Management of Medical Emergencies

A Self-Instructional Guide for the Dental Profession
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Emergencies

To manage a medical emergency that may occur in the dental office is the ethical, professional, and legal responsibility of the dental team. The evaluation of each patient’s medical history will prevent or minimize many dental office emergencies and will provide the dental professional with an insight into emergency situations that may occur for a particular patient.

Each member of the dental team should have the basic skills required to manage an emergency situation until medical assistance is available. The information included in this portion of the manual is not meant to teach the skills needed to perform emergency treatment. The intent is to provide basic information to the dental professional about the symptoms and recommended treatments for specific emergency situations. This manual may also be used as a reference in the dental office.

To supplement this material, the dental professional is strongly encouraged to acquire skills in basic life support through certification courses in cardiopulmonary resuscitation and obstructed airway procedures. Certification courses are available through organizations such as the American Red Cross and the American Heart Association.

Medical emergencies can occur at any time in the dental office. They may involve office staff, dental health care professionals, patients, and friends or relatives of patients. An emergency can occur anywhere in or near the dental office. Categorizing an emergency is unnecessary in most cases until the acute situation has improved. Responding quickly to the symptoms of the situation is more important. Some techniques or procedures that can be used in nearly all emergencies follow:

1. Terminate the dental procedure.
2. Place the patient in a supine position.
   Exceptions: respiratory problems and chest pain can be handled in a semisupine or an upright position.
3. Establish and maintain an open airway; administer oxygen.
   Exceptions: hyperventilation
4. Establish a respiration rate.
5. Establish a pulse rate.
6. Measure the blood pressure.
7. Be prepared to perform cardiopulmonary resuscitation.
8. Call the Emergency Medical Services (EMS). (Current telephone numbers of emergency medical assistance should be posted by each telephone.)
9. Transport only when acute emergency has been treated.
Hyperventilation

Hyperventilation is defined as ventilation in excess of that needed to maintain normal blood oxygen and carbon dioxide levels. Hyperventilation is one of the more common emergencies that occur in the dental office. The major predisposing factor in hyperventilation is acute anxiety. Hyperventilation is rare in children and patients over the age of 40. Hyperventilation (or hypocapnia) is caused by increased inspiration and expiration of air as a result of increase in rate or depth of respiration or both. This decreases the carbon dioxide in the blood causing respiratory alkalosis. Young adults who are anxious about dental procedures are the most likely persons to hyperventilate. Pregnancy, certain medications, and some disorders of the central nervous system, circulatory system, or respiratory system may also predispose an individual to hyperventilation.

Signs and symptoms:
1. Dizziness
2. Lightheadedness
3. Shortness of breath
4. Chest pain
5. Palpitations
6. Tachycardia
7. Dryness of mouth
8. Numbness and tingling of hands and feet
9. Muscle pains and cramps
10. Disturbance of vision
11. Confusion
12. Possible unconsciousness

Treatment:
1. Terminate the dental procedure.
2. Place the patient in a comfortable position, usually upright.
3. Calm the patient and explain the problem; reassure the patient that they are going to be alright. Have the patient breathe slowly and regularly.
4. Perform basic life support as needed.
5. Correct respiratory alkalosis, by having the patient rebreathe exhaled air (contains increased concentration of carbon dioxide). A small paper bag or headrest cover can be held over the patient's mouth and nose. The patient breathes into the bag slowly. Another method is to have the patient cup his or her hands together in front of the mouth and nose and breathe in and out. Oxygen is not indicated in the management of this emergency.
6. In the rare case that the above procedures fail to stop the attack, the dentist can administer diazepam IV. Though slower, the oral route can be used.
7. Continuing dental care: If both patient and dental health care worker feel comfortable in doing so, the dental procedure can be continued. If the dental appointment is discontinued, the patient can be discharged. If there is any question about the degree of recovery of the patient, he or she should be driven home by a friend or relative.

Airway Obstruction

Obstruction of the airway may occur in any patient, but especially in those with diminished cough reflex such as with myasthenia gravis and muscular dystrophy. Airway obstruction occurs when a foreign body becomes lodged in the larynx or pharynx. Most objects that are trapped in the pharynx will be swallowed by the patient, coughed up, or directly recovered. Some objects, however, may be aspirated into the larynx. Small objects may pass through the trachea and lodge in one of the bronchi. Larger objects can become lodged in the larynx and obstruct the trachea. Certain procedures can prevent the aspiration of dental objects. These include the following: use of a rubber dam, oral packing, chair position, help from a dental assistant, suction, and ligature. When an object enters the oropharynx of a patient who is in a supine position, do not permit the patient to sit up. Place the chair in a more reclined (or head-down) position. Use a Magill intubation forceps to retrieve the object if it is visible. If the patient swallows the object, radiographs and medical consultation are indicated. If the object passes into the larynx or trachea, usually the patient will manifest signs and symptoms of compromised air flow. Do not allow the patient to sit up. Place the patient in a head-down position. Encourage the patient to cough up the object. If acute airway obstruction does not occur, radiographs and medical consultation are indicated.

