

# **CDC 4Y051O**

## **Dental Assistant Journeyman**

### **Volume 4. General Emergency, Safety, and Preventive Dentistry**



**Air Force Career Development Academy  
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**Author:** MSgt Jillena A. Greene  
381st Training Squadron  
882d Training Group  
381 TRS/TRR  
2931 Harney Road  
Fort Sam Houston, Texas 78234-2532  
DSN: 420-2041  
E-mail address: jillena.a.greene.mil@mail.mil

**Instructional Systems**

**Specialist:** Evangeline K. Walmsley

**Editor:** Nelva J. Brown

Air Force Career Development Academy (AFCDA)  
The Air University (AETC)  
Maxwell-Gunter Air Force Base, Alabama 36118-5643

The fourth volume of CDC 4Y0510, General Emergency, Safety, and Preventive Dentistry, pertains to information about general emergency, safety, and preventive dentistry procedures. For some patients, the stress or anxiety of dental treatment, added to their medical problems, can create emergency situations. As a dental assistant, you must be prepared to respond to these situations. In the dental clinic there are basic procedures that are common to all the dental specialties. Today's Air Force dental assistants are expected to be able to function in any section of the dental clinic. Many of your job tasks involve direct patient contact and care. Be prepared to accept the role as the many duties expected of you as a member of the dental health care team. The knowledge you can gain from this volume, added to that gained from other volumes, will enable you to be of greater service to your patients.

Unit 1 includes information relating to the preparations and prevention of emergency procedures. It continues with specific type, recognition, and treatment of medical emergencies that are most likely to occur in the dental environment.

Unit 2 stresses safety and health, to include general safety principles as well as safety specific to dentistry.

Unit 3 details the USAF preventive dentistry program and clinical procedures you may perform in dental health. Also discussed are making presentations.

Unit 4 provides important information regarding oral prophylaxis procedures and dental health education.

Unit 5 provides information on the nutritional needs of your patients.

A glossary of abbreviations and acronyms is included for your use.

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This volume is valued at 15 hours and 5 points.

## Acknowledgment

Preparation of this volume was aided with the cooperation and courtesy of the industry, listed below, who permitted the use of photographs and illustrations from manuals, brochures, and pamphlets. Permission to use this information is gratefully acknowledged.

### USDA Center for Nutrition Policy and Promotion

Figure 5–1. My Plate guide illustration.

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### **NOTE:**

In this volume, the subject matter is divided into self-contained units. A unit menu begins each unit, identifying the lesson headings and numbers. After reading the unit menu page and unit introduction, study the section, answer the self-test questions, and compare your answers with those given at the end of the unit. Then, do the unit review exercises.

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# Unit 1. General Emergency Procedures

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**A**N EMERGENCY IS defined as an unforeseen situation calling for immediate action. The dental treatment room (DTR) is not usually thought of as a place where emergency conditions arise. However, unforeseen problems do arise and accidents do occur. Many factors contribute to dental emergencies. Patients with a predisposition to a medical emergency, such as those with high blood pressure, asthma, or angina, may be more likely to experience such an occurrence in a dental environment, since anxiety levels may be high. The combination of a medical problem and anxiety may trigger a physical response that can be classified as an emergency. Common drug therapy, which by design is meant to be helpful, is capable of producing hidden side effects that may result in reactions of a serious nature when the patients are subjected to routine dental procedures. It is the purpose of this unit to clearly define the role of the dental assistant in such problem situations.

## 1–1. Preparation and Prevention

The concept of emergency care in the DTR is not a new subject by any means, and there is often a fine line where first aid ends and medical treatment begins. Due to increasing claims of negligence in emergency situations, and the moral obligation of the dental team, it is mandatory that dental personnel be knowledgeable about the prevention, assessment, and proper treatment of an emergency.

### 601. Preparing for initial response and the emergency kit

Emergency care administered to an injured or sick individual is intended to be a helpful or preventive measure until the services of the dentist or physician can be obtained. As a dental assistant, you need to know the principles of emergency care and be prepared to offer competent assistance. In this lesson, you will learn two of your responsibilities as they apply to emergency care:

- Initial response.
- Emergency kit.

#### Initial response

Although each episode presents its own unique problems, there are some general considerations, which apply to practically all situations. You should understand the following rules before trying to master more specific first aid or emergency treatment.

1. Seek the aid of a dentist or physician as soon as possible. Never leave the patient alone.
2. Remain quiet and calm during an emergency. Carry out treatment procedures quickly, but do not rush around in a frantic manner.
3. Do not waste valuable time looking for emergency materials and items that are not readily available.

4. Keep the patient lying in a comfortable position, her or his head level with her or his body, until the seriousness of the condition is determined.
5. Appraisal of signs and symptoms of asphyxiation (impaired breathing), hemorrhage (serious bleeding), shock, and circulatory disorders are most important, since these conditions may require supportive breathing from a mechanical source or other prompt actions to maintain life.
6. Loosen tight clothing around the patient's neck, waist, and legs.
7. Never administer liquids by mouth to an unconscious patient, since the swallowing mechanism is not efficient. It is of the utmost importance to maintain a patient's airway and, at the same time, prevent aspiration of liquids.
8. Treat injuries in the order of their importance: first, asphyxiation; second, hemorrhage; third, shock.
9. Do not touch an open wound with bare hands unless the emergency requires you to do so.
10. Try to maintain the body temperature of the patient within relatively normal limits.
11. Do not attempt to move an emergency patient unless it is absolutely necessary.
12. Do your utmost to keep the patient as comfortable as possible, to minimize pain, and to reduce anxiety.
13. Most important of all, realize that it is best to defer any definitive treatment until you are sure of the primary problems.
14. Emergencies often occur without warning. Their treatment requires alertness and quick action that should be routine in nature. Only by automatic response to an emergency situation can the patient receive the treatment that should be rendered in most cases. Hesitation at such a time may be costly. Emergency routines should be well established and practiced enough to meet the needs whenever necessary. Ideally, a distressing situation should be handled as calmly as if it were routine. A successful method for treatment includes a working knowledge as well as the availability of instruments, drugs, and equipment necessary to manage an emergency situation.

### **Emergency kit**

Every dental clinic should have an available supply of drugs, instruments and equipment primarily designated for emergency use. To this end, an emergency kit, tray, or drawer should be properly prepared and located in an area readily accessible at all times.

