EDUCATIONAL OBJECTIVES

After reading this course, the participant should be able to:
1. Identify the necessary components of an emergency kit.
2. Describe the signs and symptoms of chest pain and cardiac arrest.
3. Discuss how to handle an emergency involving a cardiac event in the dental office.

According to the American Heart Association, 735,000 Americans experience a myocardial infarction each year; of these, 635,000 are first-time cardiac events. Heart disease remains the leading cause of death for both men and women, and claims more lives than all forms of cancer combined. Each day, approximately 2150 Americans die from heart disease, stroke, and other cardiovascular diseases — this equates to a death every 40 seconds. With the prevalence of heart disease continuing to increase, it is possible that a patient, dental team member or visitor may experience a cardiac event while in the dental office.
ALL DENTAL TEAM MEMBERS NEED TO BE PREPARED TO HANDLE A MEDICAL EMERGENCY. EVERY OFFICE SHOULD HAVE A REHEARSED EMERGENCY MANAGEMENT PLAN, AS WELL AS A FULLY STOCKED EMERGENCY KIT

All dental team members need to be prepared to handle a medical emergency. Every office should have a rehearsed emergency management plan, as well as a fully stocked emergency kit (Table 1 and Table 2). It is also recommended that each patient receive a complete medical history review — including recording of vital signs — at each dental visit. While any number of medical emergencies may occur in a dental office, this article will focus exclusively on chest pain and cardiac arrest.

CHEST PAIN
The primary difference between chest pain and cardiac arrest is that a patient experiencing chest pain will almost always remain conscious. Of course, chest pain can quickly progress into arrhythmias, which can cause unconsciousness and cardiac arrest.

There are many potential causes of chest pain, such as acute myocardial infarction (AMI), angina pectoris, paroxysmal supraventricular tachycardia, gastroesophageal reflux disease, anxiety, and costochondritis. When patients describe chest pain, they commonly use terms such as squeezing, tightness, constriction, pressure, or the feeling of a heavy weight on the chest.

If a patient begins to experience chest pain, call for help and assist the patient into a comfortable position (most will want to sit upright). While circumstances can change in an instant, if the patient is awake and talking, we can be assured that they have a patent airway, are breathing, and have sufficient cerebral blood flow and blood pressure to retain consciousness. Therefore, it is important to act immediately to provide effective treatment.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Qty.</th>
<th>Used For</th>
<th>Typical Dose (Adult)</th>
<th>Syringe</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuterol (inhaler) 90 mcg/puff</td>
<td>1</td>
<td>Bronchospasm/asthma</td>
<td>1 to 3 puffs</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td>1</td>
<td>Hypoglycemia</td>
<td>Titrated to effect</td>
<td>None</td>
<td>Orange juice, non-diet soda, glucose gel or tablets</td>
</tr>
<tr>
<td>Aspirin 325 mg/tab</td>
<td>4</td>
<td>Myocardial infarction</td>
<td>325 mg (1 tab chewed, then swallowed)</td>
<td>None</td>
<td>Must be nonenteric coated tablets</td>
</tr>
<tr>
<td>Diphenhydramine 50 mg/ml, 1ml</td>
<td>2</td>
<td>Allergic reaction</td>
<td>50 mg IM (1 mL)</td>
<td>1 mL</td>
<td>Can be given IV</td>
</tr>
<tr>
<td>Nitroglycerin 0.4 mg/tab</td>
<td>1</td>
<td>Angina</td>
<td>0.4 mg (1 tab)</td>
<td>None</td>
<td>Can use a spray or tablets</td>
</tr>
<tr>
<td>Epinephrine (1:1000); pre-loaded, self-injecting syringe</td>
<td>2</td>
<td>Allergic reaction, severe asthma/bronchospasm</td>
<td>0.3 mg IM (adult)</td>
<td>Medication comes with syringe</td>
<td>Pediatric dose is 0.15 mg</td>
</tr>
</tbody>
</table>

TABLE 1. Necessary Equipment for a Medical Emergency Kit

- Portable, full, and functional E-cylinder oxygen tank with regulator and key to open and close the tank (checked monthly)
- Oxygen delivery devices (nasal cannula, nasal hood and full face mask) that can be attached to the regulator for a patient who is spontaneously breathing, but may need supplemental oxygen
- Bag-valve-mask device with oxygen reservoir and multiple face masks (child and adult sizes) to deliver positive pressure ventilation to a patient who is unconscious and/or not ventilating adequately
- Stethoscope and sphygmomanometer with various cuff sizes (or automatic blood pressure device with various cuff sizes)
- Automated external defibrillator for early defibrillation during cardiac arrest
- Glucose to check blood sugar
- Flashlight with spare batteries in case of power outage
- Syringes with needles (two 1 cc syringes with 20G x 1.5-inch needle) to draw up medications and provide intramuscular injections
- Blank emergency record sheets and two functional pens to record events in real time

TABLE 2. Emergency Drug Kit (minimum for all dental offices)