Sings and symptoms of - partial airway obstruction: With good airflow:

1. Forceful cough
2. Wheezing between coughs
3. Ability to breathe

With poor airflow:

1. Weak, ineffectual cough
2. Crowing sound on inspiration
3. Paradoxical respiration
4. Absent or altered voice sounds
5. Possible cyanosis
6. Possible lethargy
7. Disorientation

Signs and symptoms of complete airway obstruction:

1. Universal sign for choking
2. Inability to cough
3. Panic
4. Inability to speak
5. Inability to breathe
6. Cyanosis
7. Unconscious if not relieved of obstruction
8. Cardiac arrest if not relieved of obstruction

Treatment (based on American Heart Association recommendations for adults):
1. Apply basic airway maneuvers.
   a. Encourage coughing. If the patient is able to cough forcefully, do not interfere.
   b. Place the patient in a supine position with feet slightly elevated.
   c. Rule out tongue obstruction; perform head tilt-chin lift maneuver.
   d. Assess the airway and breathing by listening and feeling for the passage of air.
   e. If complete obstruction has occurred, proceed with the Heimlich maneuver.
2. Establish an emergency airway using the abdominal thrust (or Heimlich maneuver).
   a. Conscious patient:
      (1) Have the patient stand up.
      (2) Stand behind the patient.
      (3) Wrap your arms around the patient’s waist and under the patient’s arms.
      (4) Make a fist and grasp it with your other hand.
      (5) Place the thumb side of the fist against the midline of the patient’s abdomen, well below the tip of the xiphoid process.
      (6) Repeat inward and upward thrusts until the patient expels the object or loses consciousness.
   b. Unconscious patient:
      (1) Place the patient in a supine position.
      (2) Open the airway with a head tilt-chin lift maneuver. Turn the patient’s head up into the neutral position.
      (3) Straddle the patient’s legs or thighs. (If the patient is still in the dental chair, stand astride the patient.)
      (4) Place the heel of one hand against the midline of the patient’s abdomen, well below the tip of the xiphoid process.
      (5) Place the other hand directly on top of the first hand.
      (6) Press into the patient’s abdomen with a quick inward and upward thrust.
      (7) Perform 6 to 10 abdominal thrusts.
      (8) Open the patient’s mouth and perform a finger sweep.
3. Summon office staff assistance.
4. Activate the EMS.
5. Open the patient’s mouth using tongue jaw lift.
6. Perform finger sweep.
7. Attempt to ventilate the patient. If this is ineffective, proceed with abdominal thrusts.
8. Re-peat abdominal thrusts, finger sweeps, and attempted ventilations until effective.
9. When the obstruction is relieved and it has been determined that there is no respiration or pulse present, begin cardiopulmonary resuscitation procedures.

Asthmatic Attack

Two categories of asthma occur. Extrinsic asthma, also known as allergic asthma, accounts for about 50% of asthma cases. Intrinsic asthma accounts for the other 50%. Intrinsic asthma episodes are triggered by non-allergic factors such as respiratory infection, physical exertion, environmental and air pollution, and occupational stimuli.

Thus, predisposing factors for asthma include: psychic stress, antigen-antibody reaction, bronchial infection, dusts, fumes, and climate. Aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs), and penicillin must be used with care in asthmatic patients. These agents of course should not be used in patients with a history of allergy to these medications. Asthmatic patients with nasal polyps have an incidence of aspirin sensitivity of about 30-40%. They may also cross-react with other nonsteroidal, anti-inflammatory agents. One factor is common to all asthmatics: an extreme sensitivity of the airway that results in increased secretions and an abnormally sensitive cough reflex. Asthmatic attacks will most often occur in patients who have a history of bronchial asthma.

Signs and symptoms:
1. Sense of suffocation
2. Pressure in chest, feeling of chest congestion
3. Normal inspiration with prolonged, wheezing expiration
4. Chest distension
5. Dyspnea
6. Sitting up to breathe
7. Increased anxiety and apprehension
8. Increased rate of respiration (tachypnea: greater than 20; greater than 40 if severe)
9. Normal to elevated blood pressure
10. Increased heart rate: greater than 120 in severe cases
11. Confusion
12. Cyanosis
13. Nasal flaring

Treatment:
1. Terminate the dental procedure.
2. Place the patient in an upright or comfortable position.
3. Remove dental materials from the patient’s mouth.
4. Calm the patient.
5. Perform basic life support as indicated.
6. Administer a bronchodilator. Use the patient’s aerosol spray of bronchodilator medication. If the attack clears, proceed with the dental procedure or send the patient home and reschedule the dental treatment.
7. If several doses of the aerosolized bronchodilator fail to terminate the acute episode:
   a. Administer oxygen.
   b. Call for EMS.
   c. Record blood pressure, pulse rate, and respiration.
   d. Have the dentist or emergency personnel administer parenteral bronchodilators.
   e. In cases of severe attacks, do not administer sedative medications.
   f. In cases of severe attacks where administration of parenteral drugs has occurred, a period of hospitalization may be required.

**Respiratory Arrest**

Difficulty breathing can be very disconcerting to a conscious patient. Respiratory distress usually does not present the dental team with an immediate life-threatening situation. Prompt recognition and management of the following causes of respiratory distress (listed in order of frequency) can prevent progression to respiratory arrest.

**Most common:**
- Hyperventilation
- Vasodepressor syncope
- Obstruction of pharynx or larynx

**Common:**
- Heart failure
- Hypoglycemia

**Less Common:**
- Drug overdose

**Rare:**
- Acute myocardial infarction
- Anaphylaxis
- Angioneurotic edema
Cerebrovascular accident
Epilepsy
Hypoglycemic reaction

The clinical manifestations of respiratory distress vary based on the degree of breathing difficulty present. In most cases the patient remains conscious. If the patient becomes unconscious, the dental team must provide basic life support.