**NOTE:** If a cabinet drawer is used for emergency kits, the same drawer location in all DTRs should be utilized to avoid confusion.

The contents of emergency kits may vary slightly from clinic to clinic, depending on local policy. In any case, be completely familiar with all the drugs and equipment in the emergency kit at your facility. This knowledge will ensure you can properly assist in any emergency. In addition, you will be able to maintain the equipment and supply levels. Your role in using an emergency kit is supportive. Your duties are mainly to maintain the emergency kit and assist the dentist in its use. In either case, conduct yourself as if human life depends directly on you.

### ***Kit organization***

The kit should be organized in such a manner that it is relatively compact and easily identified. All items in the kit must be labeled or tagged with information pertinent to their use. Items with a dated shelf life, such as medications and sterile instruments, must be routinely checked and periodically updated to ensure their reliability.

### ***Equipment items***

Equipment items of the greatest importance are those associated with the treatment of respiratory difficulty. A convenient source of oxygen and apparatus for its administration under pressure must be



readily available. The administration of oxygen is often the primary and most important definitive treatment necessary for the simpler, as well as the most complicated emergencies. Other equipment should include a sphygmomanometer and a stethoscope for monitoring blood pressure.

### ***Instruments***

The emergency kit includes a variety of instruments. The exact selection of these instruments depends on the types of emergencies prepared for. Generally, a need exists for the following:

- Several 2 or 3 milliliter (ml) syringes and needles for intramuscular and intravenous injections.
- Scalpel and disposable blade.
- Needles and suture material.
- Rubber tubing or a tourniquet.
- Cricothyrotomy needle to create an artificial airway below the larynx.
- Oropharyngeal airway for use on an unconscious patient.
- Hemostats.
- Sterile gauze sponges.

### ***Drugs, ointments, and medicaments***

Certain categories of drugs, ointments, and medicaments must be readily available. The following drugs and materials are generally included in the dental emergency kit:

- Ammonia inhalants—a mild stimulant for syncope.
- Epinephrine 1:1,000 (Adrenalin)—for anaphylactic shock, acute allergic reactions, and cardiac arrest.
- Benadryl (Diphenhydramine)—for acute allergic reactions.
  - Valium (Diazepam)—sedative and anticonvulsive.
  - Nitroglycerin tablets (Nitrostat)—coronary dilators for angina pectoris.
  - Solu-Cortef (Hydrocortisone sodium succinate)—for anaphylaxis and cardiac arrest.
  - 50 percent dextrose injection, sugar cubes, or packs—for diabetic hypoglycemia.
  - 5 percent dextrose in water (D5W)—for diluting drugs for slow intravenous dosage.
  - Sterile isotonic saline (0.9 percent).

### ***Maintenance***

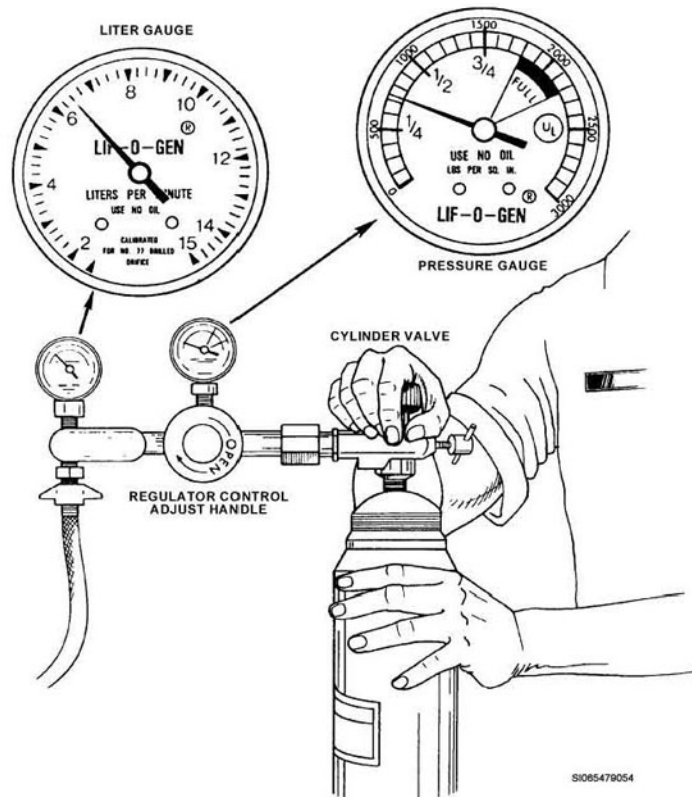
The proper maintenance of an emergency kit is a daily affair. Inspect the kit daily and correct any deficiencies noted. Inspections have revealed that some kits contain drugs with expired potency dates, and previously used drugs are not always replaced. Be sure to keep your kit or kits complete and ready for use. Your assistance in the proper use of the emergency kits increases the dentist's total treatment capability. When you perform your tasks, you free the dentist to concentrate on professional activities. Normally your tasks include placing needles and syringes, loading syringes with proper drugs, and applying tourniquets for intravenous injections.

## **602. Maintaining and operating oxygen equipment**

Oxygen equipment is most useful for many emergencies that may occur in the dental clinic. Proper operation of the equipment will allow the administration of supplemental oxygen with positive pressure. The apparatus for dispensing oxygen is a major piece of equipment in any dental clinic. As you'd expect, it should be stored conveniently near the DTR. The apparatus is designed to be portable. It consists of small, portable units with two cylinders or tanks. These cylinders are always painted green to indicate oxygen.

**NOTE:** In some larger and newer clinics, oxygen is installed in the walls of each DTR. With this arrangement, adjustable dispensing units are immediately available to provide oxygen for the ailing patient.

The apparatus is equipped with valves and gauges to control the flow of oxygen. Figure 1-1 illustrates their use. The *cylinder valve* opens the tank and releases the oxygen. When it is open, the *pressure gauge* registers the amount of oxygen remaining in the cylinder as pounds per square inch (psi). The amount of oxygen administered to the patient is controlled with the *regulator control adjust handle*, and registered on the *liter gauge*. Ideally masks, in adult and child sizes, should be stored in each DTR and periodically disinfected, so that a clean mask may be placed quickly on the oxygen unit when needed.



**Figure 1-1. Portable oxygen equipment.**

To operate the equipment, begin by assuring that the regulator control adjust handle is closed. Slowly, open the cylinder valve. When the needle on the pressure gauge stops; open the valve completely. Using the regulator control adjust handle, adjust the oxygen flow until the liter gauge registers a minimum of 6 liters per minute. The rate can be increased to 8 to 10 liters per minute for an adult.

