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Introduction

Medical emergencies can and do happen in the practice of dentistry. Recent surveys of dentists in Australia, New Zealand, the United Kingdom and U.S.A. demonstrate that, though rare, potentially life-threatening situations do develop in the dental office. Table 1 lists the most common emergencies found in a survey of 4309 dentists practicing in North America. These constituted 98.7% of the 30,608 emergencies reported.

Dental offices must be prepared to promptly recognize and effectively manage medical emergencies. Though no ‘national standard’ exists for preparation, some specialty groups (e.g. American Association of Oral & Maxillofacial Surgeons; American Academy of Pediatric Dentistry, and the American Academy of Periodontology) have published Guidelines for their members and other interested parties.

Prevention

Prevention of an emergency is much more desirable than managing one once it occurs. Most medical emergencies are preventable. Thorough evaluation of the medical history, recording vital signs, assessment of medical risk (ASA classification), and use of treatment modifications, as needed, can prevent ‘stress-induced’ emergencies.

These account for approximately 75% of all medical emergencies seen in dentistry. Table 2 lists other Quality Resource Guides discussing dental management of higher-risk patients.

Preparation

Preparation of the dental office and staff to recognize and manage medical emergencies is essential to a successful outcome. Table 3 is an example of an office preparation plan.

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**TABLE 1**

<table>
<thead>
<tr>
<th>Emergency situation</th>
<th>Number reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syncope</td>
<td>15,407</td>
</tr>
<tr>
<td>Mild allergic reaction</td>
<td>2,583</td>
</tr>
<tr>
<td>Angina pectoris</td>
<td>2,552</td>
</tr>
<tr>
<td>Postural hypotension</td>
<td>2,475</td>
</tr>
<tr>
<td>Seizures</td>
<td>1,595</td>
</tr>
<tr>
<td>Asthmatic attack (bronchospasm)</td>
<td>1,392</td>
</tr>
<tr>
<td>'Epinephrine reaction'</td>
<td>913</td>
</tr>
<tr>
<td>Insulin shock (hypoglycemia)</td>
<td>890</td>
</tr>
<tr>
<td>Cardiac arrest</td>
<td>331</td>
</tr>
<tr>
<td>Anaphylactic reaction</td>
<td>304</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>289</td>
</tr>
<tr>
<td>Local anesthetic overdose</td>
<td>204</td>
</tr>
</tbody>
</table>

**TABLE 2**

Quality Resource Guides relating to dental management of high-risk patients.

| Blood Pressure Monitoring in the Dental Setting | Michael Glick, DMD – University of Medicine & Dentistry of New Jersey |
| Cardiovascular Conditions Encountered in Dental Practice | Frank C. Nichols, DDS, PhD – University of Connecticut |
| Local Anesthetics | Clarence Trimmel, DDS – University of Connecticut |
| Management of Patients with Common Medical Conditions | Frank C. Nichols, DDS, PhD – University of Connecticut |
| Medical Health History in Dental Practice | Peter L. Jacobsen, PhD, DDS, et al – University of the Pacific |
| Pain Control In Dentistry | Clarence Trimmel, DMD, PhD – University of Connecticut |
Resuscitative equipment has been interpreted in court as integral to the ability to perform BLS. Training in the use of all resuscitative equipment is essential for proper utilization.

BLS Healthcare Provider (BLS-HCP) is the level of training required. Though states mandating current BLS cards for dental licensure require recertification every two years, multiple studies have demonstrated a significant decrease in technical prowess after as little as six months. It is suggested that BLS-HCP recertification be done annually.

Where BLS is mandated it is often required only of the doctor, perhaps the dental hygienist and more rarely the assistant. From a practical perspective, emergencies can happen to anyone, anytime, anywhere. In the surveys cited above, a number of medical emergencies developed in dental office personnel, including the doctor. BLS-HCP certification should be included in the job description of all dental office personnel.

As we are preparing ourselves to manage emergency situations in the dental office, it is strongly suggested that BLS-HCP courses be taken in YOUR DENTAL OFFICE placing the mannequin in dental ‘situations’, such as in the dental chair and on the floor in the reception room.

All staff members should be trained to ventilate using a mask. ‘B’ [breathing] in BLS has always been the step rescuers are most reluctant to perform, especially when the victim is a stranger. Regurgitation commonly occurs in unconscious victims. Additionally, it is likely that the mouth will contain blood, pus, or other debris associated with the dental treatment. Learning to ventilate with a mask enables the rescuer to deliver oxygen to the victim (1) mouth-to-mask [16% O₂]; (2) bag-valve mask device [21% O₂]; or (3) with positive pressure O₂ [100% O₂].