Management of respiratory arrest:

1. Assess the level of consciousness.
   a. Shake the patient’s shoulder and shout, “Are you OK?” to arouse. Failure to respond indicates unconsciousness.
   b. Pinch the patient in the suprascapular (shoulder) region. Failure to respond indicates unconsciousness.
2. Summon office staff assistance.
3. Position the patient in supine, back-down position. (Turn the patient on her left side in advanced stages of pregnancy.)
4. Assess the airway.
   a. Perform head tilt-chin lift.
   b. Perform jaw thrust.
   c. Place your ear about 1 inch from the patient’s nose.
   d. Look for movement of the chest indicating respiratory activity.
   e. Feel and listen for air flow from the patient’s nose or mouth.
   f. If no respiratory movement is noted and no flow of air can be detected, make a tentative diagnosis of respiratory arrest. Begin artificial ventilation immediately.
5. Remove foreign material in the airway.
   a. Tilt the dental chair back until the patient’s head is below the level of the heart.
   b. Turn the patient’s head to the side.
   c. Place two fingers into the patient’s mouth and remove any foreign objects; high-volume suction may be used instead of the fingers.
6. Artificial ventilation
   a. Exhaled air ventilation: use a device such as the pocket mask to prevent transfer of infectious agents. Reposition head (head tilt-chin lift). Using mouth-to-mouth resuscitation, give two full breaths lasting 1 to 1.5 seconds for each inspiration. Repeat one ventilation every 5 seconds for adults (every 3 seconds for children) until the patient is able to breathe. If the first two ventilations are unsuccessful, repeat the head tilt-chin lift and jaw thrust maneuvers and repeat the previous steps.
   b. Atmospheric air ventilation involves the use of an ambu-bag or a pulmonary manual resuscitator.
   c. Oxygen-enriched ventilation involves supplementation of artificial ventilation with oxygen.
7. Assess circulation: once the patient’s airway has been established, determine the adequacy of the patient’s circulation.
   a. Take the patient’s pulse from the carotid artery.
   b. Measure the patient’s blood pressure.
   c. If the patient has no pulse, proceed as described in the section on cardiac arrest. (This includes the activation of EMS.)

Syncope

Vasodepressor Syncope

Vasodepressor syncope, also known as vasovagal syncope (fainting), is the most common emergency occurring in dental practice. This type of syncope is usually benign and self-limiting. However, in rare cases it can be life threatening. Predisposing factors for syncope include psychogenic and non-psychogenic factors. Psychogenic factors are fright, anxiety, emotional stress, sudden and unexpected pain, and the sight of blood or dental instruments (such as a local anesthetic syringe). Non-psychogenic factors include sitting in an upright position, hunger, exhaustion, poor physical condition, or a hot, humid, crowded environment. Twenty to 30 years ago, dental patients were treated in an upright position, and syncope was very common. Now most patients are treated in a supine position, making syncope much less common. Syncope occurs when blood flow to the brain is diminished resulting in reduced oxygen availability.

Symptoms:

Early:
1. Feeling of warmth
2. Loss of color: pale or ashen-gray skin tone
3. Complaints of feeling bad or faint
4. Nausea
5. Heavy perspiration
6. Blood pressure near baseline
7. Rapid pulse (tachycardia)

Late:
1. Yawning
2. Rapid breathing
3. Coldness in hands and feet
4. Visual disturbances
5. Dilated pupils
6. Drop in blood pressure (hypotension)
7. Slow pulse (bradycardia)
8. Dizziness 
9. Loss of consciousness

**Treatment:**
1. Assess consciousness. 
2. Summon office staff assistance. 
3. Place patient in a supine position with feet elevated. 
4. Assess and open the patient’s airway (head tilt-chin lift). 
5. Assess airway patency and breathing. (Look for chest movement; listen and feel for exhaled air.) 
6. Assess circulation (palpate carotid pulse). 
7. Activate EMS if recovery is not immediate. 
8. Administer oxygen. 
9. Monitor vital signs (blood pressure, heart rate, and respiratory rate). 
   a. Loosen binding clothes such as ties, collars, and belts. 
   b. Administer ammonia by inhalation. 
   c. Administer atropine if bradycardia persists. 
   d. Place a cold towel on the patient’s forehead. 
   e. Place blankets over the patient if he or she is feeling cold or shivering. 
   f. Keep the patient calm.

**Postural Hypotension**
Postural hypotension, also known as orthostatic hypotension, is the second leading cause of transient loss of consciousness in the dental office. Predisposing factors for postural hypotension include drug administration and ingestion, age, prolonged recumbency and convalescence, inadequate postural reflex, pregnancy, venous defects in the legs, and Addison’s Disease. Drugs that have been reported to cause postural hypotension include antihypertensives, phenothiazines, tricyclic antidepressants, narcotics, and antiparkinsonian drugs. Postural hypotension is more common with increasing age. Confinement to bed for as little as 1 week has been shown to predispose patients to postural hypotension. Dental patients who have had a long dental appointment (2 or 3 hours) may be prone to postural hypotension. A pregnant patient may be predisposed to supine hypotensive syndrome of -pregnancy late in the third trimester. This form of hypotension can occur due to the gravid uterus compressing the inferior vena cava, decreasing venous return from the legs. Patients with severe varicose veins of the legs can develop postural hypotension. The varicose veins allow pooling of blood in the legs, thus decreasing venous return to the heart. Patients with Addison’s Disease can develop severe postural hypotension. The clinical criteria for postural hypotension are: symptomatology develops upon standing, increase of at least 30 beats per
minute in standing pulse, decrease of at least 25 mm HG in standing systolic blood pressure, and decrease of at least 10 mm HG in standing diastolic blood pressure.

Treatment:
1. Mimics that of vasodepressor syncope
2. Have pregnant patients change their position in the dental chair, that is, move from one side to the other.
3. Support patients who are predisposed to postural hypotension as they rise from the dental chair. Also, make changes in chair positions slowly.