Each DTR is also equipped with an *oral nasal mask*. After you have the oxygen flow properly adjusted, place the oral-nasal mask tightly over the patient's mouth and nose with one hand. Observe the movement of the patient's chest as an indicator of a patient's airway. Also note the color of the patient's skin and lips and her or his pulse rate.

Another device that may be used is the ambu-bag (or air-bird) shown in figure 1-2. This device can be used to resuscitate a patient with or without the oxygen equipment. If necessary, you may increase the patient's chest movement by applying intermittent pressure to the bag at the rate of 14 to 16 respirations per minute until normal breathing is restored.

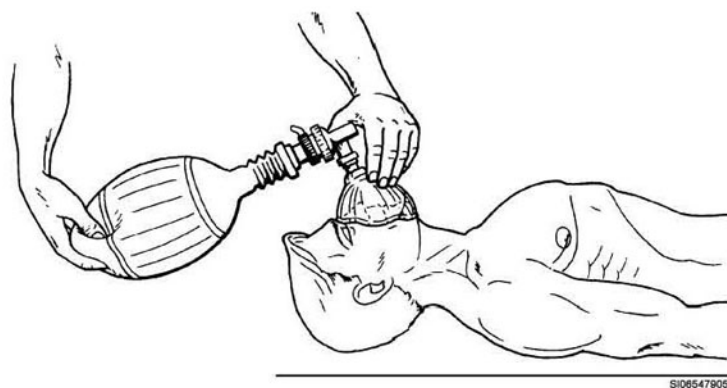


Figure 1-2. Ambu-bag or air-bird.

Oxygen equipment must be routinely maintained to ensure it is ready for use at any moment. At a minimum this includes the following:

1. The face mask must be disinfected periodically or according to local policy to maintain asepsis. An alternative is the use of disposable face masks.
2. Inspections of the condition of the mask, hoses, regulators, and amount of oxygen remaining in the cylinder must be performed daily or in accordance with local policy.
3. Oxygen cylinders must be replaced if the pressure gauge registers the oxygen content below 500 psi, or when the manufacturer's low level is reached.

**CAUTION:** *Never lubricate any part of the oxygen equipment.* If you do, you could cause an explosion. Also, never use or test oxygen near an open flame.

### 603. Measuring and recording vital signs

Prior to rendering treatment to patients, information must be sought relative to their general health status. In fact, before you initiate any treatment, check with the patient to ensure that his or her health history is current. An important element of this process is to ensure an adequate medical history of the patient on AF Form 696, Dental Patient Medical History.

Another critical factor of routine or emergency care is checking the vital signs of a patient. Vital signs are important indications of the body's response to its environment, or how well the body is carrying out the essential activities of living. Check the patient's vital signs prior to treatment:

- Take the patient's temperature.
- Take the patient's pulse.
- Take the patient's respiration rate.
- Take the patient's blood pressure.
- Observe the pupils of the patient's eyes.

This should be a routine procedure as you prepare the patient for dental treatment.

#### Temperature

The patient's temperature is a measurement of the degree of body heat. For most people, the normal reading is 98.6 degrees Fahrenheit (°F); however, some individuals routinely have a lower or higher than normal temperature. If this is determined, note it on the patient's AF Form 696. In addition, body temperature may vary according to the method used to measure it. It can be taken orally, which is the most accurate; rectally, which is 1° higher; or under arm pit, which is 1° lower. A relatively new method, which is fairly accurate, records the temperature in the ear or tympanically.

**NOTE:** You may find variations in temperature if the patient has been drinking hot or cold fluids or smoking.

In the dental environment, you will take temperatures using an electronic oral thermometer. This unit is automatically turned on when the probe is removed from the storage well. Your first step is to insert the probe completely and firmly into a disposable probe cover. This will maintain asepsis. Next, place the covered probe tip into the patient's mouth under the front of his or her tongue. During the measurement process, the probe must be held and the tip kept in contact with the tissue at all times. Do not allow the patient to reposition the probe. After the required time, a tone will sound and the patient's temperature will appear on the display (after approximately 20 seconds). Remove the probe from the patient's mouth and dispose of the probe cover. When the probe is returned to the storage well, the unit is automatically turned off. Record the patient's temperature on the appropriate forms.

### **Pulse**

The pulse is the periodic expansion of arteries caused by blood forced through them with each contraction of the heart. Characteristics of the pulse, which should be monitored, include rhythm, force, and rate. Rhythm should be regular and steady. Force or strength should be even and strong. The rate normally ranges in adults from 60 to 80 heartbeats per minute. In children, the rate is faster—from 80 to 100 beats per minute. To take the pulse rate, have a watch with a second hand indicator. Once taken, you should record the pulse rate immediately. There are two basic sites for taking the pulse: radial and carotid.

#### ***Radial pulse***

The radial artery on the inner surface of the wrist (thumb side) is the most commonly used site for taking the pulse. Using a watch with a second hand, place your index and third fingers lightly on the area between the tendons. Never use the thumb. Count the pulse for 15 seconds and multiply by four. Note the rate, rhythm, and force. If the pulse is irregular, count the beats for a full minute.

#### ***Carotid pulse***

You can detect the heartbeat of blood pulsating into the carotid artery by placing the fingertips of the right hand into the soft tissue of the patient's neck immediately above the clavicle on a perpendicular line below the angle of the mandible and to the side of the trachea. The normal count is the same as for the pulse in the wrist—60 to 80 beats per minute.

### **Respiration rate**

Respiration is the inhalation and exhalation of air. The rise and fall of the chest or abdomen is counted as one respiration. The normal adult respiration rate for a relaxed person should be approximately 17 breaths per minute. It is faster in children and when the body temperature is higher than normal. Respiration should be regular in rate, rhythm, and depth. If the patient is in a state of shock, the breathing rate will be rapid, shallow, and labored, particularly if there is an obstruction of the airway or if the patient has heart disease.

**NOTE:** If the patient is in respiratory failure or arrest, there will be little or no movement of the chest or abdomen.

Although respiration is automatic, it can be controlled. In fact, patients can control rate, rhythm, and depth, if they realize respiration is being taken. Therefore, respiration rates will be most accurate if patients think you're still taking their pulse. You will need a watch with second hand to observe the rise and fall of the chest or abdomen (as one count) for 15 seconds. Multiply this by four and record on the appropriate forms. If the respirations are irregular, you must count a full minute for an accurate rate.