ANDREA M. FONNER, DDS, is a dentist anesthesiologist and a diplomate of the American Dental Board of Anesthesiology and the National Dental Board of Anesthesiology. She serves as an instructor for the American Heart Association and is trained in basic life support, advanced cardiac life support and pediatric advanced life support. An associate faculty member in the General Practice Residency at the Swedish Medical Center in Seattle, Fonner is a clinical assistant professor of endodontics, oral and maxillofacial surgery, and orthodontics at the Ostrow School of Dentistry at the University of Southern California (USC) in Los Angeles. She is also on the faculty for the American Dental Society of Anesthesiology Human Simulation Course, and provides advanced medical emergency training to dental teams. The president and delegate for the Washington State component of the American Dental Society of Anesthesiology, Fonner maintains a private mobile dental anesthesia practice in Bellevue, Washington. She can be reached at afonnerdds@gmail.com.

KENNETH L. REED, DMD, is the associate program director in dental anesthesiology at New York University Langone Medical Center in Brooklyn, and a clinical associate professor of endodontics, oral and maxillofacial surgery, and orthodontics at the Ostrow School of Dentistry, USC. He is an affiliate assistant professor in the Department of Periodontology at the School of Dentistry, Oregon Health & Science University in Portland; a clinical instructor in the Department of Dentistry at the University of Alberta, Edmonton, Canada; and an associate professor in residence at the School of Dental Medicine, University of Nevada in Las Vegas. Reed also maintains private practices in Tucson, Arizona and Tarzana, California.

The authors have no commercial conflicts of interest to disclose.
ANGINA PECTORIS AND ACUTE MYOCARDIAL INFARCTION ARE THE TWO
MOST COMMON CAUSES OF CARDIAC-RELATED ACUTE CHEST PAIN
AMONG CONSCIOUS PATIENTS. THE CHALLENGE FOR DENTAL
TEAMS IS TO PROVIDE A QUICK DIFFERENTIAL DIAGNOSIS

consciousness for the time being. Angina pectoris and AMI are the two
most common causes of cardiac-related acute chest pain among con-
scious patients. The challenge for dental teams is to provide a quick dif-
ferential diagnosis.2

Establishing a differential diagnosis of chest pain involves evaluating
a number of signs and symptoms. One consideration is the patient’s
medical history. Has he or she ever experienced anginal chest pain? If
so, it is likely the current chest pain is angina pectoris. If this is the
patient’s first episode of chest pain, however, dental team members
should treat it as if it were AMI and have emergency medical services
(EMS) transfer the patient to a hospital as quickly as possible.

The quality of pain must also be evaluated to determine a cause. If
the pain is significant but not severe, angina pectoris is most likely the
culprit, not AMI. Angina pectoris is chest pain or discomfort when the
heart is not receiving an adequate supply of blood and oxygen. Pain
that radiates, commonly to the left side of the body — for example,
the left mandible, arm or shoulder — is more often caused by AMI than
by angina pectoris. Not all pain associated with AMI radiates, however,
and some patients have atypical pain. For example, women and
patients with diabetes often experience an unusual shortness of breath
and/or an unexplained elevation of blood sugar levels as symptoms of
AMI, but no chest pain. This is described as silent myocardial infarction.3

Blood pressure also might indicate whether the patient is experi-
encing angina pectoris or AMI. Although exceptions have been

![Figure 1](image)

**FIGURE 1.** Proper head tilting lift to open the airway.

reported, if the patient’s blood pressure is elevated during the episode
of chest pain, angina pectoris is most likely the cause.4 This elevation
may be a response to the pain felt by the patient. If the blood pressure
falls below the patient’s baseline value or immediate preoperative value,
dental team members should consider AMI. If the pump (i.e., heart)
has been injured, it is less efficient, and this results in a decreased car-
diac output and subsequent drop in blood pressure.5

Definitive care for chest pain requires the administration of supple-
mental oxygen and nitroglycerin (via sublingual tablet or spray). If this
resolves the pain, the episode was likely angina pectoris. If the pain is
persistent or worse, AMI should be suspected. Immediate activation of
EMS, as well as the administration of aspirin, is indicated. Nitrous
oxide/oxygen in a 50:50 concentration may also be administered.6 If
the patient loses consciousness, begin chest compressions and basic
life support immediately. Table 3 describes the steps to follow once a
cause of the chest pain has been determined.

### CARDIAC ARREST

Cardiac arrest can occur at any time, and may or may not be preceded
by chest pain. Witnessing a patient experiencing cardiac arrest in the
dental office is rare, but possible. In fact, this medical emergency can
occur in the parking lot, waiting room or dental chair. Prompt recog-
nition and management that includes early chest compressions, venti-
lation, immediate access to EMS, and defibrillation are critical.7

During cardiac arrest, the heart is unable to adequately pump blood and
oxygen to the body. Without proper oxygenation, the patient quickly loses
consciousness. Once cardiac arrest is recognized, the dental team must imme-
diately call EMS, begin chest compressions, and retrieve the emergency kit
with the portable oxygen tank, bag-valve mask and automated external defib-
rilator. High quality CPR improves the victim’s chances of survival, so it is
essential that every member of the dental team is trained and competent in
basic life support. Minimally, this training should take place annually so that