**TABLE 3**

Preparation of the dental office & staff for medical emergencies.

### Basic Life Support

<table>
<thead>
<tr>
<th>Annually</th>
<th>In the dental office</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLS for Healthcare Providers</td>
<td>Ventilate mouth-to-mask, NOT mouth-to-mouth</td>
</tr>
<tr>
<td>ALL dental office employees</td>
<td></td>
</tr>
</tbody>
</table>

### Dental Office Emergency Team

**MEMBER #1**

1st on scene of emergency
Stay with victim; yell for ‘HELP’; administer BLS, as needed

**MEMBER #2** on hearing call for HELP . . .
Obtains (1) emergency drug kit; (2) portable O₂ cylinder; and (3) AED and brings to site of emergency

- Doctor remains the ‘responsible’ party during management of medical emergencies.
- Tasks CAN be delegated.
- Office personnel should be interchangeable during emergency management.

### Activation of EMS (Emergency Medical Services)

**WHEN:** As soon as YOU, the doctor, think it is necessary. For example: (1) unable to make a diagnosis; (2) know the diagnosis but are uncomfortable with it (e.g. cardiac arrest); and (3) whenever you think EMS is warranted.

**DO NOT HESITATE TO ACTIVATE EMS, IF YOU FEEL IT IS NEEDED.**

**WHOM TO CALL:** 9.1.1.; or a near-by physician or dentist IF you know beforehand that they are well trained in the management of emergency situations.

### Emergency Drugs & Equipment

- See Tables 4 and 5

Listing the components involved in adequate preparation. Each dental office should develop their own detailed and specific plan fitting their circumstances.

**1 Basic Life Support**

Without doubt, basic life support (BLS) is THE most important element in successful management of medical emergencies. Though not all state dental boards mandate BLS (also known as ‘CPR’) for licensure, the drug package insert accompanying all local anesthetic drugs states:  

“Dental practitioners and/or clinicians who employ local anesthetic agents should be well versed in diagnosis and management of emergencies that may arise from their use. Resuscitative equipment, oxygen, and other resuscitative drugs should be available for immediate use.”

Resuscitative equipment should be included in the job description of all dental office personnel.

As we are preparing ourselves to manage emergency situations in the dental office, it is strongly suggested that BLS-HCP courses be taken in YOUR DENTAL OFFICE placing the mannequin in dental ‘situations,’ such as in the dental chair and on the floor in the reception room.

All staff members should be trained to ventilate using a mask. ‘B’ [breathing] in BLS has always been the step rescuers are most reluctant to perform, especially when the victim is a stranger. Regurgitation commonly occurs in unconscious victims. Additionally, it is likely that the mouth will contain blood, pus, or other debris associated with the dental treatment. Learning to ventilate with a mask enables the rescuer to deliver oxygen to the victim (1) mouth-to-mask [16% O₂]; (2) bag-valve mask device [21% O₂]; or (3) with positive pressure O₂ [100% O₂].
Chest compression, if needed, CAN be effectively performed with the victim still in the dental chair. Lepere demonstrated that the modern dental chair provides firm support for the spinal cord, enabling sufficient blood volume to be circulated during cardiac arrest.\(^{6}\)

Training in use of the automated external defibrillator (AED) is an essential component of the BLS-HCP course. When available in an office its use should be reviewed periodically by all staff members.

2 Dental Office Emergency Team

When an emergency arises all office personnel should be able to respond rapidly and efficiently. This mandates existence of a predetermined plan describing each persons function. A simple plan is described:

**MEMBER #1** is the first person at the scene of the emergency. When the situation develops in the dental chair this might be the doctor, hygienist or assistant. Where the situation occurs in the reception area it is the ‘front office’ people who will respond first. Thus the earlier recommendation that all office personnel be BLS-HCP trained.

Member #1 (1) remains with the victim; (2) administers BLS, as needed; and (3) activates the dental office emergency team (e.g. Yells for help!).

**MEMBER #2** is assigned to immediately ‘bring the stuff’ to the site of the emergency. The oxygen cylinder, emergency drug kit, and automated external defibrillator (AED) are kept together in an easily accessible location (e.g. near a telephone).

**MEMBER #3** is, in fact, the remaining members of the office staff. Possible duties include: activation of EMS; waiting outside for arrival of EMS and escorting them to the office; ‘holding’ the elevator in the lobby for EMS; monitoring vital signs; preparing emergency drugs for administration; keeping a written record of the event, including a time line and treatment (e.g. 10:15 AM – EMS called; 10:21 EMS arrives in dental office); and assisting in BLS.