### **Blood pressure**

The force of the blood exerted against the walls of the arteries is known as blood pressure. Blood pressure consists of a measurement of these two pressures: systolic and diastolic.

*Systolic* pressure is the highest pressure exerted on the circulatory system by the contraction of the left ventricle of the heart. This contraction forces the blood out into the circulatory system. The lowest pressure of the circulatory system occurs momentarily when the heart muscle rests and takes in more blood prior to the next contraction. This pressure is called the *diastolic*.

The difference between the systolic and diastolic pressures is the pulse pressure, which indicates the volume of blood the heart forces into the aorta during each contraction. Blood pressure measurements are recorded with the systolic pressure over the diastolic, such as BP 132/74. The 132 millimeters mercury (mm Hg) is the systolic pressure, while 74 mm Hg is the diastolic pressure. The arm (R or L) and patient position (sitting, reclined, standing) must also be included when recording the blood pressure.

### ***Blood pressure ranges***

The normal range of blood pressure for the adult male is: systolic pressure 110 to 120 mm Hg, diastolic pressure 70 to 80 mm Hg.

In the normal female, the blood pressure range is systolic pressure 100 to 110 mm Hg, while diastolic pressure 60 to 70 mm Hg.

Blood pressure is higher than the normal range during exercise, emotional states, or if the patient is overweight. Blood pressure above 150/95 is considered high and referred to as *hypertension*.

**NOTE:** In dentistry, patients with blood pressure of 140/90 are generally referred for a medical evaluation.

Blood pressure will be lower than normal when a patient experiences blood loss or shock. Hypotension or low blood pressure occurs when the blood pressure is below 90/60.

### ***Taking and recording blood pressure***

Blood pressure is measured at the initial examination and recorded on the completed AF Form 696. A patient's blood pressure should be taken prior to administration of any type of medication. All assistants must be capable of accurately taking and recording blood pressure.

To take and record blood pressure, you will need the following equipment:

- Stethoscope.
- Sphygmomanometer (blood pressure cuff) with gauge.
- Patient's AF Form 696, Dental Patient Medical History.
- Ink pen (black or blue-black). All entries on AF Form 696 are made in ink.
- Alcohol pads to clean the earpieces and diaphragm of the stethoscope.

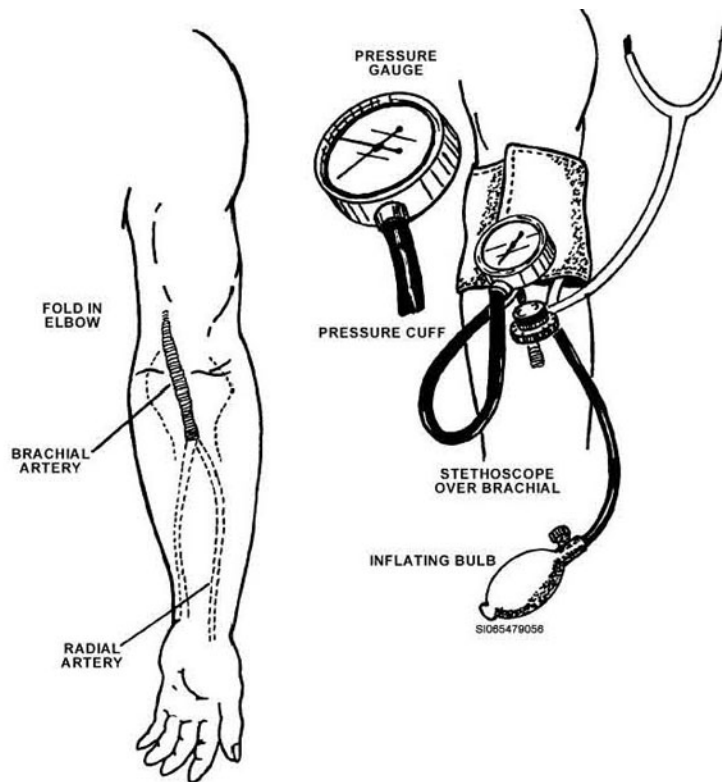
To measure blood pressure, the patient should be reclined in a supine position or seated upright in the dental chair. Allow the patient to rest quietly for a few minutes before taking the blood pressure. Have the patient's sleeve loosely rolled up to expose the upper arm. If the clothing is tight fitting, it may be necessary to have the patient remove it. Position the patient's right or left arm at heart level, with the palm facing upward. Locate the brachial artery at the inner aspect of the elbow, as shown in figure 1-3. Make a mental note of the location.

Expel all air from the cuff by opening the valve on the bulb end of the tubing. Close the valve by turning it clockwise. Place the blood pressure cuff with the bladder on the patient's inner arm area near the brachial artery. As you can see in figure 1-3, that is approximately 1 to 2 inches above the elbow. Use one hand to stabilize the end of the cuff. With the other hand, wrap the cuff comfortably around the upper arm. Be sure to place the cuff so that the gauge of the sphygmomanometer faces you. Place the earpiece of the stethoscope in your ears.

Locate the radial pulse by placing the fingertips on the radial artery near the thumb side of the inner wrist (fig. 1-3). Inflate the cuff until you can no longer feel the pulse. Then inflate the cuff an additional 30 mm Hg beyond the point at which you last felt the pulse.

Place the diaphragm of the stethoscope over the brachial artery at the inner area of the elbow on the upper arm (fig. 1-3). With the bulb of the cuff held in the palm of the hand, use your fingers to slowly open the valve and release the pressure on the cuff as you listen with the stethoscope. The mercury pressure in the gauge will drop approximately 2 mm with each heartbeat.

Note the registration of a sharp, tapping sound as you lower the air pressure in the cuff. This is the *systolic* pressure; that is, the sound of the pressure in the arteries as the heart is contracting, pushing the blood into the arteries and out of the heart. The systolic pressure should be near the point where the radial pulse disappeared.



**Figure 1-3. Location of the brachial and radial arteries, and placement of the blood pressure cuff.**

Slowly continue to release the air in the cuff, deflating the apparatus 2 to 4 mm Hg per second. Deflate until the *last* sound of the heartbeat is heard. This is the registration of the *diastolic* pressure; that is, the sound as the heart relaxes and prepares itself to receive more blood.