Angina Pectoris
Angina pectoris is caused by an insufficient supply of oxygenated blood to the heart muscle, usually due to chronic arteriosclerosis. An angina pectoris attack may be precipitated by stress and anxiety. The patient will usually show a history of angina pectoris. The major clinical characteristic of angina is chest pain. However, the discomfort is seldom described as painful by the patient. The sensation is usually described as suffocating, heavy, squeezing, or a dull ache. Three types of angina occur: stable, variant (Prinzmetal’s), and unstable. The pain of angina usually lasts from 1 to 15 minutes. The pain of stable angina is usually relieved by rest or nitroglycerin.

Symptoms:
1. Pain of a brief nature, usually described as an aching, heavy, squeezing pressure or tightness in the mid-chest region.
2. The area of discomfort is about the size of the fist.
3. The pain may radiate down the left or right arm, to the neck, to the lower jaw, to the palate, or to the tongue.
4. In rare cases, no chest pain occurs, only pain in one of the radiating sites.
5. The pain is usually brief in duration, lasting only from 1 to 3 minutes if the provoking stimulus is reduced or stopped.
6. Vital signs are usually normal.

Treatment:
1. Stop the dental procedure.
2. Place the patient in a semi-supine or comfortable position.
3. History of angina
   a. Administer a nitroglycerin tablet (from the patient’s own medication) under the tongue.
      (1) Wait 2 to 3 minutes.
      (2) If pain is relieved, let the patient rest and continue the treatment, or terminate the procedure and reschedule for another day.
(3) If possible, inform the patient’s physician of the incident.

b. If pain is not relieved:
   (1) Administer oxygen.
   (2) Take the patient’s blood pressure and pulse.
   (3) If the patient is stable, give a second nitroglycerin tablet, wait 2 to 3 minutes, and if pain is still present, give a third nitroglycerin tablet.
   (4) If the pain is not relieved following the administration of 3 nitroglycerin tablets within a 15-minute period or if the patient becomes unstable at any time, provide immediate emergency care as needed. Call the patient’s physician. Attend to the patient until he or she is in hands of a physician or is being managed by hospital emergency room personnel.

4. No history of angina
   a. Measure blood pressure and heart rate.
   b. Provide basic life support as indicated.
   c. Call for EMS.
   d. Administer nitroglycerin as described.
   e. Administer oxygen.
   f. Arrange for transportation of the patient to a medical facility.

Myocardial Infarction

Myocardial infarction (or heart attack) may occur in any patient, especially those over 40 years of age. Usually the victim of a myocardial infarction shows a history of some heart condition, such as coronary artery disease, angina pectoris, or hypertension. Myocardial infarction is defined as a clinical syndrome resulting from a deficient coronary arterial blood supply to a region of myocardium that results in cellular death and necrosis. Infarction is usually characterized by severe and prolonged substernal pain similar to, but more intense and of longer duration than, that of angina pectoris. Common complications of myocardial infarction include shock, heart failure, and cardiac arrest. This emergency is usually the result of complications of coronary artery disease during which the flow of blood to the myocardium is obstructed.

Signs and symptoms:

1. Pain
   a. Severe to intolerable
   b. Prolonged, usually longer than 30 minutes
   c. Crushing, choking, knifelike
   d. Retrosternal
   e. Radiates into the left arm, hand, shoulders, neck, and/or jaw

2. Profuse perspiration
3. Nausea and vomiting
4. Weakness
5. Dizziness
6. Palpitations
7. Sense of impending doom
8. Restlessness
9. Patient in acute distress
10. Skin: cool, pale, moist
11. Heart rate: bradycardia to tachycardia. Premature ventricular contractions are common.

Treatment:
1. Terminate the dental procedure.
2. Place the patient in a semi-supine or comfortable position.
3. Perform basic life support as indicated.
4. Call for EMS.
5. Administer nitroglycerin and oxygen. (The pain will not be relieved if a myocardial infarction is occurring.)
6. Keep the patient calm and comfortable.
7. Monitor vital signs.
8. Relieve pain with parenteral narcotics, nitrous oxide, and oxygen.
9. Manage complications: arrhythmias left ventricular failure, cardiac arrest (in case of cardiac arrest an automated external defibrillator should be used in an attempt to restore cardiac function)
10. Transfer to hospital.

Congestive Heart Failure and Acute Pulmonary Edema
Congestive heart failure refers to a combination of left and right ventricular failure. There is evidence of both systemic and pulmonary congestion. Congestive heart failure can follow heart disease, hypertension, chronic obstructive lung disease, and asthma. Acute pulmonary edema is a life-threatening condition resulting from the rapid accumulation of fluid into the alveolar spaces of the lungs. This is accompanied by great difficulty breathing. Acute pulmonary edema is often precipitated by physically or psychologically stressful situations. Acute pulmonary edema may also be induced by salty meals, noncompliance with medications, or infections.

