraindicated

Consider morphine 5 mg IM or sedation with mixture of nitrous oxide and oxygen

If no history of angina

Basic life support measures, oxygen, call 911

Give nitroglycerin spray and wait 3 minutes
If no relief, repeat nitro, and wait 3 minutes
If no relief, repeat nitro, and wait 3 minutes

Give ASA 325 mg if pain persists unless contraindicated

Consider morphine 5 mg IM or sedation with mixture of nitrous oxide and oxygen

SYNCOPE OR HYPOTENSION

- Position patient supine
- Basic life support measures, oxygen
- Consider oral glucose if patient is conscious

DIABETIC EMERGENCY

Hypoglycemia

If conscious:
Sugar cubes taken orally
If unconscious:
Position patient supine
Basic life support measures, oxygen, call 911
Glucagon 1 mg IM

Hyperglycemia

If conscious:
Arrange transfer to hospital
If unconscious:
Position patient supine
Basic life support measures, oxygen, call 911

A salbutamol inhaler is required in case of asthmatic crisis in a patient with asthma who has forgotten to bring an inhaler to the appointment. Vials of epinephrine (1 mg/mL of a 1:1,000 solution) are indicated for severe acute anaphylaxis (0.5-mg dose) and asthma that fails to respond to salbutamol inhalation (0.5-mg dose). Preloaded syringes (e.g., EpiPen, which contains a 0.3-mg dose of epinephrine) save time in an emergency, but are more expensive than vials of epinephrine.

Nitroglycerin spray administered sublingually (0.4-mg dose) is indicated for suspected angina. The spray has a longer shelf life than tablets. A patient with persisting chest pain should chew a tablet of acetylsalicylic acid (ASA) (160 or 325 mg) in case of myocardial infarction; ASA significantly reduces myocardial damage. ASA is contraindicated if the patient has a known allergy to it; gastric ulceration is a relative contraindication. Morphine (5 mg IM) is indicated if the patient has severe chest pain, but a 50:50 mixture of nitrous oxide and oxygen administered by face or nasal mask is also suitable if available.

Hydrocortisone sodium succinate (100 mg IM) is indicated for a patient with addisonian crisis (adrenal insufficiency) and as supportive therapy for acute anaphylaxis after epinephrine has been administered. Diphenhydramine hydrochloride (e.g., Benadryl) is also indicated for acute anaphylaxis (two 50-mg capsules) after epinephrine has been administered, or for severe acute asthma (50 mg IM).

A diabetic patient might become hypoglycemic in the dental office. If the patient is conscious, glucose (in the form of sugar cubes) should be administered orally. For an unconscious patient, glucagon (1 mg IM) is indicated.

The drugs described above are summarized in **Table 1**. This list is not exhaustive, and additional emergency drugs may be kept if desired. For example, diazepam (10 mg IM) may be administered to a patient who is having convulsions. The drugs selected will depend largely on the dentist's own informed choice and the type and scope of clinical practice. Once drugs for an emergency kit have been selected, a list of the drugs, doses and indications for use may be kept in the emergency drug box for reference (**Box 1**). For dental offices with Internet access, a reminder service can be used to remind the dentist or staff to replace the drugs 1 month before expiry.[3]

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