The dentist remains the team leader, the one legally responsible for the health and safety of the patient (e.g. victim). Tasks may be delegated as long as the person performing the task is capable of doing it well under the dentist’s supervision.

3 Summoning Assistance

Two questions: WHEN? And WHOM?

**WHEN TO CALL FOR HELP:** Emergency medical assistance should be sought as soon as the doctor (the person legally responsible for the patient) feels it is needed. This occurs (1) if the diagnosis of the problem remains unknown; (2) when the diagnosis IS known but is disturbing to the doctor; and (3) at any time the doctor feels uncomfortable and wishes help.

Never hesitate to seek assistance in managing a medical emergency if you feel it is warranted.

**WHOM TO CALL:** Emergency medical services (EMS) are the first responders to life-threatening medical emergencies in your community. In most areas of the USA 9.1.1. is the EMS number. EMS response times vary significantly from community to community. Where response time is prolonged and the dental office is located in a ‘medical-dental’ complex there might be available another healthcare professional well trained in emergency management. It is this author’s opinion that the Oral & Maxillofacial Surgeon usually meets that standard since they are generally trained in Advanced Cardiovascular Life Support.

Once EMS arrive at the site of the emergency they will take over its management. Primary duties of EMS are to (1) stabilize the victims condition at the scene and (2) transport to the emergency department of a hospital for definitive care, if needed.

4 Emergency Drugs & Equipment

(Table 4) Many, if not most, dentists admit they would be quite uncomfortable administering drugs during a medical emergency. Given, however, that the availability of emergency drugs is mandated (see local anesthetic package insert, page two), it seems prudent to prepare an emergency drug kit consisting of drugs which are considered to be essential. Dentists should continue to seek continuing education to upgrade their knowledge and ability to safely and successfully employ emergency drugs.

The following seven drugs represent the ‘bare bones basic’ emergency kit. It contains seven drugs, two injectable and five non-injectable.

**INJECTABLE DRUGS:** Epinephrine 1:1000 (1:2000 for infants [<1 year old] and children [between 1 year and the onset of puberty]) in a preloaded syringe represents the most important drug in the emergency kit and, happily, probably the least likely to be used. The availability of two Twinject®, (2-dose) preloaded epinephrine syringes is recommended. A histamine-blocker, such as diphenhydramine (Benadryl®), 50 mg/mL, is the other injectable drug. It is recommended that the emergency kit contain 2 or 3 1-mL ampules of diphenhydramine.

Both injectable drugs are used to manage the allergic reaction, be it non-life-threatening or life-threatening (anaphylaxis).

**NON-INJECTABLE DRUGS:** Oxygen (available in an “E” cylinder) can be administered during almost any emergency situation. An ‘E’ cylinder provides O\(_2\) for approximately 30 minutes during ventilation of an unconscious, apneic adult. Nitroglycerin, a vasodilator, is used to manage the acute anginal episode. Recommended for the dental office is the spray form, Nitrolingual Spray, rather than sublingual tablets (NitroStat). Albuterol is the preferred bronchodilator used to manage bronchospasm (acute asthmatic episode). Hypoglycemia (low blood sugar) is a common occurrence in dentistry. An antihypoglycemic, a source of sugar such as a tube of a glucose gel should be included in the emergency drug kit. Alternatively 12-ounces of orange juice or soft drink (non-diet) can be used. Aspirin, either chewable or tablets, is recommended in the prehospital management of ‘suspected myocardial infarction’ victims. A dose of 325 mg (one adult tablet) is chewed then swallowed. Aspirin inhibits platelet aggregation thus minimizing the size of the blood clot developing during the ‘heart attack.’

**EQUIPMENT:** (Table 5) Oxygen delivery system including a positive pressure mask and/or a bag-valve-mask device with several sized face masks (pediatric, small- and large-adult). Also recommended is a pocket mask to aid in mouth-to-mask ventilation. An automated external defibrillator (AED) is considered an absolutely essential part of emergency preparedness as early defibrillation is THE most important intervention in successful resuscitation from cardiac arrest. Other equipment includes: syringes
and needles for drug administration; suction and suction tips; tourniquets; and Magill intubation forceps (for easy retrieval of foreign objects from the posterior part of the oral cavity or the pharynx). These items are described in Table 5.

**Recognition & Management**

Prompt recognition and efficient management of a medical emergency are essential to a successful outcome.

Recognize the presence of a problem, discontinue dental treatment and institute emergency management as soon as the problem is noted.

Recognition is based upon presenting signs and symptoms (S&S) including altered consciousness, respiratory distress, and chest pain. If every patient reports any unusual S&S, immediately stop the dental procedure and try to determine the cause of the situation and manage it as efficaciously as possible.