Signs and symptoms of heart failure:
1. Pallor, cool skin
2. Sweating
3. Dependent edema
4. Narrow pulse pressure
5. Ascites
6. Enlarged liver and spleen
7. Left ventricular hypertrophy
8. Weakness and fatigue
9. Dypsnea on exertion
10. Hyperventilation
11. Wheezing (cardiac asthma)
12. Paroxysmal nocturnal dyspnea

**Signs and symptoms of acute pulmonary edema:**
1. Any of the signs or symptoms of heart failure
2. Moist rates at the base of the lungs
3. Rapid breathing (tachypnea)
4. Dyspnea
5. Cyanosis
6. Frothy pink sputum (blood tinged)
7. Increased anxiety
8. Dyspnea at rest

**Treatment:**
1. Terminate dental procedure.
2. Remove dental materials from the patient’s mouth.
3. Place the patient in semi-supine or comfortable position.
4. Call for EMS.
5. Calm the patient.
6. Perform basic life support as indicated.
7. Administer oxygen.
8. Monitor vital signs; record blood pressure and pulse.
10. Bloodless phlebotomy: apply blood pressure cuffs on extremities (3 at a time, every 5 to 10 minutes; one of the cuffs is deflated). Apply pressure between systolic and diastolic pressures.
11. Administer a vasodilator. (The dentist or emergency medical personnel should administer these agents.)
12. Alleviate apprehension. Morphine with naloxone is available if an overdose of a sedative given. (Again, the dentist or emergency medical personnel should administer these agents.)
13. Transport the patient to the hospital once he or she has been stabilized.
Cardiac Arrest

Cardiac arrest is an emergency that may occur without warning. In cardiac arrest, the heart ceases pumping blood to the brain and other body systems. Cardiac arrest may be caused by any of the following conditions:

Most common:
- Myocardial infarction
- Sudden death, no other symptoms

Common:
- Airway obstruction
- Drug overdose reaction

Less common:
- Anaphylaxis
- Acute adrenal insufficiency
- Seizure disorders

Medical emergencies can lead to cardiac arrest. Prompt recognition and initiation of effective management of specific problems will usually prevent cardiac arrest. However, the dental team must be prepared to deal with this serious emergency. Cardiac arrest may occur at any location within the dental office. It has been known to occur in the waiting room, rest room, laboratory, dentist’s office, and treatment room. Sudden death is death that occurs within 1 hour of the onset of signs and symptoms. Clinical death occurs at the moment of cardiopulmonary arrest and on occasion can be reversed by prompt, effective action, thus preventing biological death. Biological or cellular death of brain tissue takes place when delivery of oxygen is inadequate for 4 to 6 minutes or longer. Because the time from cardiac arrest (clinical death) to biological death is short, the dental team must take prompt action to save the patient’s life.

In its latest CPR guidelines (2014), the American Heart Association (AHA) has rearranged the A-B-C to C-A-B. Airway-Breathing-Compressions (ABC) required the responder to first open the airway to give mouth-to-mouth breaths. AHA stated that in this sequence, chest compressions were often critically delayed. Studies show that more than 22 percent of lives are saved by hands only (chest compressions) as opposed to any other method. By updating the sequences to C-A-B or Chest-Airway-Breathing compressions will be initiated earlier, increasing the chances of survival for many patients.

The latest APIA guidelines instruct responders that the “adult sternum should be depressed at least 2 inches.” Previously, the AHA recommended the responder “Look, listen, and feel” after the airway was opened to make sure that the patient is breathing. Now, in the latest guidelines, the rescuer opens the patient’s airway, delivers two breaths after providing 30
compressions to the patient’s chest.

The new AHA guidelines provide step-by-step instructions according to the C-A-B sequence. Rescuers should first conduct a brief assessment to determine whether the victim is responding or not. If there is no response, the responder should take ten seconds to check for normal breathing or pulse. If normal breathing or pulse cannot be detected with the ten seconds, immediately initiate CPR, starting with 30 chest compressions. For an adult, compressions should be two inches deep, on the center of the chest. The responders should deliver the compressions at a rate of 100 per minute, which comes to roughly 1.5 compressions per second. After delivering 30 compressions, the responder should tilt the victim’s head and lift the chin to open the airway and deliver two breaths.

Symptoms:
1. Absence of carotid pulse
2. Absence of respiration
3. Absence of blood pressure
4. Cyanosis
5. Dilated pupils

Treatment:
1. Recognize unconsciousness.
2. Summon office staff for assistance.
3. Place the patient supine on a hard surface, preferably the floor. If the floor does not allow enough room and the patient is in the dental chair, place a solid board under the patient to allow effective cardiac compressions to be performed.
4. Deliver a single precordial thump, but only if the cardiac arrest was witnessed.
5. If the patient has no pulse, begin basic life support.
6. Call EMS.
7. An automated external defibrillator can be used to attempt to restore cardiac function.
8. Transport the patient (accompanied by the dentist) to the emergency department of a hospital.

Allergic Reactions

Two types of allergic reactions are of primary importance to the dental team. Type I reactions are immediate and can be life threatening. Type I reactions include urticaria (rash, hives), angioedema, and anaphylaxis. Type I reactions can be caused by aspirin, penicillin, local anesthetics, latex, and other agents used in dental practice. Type IV allergic reactions are delayed and are usually not life threatening. These reactions involve the skin or mucosal tissues. About 5% of the dental health care workers develop type IV reactions to latex gloves.
**Angioedema**

If the immediate type I allergic reaction results in edema of the tongue, pharyngeal tissues, or larynx, steps must be taken to prevent death due to respiratory failure. Type I allergic reactions occur soon after contact with the antigen. The reaction consists of painless swelling. Itching and burning may occur over the lesion. For the reaction to clear without treatment takes from 1 to 3 days.