If the patient appears to be apprehensive at the first measurement, it may take two or three times, to obtain an accurate or average blood pressure measurement. When it is necessary to retake the blood pressure, the cuff can remain on the arm in a deflated position after the first measurement is obtained. Record the blood pressure measurements on the appropriate forms.

### Eye pupils

Observation of the eye pupils also provides valuable information regarding a patient's medical condition. As a dental assistant, observe the pupils of your patient for any unwarranted constriction or dilation and inform the dentist of any such signs. Be alert for the following conditions:

1. Normal pupils have a regular outline, and each is the same in size as the other. It is a normal reaction for pupils to constrict when exposed to light and dilate when exposed to darkness.
2. If the pupils are unequal, the patient has probably experienced brain damage from trauma or a stroke.
3. When the patient's pupils constrict before light is directed into the eyes, disease or dysfunction of the central nervous system or drug addiction is indicated.
4. Failure of the pupils to constrict from direct lighting indicates injury, disease, drug overdose, or poisoning.
5. Dilation of the pupils indicates a relaxed or unconscious state from drugs, such as marijuana.
6. Sudden dilation within 30 seconds indicates cardiac arrest.
7. In death and near-death states, the pupils are widely dilated, with no response to light.

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### Self-Test Questions

**After you complete these questions, you may check your answers at the end of the unit.**

#### **601. Preparing for initial response and the emergency kit**

1. In an emergency situation, when should you seek the aid of a dentist or physician? When can you leave the patient alone?
2. Why is an appraisal of the signs and symptoms of asphyxiation, hemorrhage, shock, and circulatory disorders the most important?
3. Why should liquids never be administered by mouth to an unconscious patient?
4. Arrange the treatment of the following injuries in order of importance: shock, hemorrhage, asphyxiation.
5. How can we ensure emergencies can be responded to with alertness and quick action?
6. Where should the emergency kit be located?
7. How should the kit be organized?
8. What items must be routinely checked and periodically updated to ensure their reliability?

9. What is often the primary and most important definitive treatment necessary for the simpler as well as the most complicated emergencies?
10. What types of instruments are generally needed in the emergency kit?
11. Match the drugs in column B with the appropriate use in column A. Column B items may be used only once.

*Column A*

- \_\_\_\_ (1) Diabetic hypoglycemia.
- \_\_\_\_ (2) Acute allergic reactions.
- \_\_\_\_ (3) Mild stimulant for syncope.
- \_\_\_\_ (4) Sedative and anticonvulsive.
- \_\_\_\_ (5) Anaphylactic shock and cardiac arrest.
- \_\_\_\_ (6) Coronary dilators for angina pectoris.
- \_\_\_\_ (7) Diluting drugs for slow intravenous dosage.

*Column B*

- a. Valium.
- b. Benadryl.
- c. Ammonia inhalants.
- d. Epinephrine 1:1,000.
- e. Nitroglycerin tablets.
- f. 5 percent dextrose in water.
- g. 50 percent dextrose injection, USP.

**602. Maintaining and operating oxygen equipment**

1. What color are oxygen cylinders?
2. What device opens the oxygen tank and releases the oxygen?
3. What information does the pressure gauge provide?
4. What device controls the amount of oxygen administered to the patient?
5. What information does the liter gauge provide?
6. What control must be closed before beginning to operate the oxygen equipment?
7. At what rate is the oxygen adjusted to flow?



8. What is observed as an indicator of a patient's airway?
9. What device can be used to resuscitate a patient with or without oxygen equipment? How can increased chest movement be accomplished?
10. What items must be inspected daily or in accordance with local policy?
11. When must oxygen cylinders be replaced?
12. How often should the oxygen equipment be lubricated?

**603. Measuring and recording vital signs**

1. What do vital signs indicate?
2. What should you do if a patient routinely has a lower or higher than normal temperature?
3. What methods can be used to measure temperature?
4. Briefly describe the steps necessary to measure temperature using an electronic oral thermometer.
5. Define pulse.
6. What are the characteristics of the pulse which should be monitored?
7. What is the normal pulse rate in adults and children?
8. The most commonly used site for taking the pulse is located where?

9. Briefly describe the steps necessary to measure pulse.
10. What is respiration?
11. What is the normal adult respiration rate for a relaxed person?
12. How does respiration appear if the patient is in a state of shock?
13. Briefly explain how to measure respiration.
14. What is blood pressure?
15. Define systolic and diastolic pressures.
16. What are the normal systolic and diastolic ranges for men and women?
17. What is the difference between the systolic and diastolic pressures?
18. Give an example of how blood pressure is recorded.
19. When is blood pressure considered hypertension? What occurs when the blood pressure is below 90/60?
20. How should the patient and the patient's arm be positioned to measure blood pressure?
21. Where is the brachial artery located?
22. Describe the placement of the blood pressure cuff.

23. Where do you place your fingers to locate the radial pulse? What is the significance of the radial pulse when measuring blood pressure?
24. Where is the diaphragm of the stethoscope placed when measuring blood pressure?
25. What does the registration of a sharp, tapping sound indicate as you lower the air in the cuff?
26. At what point should the systolic pressure be near?
27. How is the diastolic pressure indicated?
28. Describe the normal appearance and reactions of the eye pupils.
29. What has the patient probably experienced if the pupils are unequal?
30. What is indicated when the pupils constrict before light is directed into the eyes?
31. What does sudden dilation within 30 seconds indicate?
32. How do pupils appear in death and near-death states?

## **1-2. Medical Emergencies**

Medical emergencies include any potential physical life threatening situation. If emergencies occur, you must be able to recognize them and assist in correcting them. There are many types of medical emergencies that can arise in the dental clinic. You will be studying the more common types. Any medical emergency is important and should always be given your undivided attention. In this section, we will provide brief descriptions of the following medical emergencies:

- Shock recognition and treatment.
- Drug related emergencies.
- Respiratory emergencies.
- Cardiovascular emergencies.

In addition, we will cover some other medical emergencies you may encounter.

We will only provide word pictures of the emergency conditions and procedures we have listed; however, there should be regular training sessions in your section to ensure that all personnel are qualified to administer appropriate life-saving measures.

#### **604. Shock recognition and treatment**

In medicine, shock means the state of collapse of the cardiovascular system. Stimuli that cause the opening and closing of the blood vessels of the vascular system include fright, heat and cold, and the needs of the body organs for oxygen and the removal of waste. They are under the control of the involuntary nervous system and entirely automatic.