The following algorithm represents the management sequence for ALL emergency situations: P→A→B→C→D. (Figure 1)

Position the patient appropriately. If conscious (e.g. speaking, moving) the position of choice is whatever is most comfortable for them. Unconsciousness is defined as the absence of response to sensory stimulation (e.g. verbal or physical stimulation). A decrease in blood flow to the brain (e.g. low blood pressure) is, far and away, the most common cause of unconsciousness. All unconscious persons are placed, at least initially, into the supine position with their legs elevated slightly.

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**Table 4**

<table>
<thead>
<tr>
<th>Category</th>
<th>Drug Generic</th>
<th>Drug Proprietary</th>
<th>Alternative</th>
<th>Quantity</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Injectable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allergy – anaphylaxis</td>
<td>Epinephrine</td>
<td>Adrenalin</td>
<td>None</td>
<td>2 Twinject® syringes</td>
<td>1:1000 (1 mg/mL)</td>
</tr>
<tr>
<td>Allergy – Histamine-blocker</td>
<td>Diphenhydramine</td>
<td>Benadryl</td>
<td>Chlorpheniramine</td>
<td>3 x 1 mL ampules</td>
<td>50 mg/mL</td>
</tr>
<tr>
<td><strong>Non-injectable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen</td>
<td>Oxygen</td>
<td>Oxygen</td>
<td></td>
<td>1 ‘E’ cylinder</td>
<td></td>
</tr>
<tr>
<td>Vasodilator</td>
<td>Nitroglycerin</td>
<td>Nitrolingual spray</td>
<td>NitroStat sublingual tablets</td>
<td>1 metered spray bottle</td>
<td>0.4 mg/metered dose</td>
</tr>
<tr>
<td>Bronchodilator</td>
<td>Albuterol</td>
<td>Proventil, Ventolin</td>
<td>Metaproterenol</td>
<td>1 metered dose inhaler</td>
<td>Metered aerosol inhaler</td>
</tr>
<tr>
<td>Antihypoglycemic</td>
<td>‘sugar’</td>
<td>Orange juice, Non-diet soft drink</td>
<td>Insta-Glucose gel</td>
<td>1 bottle</td>
<td></td>
</tr>
<tr>
<td>Inhibitor of platelet aggregation</td>
<td>Aspirin</td>
<td>Many</td>
<td>None</td>
<td>2 packets</td>
<td>325 mg/tablet</td>
</tr>
</tbody>
</table>

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**Table 5**

<table>
<thead>
<tr>
<th>Recommended Emergency Equipment (Module one — critical [essential] emergency equipment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen delivery system</td>
</tr>
<tr>
<td>(+) pressure and demand valve</td>
</tr>
<tr>
<td>Pocket mask</td>
</tr>
<tr>
<td>Automated electronic defibrillator [AED]</td>
</tr>
<tr>
<td>Syringes for drug administration</td>
</tr>
<tr>
<td>Suction and suction tips</td>
</tr>
<tr>
<td>Large-diameter, round-ended suction tips</td>
</tr>
<tr>
<td>Tourniquets</td>
</tr>
<tr>
<td>Magill intubation forceps (for removal of foreign objects from the airway)</td>
</tr>
</tbody>
</table>

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**RECOGNIZE PROBLEM**
(altered consciousness, respiratory distress, chest pain)

**DISCONTINUE DENTAL TREATMENT**

**ACTIVATE OFFICE EMERGENCY TEAM**

**P** – **Position** patient appropriately
- if conscious comfortably
- if unconscious supine, legs elevated

**A** **B** **C** – **Assess** airway, breathing, circulation and perform intervention, prn
- if conscious and able to speak
  - **A, B, C adequate**
- if unconscious
  - **assess & implement, prn**

**D** – **Definitive** care, prn
(diagnosis, drugs, defibrillation, prn)

**E** – **Activate EMS, prn**

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**O₂**, oxygen; **P**, position; **A**, airway; **B**, breathing; **C**, circulation; **D**, definitive care; **prn**, as needed; **EMS**, emergency medical services
Airway, breathing and circulation are assessed and implemented as needed. In the conscious victim who can speak A, B and C are deemed to be ‘adequate’ (by virtue of the patient being conscious and capable of speech). With loss of consciousness each step must be assessed individually. In most unconscious persons, head-tilt chin – lift (A) provides for a patent airway. However, airway patency must still be assessed using the ‘look’, ‘listen’ and ‘feel’ technique (B) with two rescue breaths (e.g. mouth-to-mask) delivered in the absence of spontaneous respiratory efforts (e.g. apnea). Next, the carotid pulse is palpated for not more than 10 seconds (C) and, if absent, (e.g. cardiac arrest), chest compression begun. With cardiac arrest, 30 chest compressions followed by 2 breaths repeated for four to five sequences are provided in approximately 2 minutes.12-13

The goal of the steps (P→A→B→C) described thus far is to ensure that the victim’s brain and heart are receiving an adequate supply of blood containing oxygen and ‘sugar’, the fuels required by the cells of the body to maintain normal function.