**Signs and symptoms (laryngeal edema):**
- 1. Dyspnea
- 2. Hoarseness
- 3. Throat tightness
- 4. Exaggerated chest movements
- 5. High-pitched crowing sound (if partial obstruction)
- 6. No sound if total obstruction
- 7. Cyanosis
- 8. Hypersalivation
- 9. Laryngeal stridor
- 10. Supraglottic and glottic edema

**Treatment:**
- 2. Position the patient comfortably.
- 3. Call for EMS.
- 4. Initiate basic life support as indicated.
- 5. The dentist or emergency medical personnel should inject 0.5 ml of 1:1,000 epinephrine into the tongue, IM or SC.
- 6. Maintain airway with head tilt-chin lift and jaw thrust maneuvers.
- 7. Administer oxygen.
- 8. Monitor vital signs.
- 9. The dentist or emergency medical personnel should administer additional drugs, antihistamine and corticosteroid, IM.
- 10. Cricothyrotomy may be given, if needed, by the dentist or emergency medical personnel.

**Anaphylactic Shock**

Anaphylactic shock is a severe type I allergic reaction. Aspirin and penicillin are frequently the substances causing the reaction. In rare cases, local anesthetics can be the cause. This emergency progresses rapidly and may be life threatening for the patient. The patient will usually demonstrate a history of allergy to a substance.
Signs and symptoms:
1. Itching of soft palate
2. Nausea, vomiting
3. Substernal pressure
4. Shortness of breath
5. Urticaria (rash)
6. Pruritus (itching)
7. Laryngeal edema
8. Hypotension
9. Cardiac arrhythmias
10. Occasional wheezing
11. Loss of consciousness

Treatment:
2. Place patient in a supine position with the legs elevated.
3. Perform basic life support as indicated.
4. Call for EMS.
5. The dentist or emergency medical personnel should inject 0.5 ml of 1:1,000 epinephrine into the tongue, IM or SC.
6. Administer oxygen.
7. Monitor vital signs.
8. The dentist or emergency medical personnel should administer additional drugs, antihistamine and corticosteroid IM.

Mild Allergic Reactions
A mild allergic reaction can occur when a susceptible patient comes into contact with an allergen, either by inhaling, eating, or injecting the substance.

Symptoms:
1. Urticaria (rash) usually on face, neck, arms, or hands
2. Pruritus (itching) of face, neck, arms, or hands

Treatment:
Diphenhydramad Hydrochloride (Benadryl) 50 mg, orally every 6-8 hours for two days or Chlortrimeton 4-8 mg, orally every 6-12 hours for two days.

Local Anesthesia and Drug Toxicity
Local anesthetics are the most commonly used drugs in dentistry. An overdose reaction to a local anesthetic is related to the blood level of local anesthetic occurring in certain tissues and organs following its administration. Predisposing factors to local anesthetic overdose include patient factors and drug factors.

Predisposing patient factors are age (very young and old), body weight (lower weight increases risk), presence of pathology (liver disease, congestive heart failure, pulmonary disease), genetics (atypical plasma cholinesterase), mental attitude (anxiety decreases seizure threshold), and pregnancy. Predisposing drug factors are vasoactivity of drug (vasodilation increases risk), dose of drug (higher dose increases risk), route of administration (intravascular route increases risk), rate of injection (rapid injection increases risk), vascularity of injection site (increased vascularity increases risk), and presence of vasoconstrictor (decreases risk). Thus, toxic levels of a local anesthetic can occur if the biotrans formation of the drug is unusually slow, the drug is slowly eliminated from the body through the kidneys, the total administered dose is too large, the absorption from the injection site is unusually rapid, or the local anesthetic is inadvertently administered intravascularly.

The maximal recommended doses of commonly used local anesthetics for a 180 pound person are: 2% lidocaine, 8.0 cartridges; 2% mepivacaine, 8.0 cartridges; 4% prilocaine, 5.5 cartridges. The maximum recommended doses for a 120 pound person are: 2% lidocaine, 6.5 cartridges; 2% mepivacaine, 6.5 cartridges; 4% prilocaine, 4.5 cartridges. In general, a person can be given 2.0 mg of lidocaine or mepivacaine per pound up to a maximum dose of 300 mg or 2.7 mg of prilocaine per pound up to a maximum dose of 300 mg.

**Signs and symptoms:**
1. Confusion
2. Talkativeness
3. Apprehension
4. Excitedness
5. Slurred speech
6. Generalized stutter
7. Headache
8. Lightheadedness
9. Dizziness
10. Blurred vision (unable to focus)
11. Ringing in ears
12. Numbness of tongue
13. Flushed or chilled feeling
14. Drowsiness
15. Disorientation
16. Loss of consciousness
17. Muscular twitching and tremor of face and extremities
18. Nystagmus
19. Elevated blood pressure
20. Elevated heart rate
21. Elevated respiratory rate
22. With higher blood levels, generalized tonic-clonic seizure may occur followed by generalized CNS depression and depressed blood pressure, heart rate, and respiratory rate.

Treatment:
1. Mild overdose with rapid onset or delayed onset:
   a. Terminate the dental procedure.
   b. Position the patient comfortably if the patient is conscious.
   c. Reassure the patient to keep he or she calm.
   d. Administer oxygen.
   e. Perform basic life support as indicated.
   f. Monitor vital signs.
   g. Call EMS if needed.
   h. The dentist or emergency medical personnel should administer anticonvulsant drug (low dose of IV diazepam) if needed.
   i. Allow patient to recover, then discharge.
2. Severe overdose with slow or rapid onset:
   a. Terminate the dental procedure.
   b. Position the patient in a supine position with the legs elevated if the patient is unconscious.
   c. Call for EMS.
   d. Perform basic life support as indicated.
   e. Monitor vital signs.
   f. Administer IV anticonvulsant (moderate dose of diazepam).
   g. Stabilize the patient at the dental office and then transport him or her to the emergency room by EMS.