Shock, then, is a condition that alters the normal flow of blood through the vascular system and is caused by any of the following:

- Damage to the heart, the organ responsible for the circulation of the blood.
- Sudden loss of a quantity of blood through hemorrhaging.
- Dilation of the vessels of certain regions of the body, which prevents the normal flow of blood throughout the circulatory system.

There are several types of shock. Because of text limitations, we will limit our discussion to those types most common to patients in the practice of dentistry.

#### **Signs and symptoms of shock**

Be observant of the following signs and symptoms which are common to all forms of shock:

- Restlessness or anxiety.
- Rapid but weak pulse.
- Cold, wet, clammy skin.
- Profuse sweating.
- Pale face or cyanotic appearance around the mouth.
- Respiration which is shallow, labored, and rapid.
- Eyes appearing dull or lusterless and dilated pupils.
- Thirst.
- Nausea or vomiting.
- A drop in blood pressure.

#### **Syncope**

Although syncope is not a form of shock, it commonly accompanies or is a symptom of many types of shock. Syncope or fainting is a temporary loss of consciousness caused by insufficient blood to the brain. It may be caused when a person experiences surprise, fear, or pain. As the assistant, you must be alert to the signs and symptoms that accompany syncope. They include the following:

- Pallor (loss of skin color).
- Clamminess.
- Rapid but weak pulse.
- Decreased blood pressure.

Frequently, placing the patient in a *supine* position is sufficient to revive him or her. Elevate the patient's feet to a position higher than his or her head to cause the blood to flow away from the stomach and toward the brain. You may also apply a cool cloth to the patient's forehead, or the back

of the neck. Monitor the patient's pulse rate and blood pressure. Prepare an ammonia inhalant and oxygen for use. Call for help if the patient's condition does not improve.

If the patient loses consciousness, break the ammonia inhalant and waft gently under the patient's nostrils. This will cause the patient to inhale quickly and thus receive oxygen. You can then administer the oxygen. Usually, the patient will regain consciousness within one or two minutes.

**CAUTION:** Never hold spirits of ammonia directly under the nostrils, as the aromatic substance of the ammonia vapors may cause irritation to the membrane of the nostrils and the nasal cavity.

### **Postural hypotension**

This type of shock is caused when a patient has been in a supine position during treatment for a prolonged time and is abruptly returned to an upright position. The onset of postural hypotension is usually rapid. The blood pressure of a patient with this condition is usually very low. The patient may lose consciousness or merely feel lightheaded or extremely dizzy, appear disoriented, or experience blurred vision.

When postural hypotension occurs, return the patient to the supine position, ensure an open airway is maintained, and monitor the patient's vital signs. It may be necessary to administer oxygen. When the patient begins to appear normal; return the patient to the upright position slowly with stops at various levels. You can prevent this condition by returning your patients to the upright position very slowly.

### **Psychogenic shock**

In psychogenic shock, the nervous system reacts to a stimulus of fright, fear, or pain. This reaction causes a temporary reduction of the blood supply to the brain. A momentary vascular dilation causes the blood to pool in the dilated vessels, and the patient faints. Place the patient in a supine position and monitor his or her vital signs. Advise the dentist at once. Use an ammonia inhalant as needed for a respiratory stimulant.

Frequently, the patient may be frightened of anticipated dental treatment or overly tired from work and lack of sufficient rest. Prolonged waiting for treatment in a reception area or in a treatment room is not conducive to the relaxation of a patient. The patient may complain of the room being too warm, appear agitated, and attempt to loosen clothing.

### **Anaphylactic shock**

Anaphylactic shock is the most severe, allergic reaction of the body to a foreign protein substance in the blood. Allergic responses in an individual may be stimulated by sensitivity to certain foods, administration of a medication, or sting or bite of an insect.

The exact cause is not fully understood, but medical specialists contend that the foreign protein elicits a widespread response of a sudden release of histamine in the blood stream, which in turn allows plasma to flow through the capillary walls into the tissue.

This action causes a decrease in the amount of blood returning to the heart, which in turn causes the circulatory needs of the body to suffer, and shock follows immediately. Immediate treatment is imperative.

Listed are some signs and symptoms that may accompany allergic reactions:

- Itching or burning sensation.
- Extreme edema (swelling) of the tissues of the body.
- A rash or eruption of hives (urticaria).
- Tightness or pain in the chest.
- An irritating or persistent cough.
- Wheezing and difficulty in breathing.

- Large, rapid drop in blood pressure.
- Weak or absent pulse.

Swelling of the tissue of the larynx and bronchi will cause obstruction of the airway (trachea). The patient may show signs of choking, nausea, coughing, cyanosis (bluish discoloration of the skin), and may lose consciousness if relief is not immediate.

Immediately place the patient in a supine position and call for help. You will need the emergency kit to prepare for the administration of a specific antiallergic agent. Epinephrine of 1:1,000, in a dosage of 0.3 to 0.5 ml, may be administered intramuscularly. As the dental assistant, you will prepare the sterile syringe at the request of the dentist. If the reaction is severe, an additional dose may be administered.

Oxygen will relieve the patient's distress and should be administered along with the antiallergic drug. Remember, oxygen is effective only if the patient is breathing. You will need to monitor the patient's vital signs. Be prepared to perform cardiopulmonary resuscitation (CPR), if necessary.

Antihistamines (Benadryl) and corticosteroids (Solu-Cortef) are usually prescribed as follow-up treatment.

### **605. Drug related emergencies**

Drug related emergencies arise from unforeseen circumstances caused by reactions to certain drugs or medications. In this lesson, we have grouped these reactions into the following categories:

- Toxic reactions.
- Anesthetic reactions.
- Penicillin reactions.
- Angioneurotic edema.

#### **Toxic reactions**

Toxic reactions usually result from an overdose (or excessive amount) of a drug. They take place because a concentration of the drug in the patient's blood stream impedes respiration or circulation. These reactions are caused by administering too much of the drug or administering it too quickly. The dentist should diagnose and treat toxic reactions. The proper emergency treatment is to place the patient in the supine position and administer oxygen.