<table>
<thead>
<tr>
<th>TABLE 3. Steps to Follow When a Patient Experiences Chest Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chest Pain</strong></td>
</tr>
<tr>
<td>Angina</td>
</tr>
<tr>
<td>Position: Comfortable</td>
</tr>
<tr>
<td>Administer Oxygen</td>
</tr>
<tr>
<td>Administer Nitroglycerin</td>
</tr>
<tr>
<td>Acute Myocardial Infarction</td>
</tr>
<tr>
<td>Position: Comfortable</td>
</tr>
<tr>
<td>Call EMS</td>
</tr>
<tr>
<td>Administer Oxygen</td>
</tr>
<tr>
<td>Administer Nitroglycerin</td>
</tr>
<tr>
<td>Administer Aspirin (If not allergic)</td>
</tr>
</tbody>
</table>

50 Decisions IN DENTISTRY • July 2016
team members can maintain their skills.

According to guidelines released by the American Heart Association in 2015, health care providers trained in basic life support should be able to assess pulse and breathing simultaneously in less than 10 seconds. It should be noted that agonal breathing or gasping is not considered normal breathing.

Chest compressions should begin immediately at a rate of 100 to 120/minute, with a compression depth of at least two inches (and no more than 2.4 inches) in an adult, while allowing complete chest recoil. The dental team should use the automated external defibrillator as soon as it is available, minimizing chest compression interruptions.

Meanwhile, open the airway with a head tilt/chin lift (Figure 1), and begin rescue breathing at a compression-to-ventilation ratio of 30:2. Rescue breathing by the health care professional is most often performed with a bag-valve mask device plugged into the portable oxygen tank at 10 to 15 L/minute. It is important to give effective breaths that make the chest rise and avoid excessive ventilation. The American Heart Association recommendation for a cardiopulmonary resuscitation cycle of chest compressions is two minutes. This is the cycle programmed into the automated external defibrillator. Table 4 is a flow chart of the steps to follow when a patient experiences cardiac arrest.

**TABLE 4: Steps to Follow When a Patient Experiences Cardiac Arrest**

<table>
<thead>
<tr>
<th>Step</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac Arrest</td>
<td>Call EMS</td>
</tr>
<tr>
<td>Position: Supine</td>
<td>Begin Chest Compressions at 100–120/Minute</td>
</tr>
<tr>
<td>Call EMS</td>
<td>Provide Rescue Breathing</td>
</tr>
<tr>
<td>Call EMS</td>
<td>3:2 Compression-to-Ventilation Ratio</td>
</tr>
<tr>
<td>Begin Chest Compressions at 100–120/Minute</td>
<td>Turn on AED and Follow Prompts</td>
</tr>
<tr>
<td>Repeat Steps Until EMS Arrives</td>
<td></td>
</tr>
</tbody>
</table>

**REFERENCES**


**SUMMARY**

Dental team members should receive annual comprehensive training on basic lifesaving techniques to ensure that all personnel are prepared to perform these duties at a moment’s notice. Scheduled, formal reviews of the office’s emergency plan and medical emergency kit will also help ensure that team members are prepared. Dental professionals are integral to the promotion and maintenance of oral health, and, with proper training and equipment, they can also save lives in the face of a life-or-death emergency.

**CE QUESTIONS**

The answer sheet and further instructions are located on the tear-out card that appears on page 37, or take the test online at DecisionsInDentistry.com.

1. Approximately how many Americans experience myocardial infarction each year?
   - A. 335,000
   - B. 472,000
   - C. 735,000
   - D. 1,000,000

2. Which is the leading cause of death for both men and women?
   - A. Heart disease
   - B. Tobacco use
   - C. Colon cancer
   - D. Breast cancer

3. Which term is commonly used to describe chest pain?
   - A. Squeezing
   - B. Tightness
   - C. Pressure
   - D. All of the above

4. Which of the following can cause chest pain?
   - A. Acute myocardial infarction
   - B. Angina pectoris
   - C. Gastroesophageal reflux disease
   - D. All of the above

5. Conscious patients experiencing chest pain should remain in any position that is comfortable.
   - True
   - False

6. If chest pain is significant but not severe, which of these is most likely the cause?
   - A. Angina pectoris
   - B. Acute myocardial infarction
   - C. Silent myocardial infarction
   - D. None of the above

7. During cardiac arrest, the heart pumps too much blood and oxygen to the body.
   - True
   - False

8. Which of the following helps define the difference between chest pain and cardiac arrest?
   - A. Consciousness
   - B. Ability of the heart to pump blood through the body
   - C. A and B
   - D. None of the above

9. What is the recommended rate for chest compressions for patients experiencing cardiac arrest?
   - A. 70–90/minute
   - B. 80–100/minute
   - C. 100–120/minute
   - D. 120–140/minute

10. According to the American Heart Association, how long should each cardiopulmonary resuscitation cycle of chest compressions last?
    - A. 1 minute
    - B. 2 minutes
    - C. 3 minutes
    - D. 4 minutes