Seizures or Convulsions
Seizure activity may occur on occasion even though a patient’s disorder is controlled by medication. Seizures may also occur as a result of some other emergency situation such as insulin shock. In some instances a seizure occurs for what may seem to be no apparent reason, but in many instances a triggering disturbance is present. These precipitating factors include flickering lights, fatigue, decreased physical condition of the patient, physical stress, and emotional stress. The dental professional should be aware of these factors and be alert
to the signs and symptoms of seizure activity.

**Symptoms**
1. Aura—patient may warn the dental professional of onset of seizure
2. Convulsive movement of the extremities
3. Excessive salivary flow
4. Loss of consciousness

**Treatment:**
1. With sufficient warning of an impending seizure, immediately place the patient in such a position that he or she cannot fall or come into contact with furniture or equipment.
2. If the seizure has already started in the dental chair, do not move the patient. Place the patient in a supine position and on their side if possible to avoid aspiration, and clear all equipment from the area.
3. Once the seizure has started and the mouth is closed, do not force the mouth open in an attempt to insert objects between the teeth. This could result in more trauma to the patient.
4. If a seizure is sudden and an instrument has become clamped between the patient’s teeth, do not attempt to remove it forcibly. Wait alertly until the seizure subsides to remove the object without injury to the patient.
5. Time the seizure. If the seizure activity lasts for 10 minutes or longer, call for EMS.
6. Following the seizure, be certain the patient maintains an open airway.
7. Administer oxygen if needed.
8. Establish the patient’s pulse rate.
9. Record the blood pressure.
10. Permit the patient to rest until recovery is complete. The patient’s vital signs should return to approximately baseline levels, and the signs of confusion and disorientation should disappear. Questions that may assist the dental professional in determining the patient’s level of orientation include: Can you tell me your name? ...what day it is? ...where you are?
12. Discharge the patient into the care of a responsible adult. If there is any question with regard to the patient’s condition, consult the physician.

**Diabetic Coma**

Three types of diabetes mellitus occur. The most common and least severe is type 11 (or non-insulin-dependent diabetes mellitus). This form of diabetes is usually not treated by insulin, and diabetic coma is rare. The most severe form of diabetes is type I (or insulin-dependent diabetes mellitus). This form of the disease requires insulin treatment, and in the uncontrolled state, can lead to diabetic coma. Other specific types of diabetes mellitus are secondary to pancreatic disease, thyroid disease, pituitary disease, or drugs such as
thiazide diuretics, steroids or lithium salts. When severe, other specific types of diabetes mellitus can lead to diabetic coma and often requires insulin for treatment. Diabetic coma or hyperglycemia is caused by an insufficient amount of insulin in the body. The result of this insufficiency is a high blood glucose level. Patients can usually tolerate a temporary high blood sugar condition; therefore, diabetic coma is less likely to occur as an emergency situation in the dental office. Information from the medical history questionnaire is important with regard to the possibility of this condition occurring. If the diabetic patient requires large doses of insulin daily, the possibility of diabetic coma should be considered. The onset of diabetic coma is much more gradual than insulin shock. Hyperglycemia and ketoacidosis usually develop over a period of many hours or days, and the patient will appear and behave chronically ill. Emergency medical technicians are trained to regard any unknown diabetic emergency encountered in the field as though it were hypoglycemia. If the patient is awake and alert, the administration of oral glucose is recommended. If the patient’s consciousness is altered, the use of glucose paste is recommended, while paying attention to airway management. The reason for this is that if hypoglycemia, is not treated rapidly, death or serious damage to the patient is likely. On the other hand, permanent disability or death due to hyperglycemia occurs over an extended period of time.

Symptoms:
1. Dry, warm skin
2. Fruity or sweet breath odor; acetone breath
3. Fever
4. Flushed complexion
5. Intense thirst
6. Low blood pressure
7. Nausea and vomiting
8. Shortness of breath
9. Weak and rapid pulse
10. Altered level of consciousness

Treatment:

Conscious Patient:
No direct treatment is indicated. Do not perform any dental treatment. Contact the patient’s physician, and refer the patient for evaluation and medical treatment.

Unconscious Patient:
1. Place the patient in a supine position.
2. Establish and maintain the patient’s airway.
3. Establish a respiration rate.
4. Establish a pulserate.
5. Perform cardiopulmonary resuscitation if the patient has no respiration or pulse rate.
Hypoglycemia or Insulin Shock

Hypoglycemia can occur as a result of overdosage of an oral hypoglycemic agent used to treat patients with type II diabetes mellitus. The hypoglycemia associated with oral agents has a gradual onset and usually does not lead to a medical emergency. The clinical symptoms associated with hypoglycemia depend on the rate of fall of the blood glucose level in the body. Usually the faster the blood glucose level falls, the more symptomatic the patient.

Insulin shock, a form of hypoglycemia, is caused by an excessive amount of insulin in the body. If a diabetic patient injecting insulin fails to maintain normal food intake, the symptoms of hypoglycemia can develop quickly, progress rapidly to unconsciousness, and result in a sudden emergency situation in the dental office. Diabetic patients on insulin should be informed to take their normal insulin dose and meal prior to a dental appointment. More often then not, patients take their insulin but fail to eat just before coming to the dental office. When hypoglycemic patients come in for an appointment, they should be asked if they have taken their last insulin dose and when they have eaten their last meal. If a patient has failed to eat, give the patient a source of glucose prior to starting the dental procedure. All diabetic patients, particularly those being treated with insulin, should be advised to tell their dental professional if they experience the onset of hypoglycemic symptoms. When working with a diabetic patient, be aware of and alert for signs and symptoms of this possible emergency situation.