Definitive care represents the final step of management. Possible components of definitive care include diagnosis, drugs and defibrillation. When possible, a diagnosis is made and treatment proceeds accordingly (examples of easily diagnosed problems are: asthma, hypoglycemia, and angina).

Drugs, other than oxygen (which may be administered in any emergency situation) are rarely needed. Notable exceptions are acute bronchospasm (asthma) and anginal pain. In both cases the patient will (1) diagnose the problem; (2) likely have their own bronchodilator or vasodilator available; and (3) medicate themselves. In the highly unlikely event of cardiac arrest prompt defibrillation is essential.

Emergency Medical Services (EMS) should be summoned at any time it is felt necessary.

Space precludes in-depth discussion of management of specific emergencies. The interested reader is referred to textbooks such as Handbook of Medical Emergencies in the Dental Office.14

Conclusion

The legal obligation of the dentist managing a medical emergency is to keep the victim alive until (1) they recover or (2) someone, better trained in emergency care, takes over management of the victim.

The ultimate goal for a dentist managing a medical emergency is to prevent the death of the victim, a goal achieved through office preparation, prompt recognition and effective management. In the most common dental office emergency, syncope (e.g. ‘fainting’), simply instituting the steps of BLS (P→A) leads to a prompt recovery of consciousness. Drugs are never the first line of management. The management sequence introduced in the algorithm is adhered to in ALL emergency situations.

References

14. Malamed SF. Handbook of Medical Emergencies in the Dental Office, ed. 6, 2007, C.V. Mosby, St. Louis
### POST TEST – MEDICAL EMERGENCIES: PREPARATION & MANAGEMENT

**Internet Users:** This page is intended to assist you in fast and accurate testing when completing the “Online Exam.” We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam.

(1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) The most common medical emergency in the dental environment is:</td>
<td>A. hyperventilation</td>
</tr>
<tr>
<td>2) Which of the following is the most important element in successful preparation for management of medical emergencies?</td>
<td>A. Oxygen</td>
</tr>
<tr>
<td>3) Which of the following provides the victim with the highest concentration of oxygen?</td>
<td>A. positive pressure oxygen ventilation</td>
</tr>
<tr>
<td>4) The first step in managing a conscious patient experiencing respiratory difficulty is:</td>
<td>A. administration of oxygen-enriched air</td>
</tr>
<tr>
<td>5) Emergency medical assistance should be sought:</td>
<td>A. only when the pulse is absent</td>
</tr>
<tr>
<td>6) Which of the following emergency drugs is administered via injection?</td>
<td>A. nitroglycerin</td>
</tr>
<tr>
<td>7) The single most important step in the management of all emergency situations, without exception, is?</td>
<td>A. administration of oxygen</td>
</tr>
<tr>
<td>8) Can effective chest compressions be applied with the victim lying in the dental chair?</td>
<td>A. yes</td>
</tr>
<tr>
<td>9) Which of the following represents the most important drug in the emergency kit?</td>
<td>A. Epinephrine</td>
</tr>
<tr>
<td>10) The first step to take in the management of a patient who &quot;collapses&quot; at the site of a dental needle is:</td>
<td>A. administer oxygen via face mask</td>
</tr>
</tbody>
</table>
PARTICIPANT EVALUATION: MEDICAL EMERGENCIES: PREPARATION & MANAGEMENT

Providing dentists with the opportunity for continuing dental education is an essential part of MetLife’s commitment to helping dentists improve the oral health of their patients through education. You can help in this effort by providing feedback regarding the continuing education offering you have just completed.

Please respond to the statements below by checking the appropriate box, using the scale on the right.

1) How well did this CE offering meet its stated objectives?
2) How relevant was the course material to your practice?
3) How would you rate the quality of the content?
4) Please rate the effectiveness of the instructor/author.
5) Please rate the written materials and visual aids used.
6) Please rate the administrative arrangements for this course.
7) Would you recommend this offering to a colleague?
8) Did this educational offering meet your expectations? Circle: Yes / No
   Why or why not?
9) Please identify future topics that you would like to see:
10) Your comments are important to us and will be considered in planning future educational offerings.
    Thank you for your time and feedback.

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