#### **Anesthetic reactions**

There are three types of reaction to local anesthetics:

1. Allergic reaction.
2. Toxic reaction.
3. Hypersensitivity.

#### ***Allergic reactions***

The most common allergic reaction to local anesthetics is a rash, swelling, or redness. The rash appears on other parts of the body, such as the arms. The swelling and redness are usually found around the area of injection. These reactions usually occur soon after the injection, though swelling may occur at the injection site from 12 to 24 hours later.

The anaphylactic (allergic) shock is the least common of the reactions from a local anesthetic. This reaction is characterized by a sudden circulatory or respiratory collapse. The blood pressure drops and respiration is impaired. The dentist usually treats this type of reaction with an intramuscular injection of 1:1,000 epinephrine. Administer oxygen under pressure or by mouth-to-mouth resuscitation. An antihistamine drug may also be given. The dentist should treat these reactions. In mild cases, oral

antihistamines may be given. In the more severe cases, injections of epinephrine or antihistamine may be given.

### ***Toxic reactions***

Toxic reactions are the result of an overdose of local anesthetic. You have studied this type of reaction earlier. In dentistry, a toxic reaction to a local anesthetic is usually the result of injecting the solution directly into a blood vessel or administering too many carpules of local anesthetic. Oxygen should be administered.

### ***Hypersensitivity***

Some patients are hypersensitive to local anesthetics. These patients develop all of the symptoms of a toxic reaction, even when they receive only a minimal amount of the drug. The diagnoses and treatments are the same as for toxic reactions discussed earlier. Oxygen should be administered.

### **Penicillin reactions**

There are two types of reactions to penicillin: immediate or anaphylactic and delayed or serum sickness.

#### ***Immediate or anaphylactic***

This type of reaction occurs within minutes to several hours after administration.

#### ***Delayed or serum sickness***

This type of reaction occurs several days to two weeks after administration. It is characterized by urticaria, angioneurotic edema, fever, pain in the joints, and swelling.

**NOTE:** Penicillin injections should not be given in the dental clinic. The dentist should prescribe oral penicillin, if conditions permit. If this is not possible, injections should be given in the hospital emergency room.

### **Angioneurotic edema**

This is a form of giant urticaria (hives), characterized by localized painless swelling of subcutaneous tissue in various parts of the body. It could also appear in the mouth. The reaction is an allergic response to food, drugs, infections, or emotional stress. This reaction is common in patients with a history of allergies. It is also caused by trauma. Angioneurotic edema must be treated by the doctor with an antihistamine drug, such as Benadryl.

## **606. Respiratory emergencies**

When a dental patient experiences problems breathing, determine the cause as soon as possible. This is essential so that management and treatment can begin quickly. A patient deprived of oxygen over a period of several minutes could result in serious consequences. The following are respiratory emergencies you must be prepared for in the dental environment:

- Hyperventilation.
- Asthmatic conditions.
- Airway obstructions.
- Pulmonary arrest.

### **Hyperventilation**

This condition is not uncommon as an emergency in the dental environment. Hyperventilation occurs as a result of fear, acute anxiety, or disease. A decrease in the concentration of carbon dioxide in lungs causes a rise in blood alkalinity, resulting in constriction of the blood vessels in the cerebrum. This condition may lead to syncope, or at least an impaired consciousness.

Patients who exhibit acute anxiety toward dentistry can often be detected before starting treatment. They may be overly concerned about the activity around them and even hold on tightly to the arms of the dental chair. The primary sign of hyperventilation a patient may exhibit is excessive, rapid

respiration, or overbreathing. The patient may complain of a feeling of tightness in the chest, tingling or numbness in the hands or feet, and light-headedness, dizziness, or faintness. The patient may also demonstrate an increased level of apprehension, perspire profusely, and complain that the room is very warm.

Prevention is the first step toward managing hyperventilation. Begin by reducing the stress level in the dental environment as low as possible. When hyperventilation does occur, terminate the dental treatment as soon as possible. Reassure the patient and remove any visual cues from sight that may be upsetting the patient. Position the patient upright in the dental chair. Increase the carbon dioxide in the patient's blood by having the patient breathe into a paper bag or full face mask. Do not administer oxygen.

### **Asthma**

This condition has both child and adult classifications. A patient may exhibit both chronic and acute attacks and may have one or several triggers that cause flare-ups. Common to all asthmatics is a clinical state of hyperactivity of the tracheobronchial components of the respiratory system.

The typical asthmatic attack is manifested by a feeling of tightness in the chest, shortness of breath, coughing, wheezing, and sputum production that is above normal. All of these initial signs and symptoms intensify as the attack continues. Extreme labored breathing and apprehension are apparent. Over a long and severe asthmatic attack, the patient may become cyanotic, perspire profusely, and demonstrate extreme fatigue and mental confusion.

In case of an acute attack, stop the dental procedure immediately and position the patient upright. Allow the patient to use a bronchodilator, which most patients who suffer from these attacks carry with them. Bronchodilator drugs most commonly used are epinephrine, isoproterenol, or metaproterenol. These drugs act primarily as a smooth muscle relaxant to produce bronchial dilation. Bronchodilators often give relief of the signs and symptoms within seconds, although sometimes they do not last a long time. Oxygen administration is also appropriate during acute asthmatic attacks.

When an asthmatic attack does not respond with normal treatment procedures, administration of 0.3 ml of epinephrine intramuscularly is indicated and should be repeated every 30 minutes, if needed. Call for medical assistance in a severe attack.

### **Airway obstruction**

Items such as small castings, rubber dam clamps, and endodontic instruments, are just a few of the items that may be aspirated. In most situations, foreign bodies lost in the pharynx will either be swallowed and enter the esophagus, or the patient may expel the item by coughing it up. In this case, the airway is only partially obstructed for a short time, and an acute condition is not created.

Patients receiving dental treatment in a supine position are more susceptible to the following two types of air way obstruction: partial and complete.

#### ***Partial***

If the patient with a partially obstructed airway is conscious, a range of poor-to-good air exchange could exist. If the patient is able to cough, do not interfere. Coughing aids in the removal of the object and indicates good air exchange. As the condition progresses from fair to worse, the normal cough reaction may become weak and ineffective. A high-pitched noise heard when the patient tries to inhale indicates extreme respiratory difficulty. Manage partial obstructions with poor air exchange as a complete obstruction.

The treatment of the partially obstructed airway usually begins with the recognition of an airway problem, that is characterized by a wheeze or cough and excited activity. If the patient is in the supine position, maintain the position and lower his or her head even more. Gravity may assist with the recovery of the object. Do not allow the patient to sit up if the object has progressed into the trachea. With the patient lying down in the head-down position, turn the patient to his or her right side.