Signs and symptoms:

Mild or early stage:
1. Hunger
2. Weakness, dizziness
3. Full and bounding pulse
4. Tachycardia
5. Sweating
6. Pallor, moist skin
7. Paresthesia
8. Headache

Moderate stage:
1. Incoherence
2. Uncooperativeness
3. Belligerence
4. Irritability
5. Lack of judgment  
6. Poor orientation  

**Severe or late stage:**  
1. Unconsciousness  
2. Tonic or clonic movements  
3. Hypotension  
4. Hypothermia  
5. Rapid thready pulse  

**Treatment:**  

*Conscious Patient:*  
1. Recognize hypoglycemia.  
2. Terminate the dental procedure.  
3. Position the patient comfortably.  
4. Perform basic life support as indicated.  
5. Administer oral carbohydrates such as sugar, orange juice, cola beverages, or candy bars.  
6. If episode terminates, permit the patient to recover, observe him or her for about 1 hour, then discharge.  
7. If episode continues:  
   a. Call for emergency medical assistance.  
   b. The dentist or emergency medical personnel should administer Glucagon, 1 mg IM.  
   c. The dentist or emergency medical personnel should administer parenteral carbohydrate, 50 ml of 50% dextrose, IV over 2 to 3 minutes.  
   d. Monitor the patient and then discharge. 

The dental assistant or hygienist will be able to follow steps 1 through 6 and step 7 a. The dentist or trained medical personnel will need to perform steps 7 b and c. If the dental office is not equipped for the administration of glucose intravenously, call for EMS immediately. If the dentist administers glucose, the patient may need follow-up care in a medical facility. 

**Cerebrovascular Accident or Stroke**  
A cerebrovascular accident (CVA) or stroke is usually caused by the rupture of a blood vessel in the brain as a result of arteriosclerosis, hypertension, aneurysm, infarction, cerebral thrombosis, hemorrhage, or embolism. A transient ischemic attack (TIA) or temporary stroke often precedes a stroke. TIAs usually last from 15 to 60 minutes. TIAs indicate an increased risk for stroke. CVAs due to infarction result in a gradual onset of symptoms, are often preceded by TIAs, and are accompanied by a mild headache and neurologic signs and symptoms. CVAs due to embolism have a sudden onset of symptoms; mild headache
precedes neurological signs and symptoms by several hours. CVAs caused by hemorrhage also have a sudden onset, but are associated with headache. They result in nausea and vomiting, chills and sweating, vertigo, loss of consciousness, and neurological signs and symptoms. Neurological signs and symptoms associated with CVAs include: paralysis on one side of the body, difficulty breathing and swallowing, inability to speak or slurring of speech, loss of bladder and bowel control, and pupils that are unequal in size. The loss of consciousness is associated with a very poor prognosis in CVA (70-100% initial mortality rate).

**Symptoms:**
1. Dizziness
2. Weakness
3. Headache (mild to severe)
4. Nausea and vomiting
5. Chills and sweating
6. Vertigo
7. Varying degrees of paralysis or numbness
8. Convulsions
9. Unconsciousness
10. Blood pressure is usually elevated.
11. Heart rate may be normal or elevated.

**Treatment:**

*Conscious Patient:*
1. Terminate the dental procedure.
2. Place the patient in an upright or semi-supine position.
3. Assess the airway, breathing, and circulation (ABCs)
4. Provide basic life support as indicated.
5. Maintain an open airway.
6. Administer oxygen.
7. Record blood pressure and pulse every 5 minutes during the episode.
8. Do not move the patient or turn the patient's head.
9. Call for EMS immediately.
10. Do not administer CNS-depressant medications.

*Unconscious Patient:*
1. Place the patient in a supine position with the legs slightly elevated.
2. Perform basic life support as indicated.
3. Monitor vital signs.
4. If the blood pressure is elevated, reposition the patient by slightly elevating the head.
5. The dentist or emergency medical personnel should establish intravenous lines.

**Thyroid Storm or Crisis**

Thyroid storm or crisis is rarely seen, but may occur in patients with untreated or improperly treated hyperthyroidism. Thyroid storm or crisis is a sudden, severe onset of the symptoms of hyperthyroidism and is precipitated by infection, trauma, surgery, or physiologic stress.

**Symptoms:**
1. Abdominal pain
2. Acute fever
3. Increase in blood pressure followed by severe hypotension
4. Nausea and vomiting
5. Profuse sweating
6. Pulmonary edema or congestive heart failure
7. Restlessness
8. Tachycardia and arrhythmias
9. Tremors
10. Warm, moist skin
11. May progress to coma

**Treatment:**
1. Terminate dental procedure.
2. Place the patient in a supine position with the legs slightly elevated.
3. Perform basic life support as indicated.
4. Call for EMS.
5. Place a cold, wet towel on the patient’s forehead.
6. Emergency medical personnel should administer medications: antithyroid drugs (propylthiouracil), potassium iodide, propranolol, hydrocortisone, and IV glucose.
7. Administer oxygen.
8. Transport the patient to the hospital emergency room.

**Hemorrhage**

Hemorrhage or a prolonged bleeding episode may occur whenever an artery or vein is traumatized. Hemorrhage may be the result of treating a patient who has a bleeding disorder such as hemophilia, deficiency of platelets, or prothrombin deficiency.

**Symptoms:**
1. Spurting blood indicates trauma to an artery.
2. Oozing blood indicates trauma to a vein.

Treatment:
1. Apply compression with gauze pack over bleeding area, and bandage pack firmly into place when possible.
2. For severe bleeding, apply digital pressure on pressure point of supplying vessel.
3. Suture(s) may be necessary.
4. Call for EMS.