Encourage the patient to cough, if it does not occur spontaneously. If the patient cannot cough and begins to express panic, assistance may be necessary. The recommended procedure for partial obstructions with poor air exchange and complete obstructions is the *Heimlich maneuver*. This technique uses forceful upward compressions on the diaphragm to force residual air from the lungs through the obstructed airway in sufficient quantity to dislodge or expel the object. This noninvasive technique is taught in ancillary training as part of the basic life support course required for healthcare workers.

If the object causing the obstruction is dislodged from the airway, but not expelled where it can be retrieved, it is possible that the patient has swallowed or aspirated the object. In either case, additional treatment may be required.

If the object is swallowed and enters the esophagus and gastrointestinal tract, treatment for the patient may include medical evaluation, x-rays, and followup to ensure the object has passed. Potential problems that the patient may experience include intestinal blockage, intestinal abscess, perforated intestine, and peritonitis (inflammation of the membrane lining the walls of the abdominal cavity).

If the object is aspirated into the trachea and bronchi (lung), treatment for the patient may include medical assistance and evaluation, x-rays, and hospitalization for removal. Potential problems the patient may experience include infection, lung abscess, pneumonia, and atelectasis (collapse of the lung).

### ***Complete***

In a complete airway obstruction, the aspirated item is usually resting in a position where it cannot be easily seen. If this is determined to be the problem, then you must be able to respond to the condition, which may quickly become a life-threatening situation.

A patient who cannot speak, breath, or cough characterizes complete air obstruction of a conscious patient. The patient may be observed clutching the throat, which is a universal distress signal. With complete obstruction, oxygen saturation in the blood will decrease rapidly, resulting in brain oxygen deficit and unconsciousness. Death will follow if prompt action is not started.

An invasive emergency technique is the cricothyrotomy procedure. The purpose of this procedure is to open the airway at a point below the obstruction. This procedure is performed only by trained individuals on an unconscious patient. Proper equipment must be available.

### **Pulmonary arrest**

The patient in pulmonary arrest has ceased breathing and emergency artificial ventilation must be started immediately. Artificial ventilation, also known as *artificial respiration*, is breathing that is artificially maintained by one individual for another through the forced exchange of air in the lungs.

The rescuer's exhaled air in artificial ventilation provides about 16 percent oxygen. If the patient's other vital systems are functioning, this is enough oxygen to sustain life. Mouth-to-mouth, mouth-to-nose, and an artificial airway are techniques to establish artificial ventilation. These techniques are learned in the required ancillary training and certification of basic life support for health care workers.

## **607. Cardiovascular emergencies**

The time required to start emergency care for a patient with cardiovascular problems often may be directly related to the chances of survival. CPR is a widespread technique of management for patients with emergency heart problems. All dental healthcare workers must be certified in basic life support on a routine basis. You will review the current procedures for performing cardiopulmonary resuscitation and emergency cardiac care through ancillary training.

The three most prevalent cardiovascular emergencies likely to occur in the dental environment are angina pectoris, myocardial infarction, and cardiac arrest.

**Angina pectoris**

Angina pectoris is a condition caused by a decreased blood flow to the heart muscle as a result of a narrowing of the coronary artery. The condition can be brought on by physical exertion or emotional stress, such as excitement and anxiety.

**Symptoms**

The constricting blood flow causes mild to severe pain in the chest that radiates to the left arm. The patient may express a burning or pressing, or extreme tightness in the chest. The signs and symptoms also include shortness of breath, extreme anxiety, and a concern of the patient to remain sitting up. An elevated blood pressure and rapid heart rate can be expected with angina.

**Treatment**

The patient experiencing angina will be more comfortable sitting upright at a 45-degree angle. Administer nitroglycerin (a vasodilator) sublingually. When placed under the patient's tongue, the medication is absorbed through the mucous membrane on the floor of the mouth. One to three nitroglycerin tablets is the usual dose. The angina and the pain could be relieved within three to five minutes. Oxygen may be administered in addition to the nitroglycerin.

**NOTE:** If the patient is wearing a transdermal form of nitroglycerin, the administration of additional nitroglycerin is not usually recommended.

In acute episodes when nitroglycerin does not give prompt relief, an ampule of amyl nitrate may be crushed and held so the patient can inhale the vapors. This therapy may produce relief in a matter of seconds. If the pain persists beyond 10 minutes and three doses of nitroglycerin, call for emergency medical help.

**Myocardial infarction**

The heart has three main arterial vessels that supply the heart muscle with oxygen and other life-sustaining nutrients. If one or more of these arteries becomes blocked, the coronary artery flow to some portion of the heart muscle is stopped. The affected muscle dies from lack of oxygen. This condition is a myocardial infarction, also known as a *heart attack*.

**Symptoms**

The symptoms are similar to those of angina pectoris, but the pain is more crushing and is not relieved by nitroglycerin. The signs and symptoms include the following:

- Apprehension, anxiety, or restlessness.
- Extreme tightness and severe pain in the chest.
- Shortness of breath.
- Profuse perspiration.
- Nausea and vomiting.

At onset, the pain is usually located at the sternum and left arm, and radiates to the neck and left side of the chest. It may remain in the chest or back or even travel to the left jaw. The patient may also complain of extreme chest pain, as though being held in a viselike apparatus which is pressing on his or her chest, impeding breathing.

**Treatment**

Immediate emergency treatment is essential to prevent further damage and possibly death for the patient experiencing a myocardial infarction. Treatment includes the following:

- Administering oxygen.
- Maintaining the patient at rest in an upright position.

- Monitoring vital signs.
- Immediately calling a physician.

Reassure the patient in quiet tones and loosen his or her tight clothing. Oxygen and reassurance will cause the patient to be more relaxed and comfortable, which in turn will lower anxiety. Oxygen will benefit the cells of the entire body, including those of the brain and heart. Stay with the patient; do not walk away. The dentist or physician may administer intramuscular or intravenous drugs to relieve pain. CPR may be required.

### **Cardiac arrest**

Cardiac arrest is the sudden stop of effective heart muscle contraction. This condition can occur spontaneously and without prior warning even in individuals with no suspected heart problems. Cardiac arrest is often referred to as *sudden death*. It can occur at any time, at any age.

### ***Causes***

Cardiac arrest can be caused by any of the following:

- A myocardial infarction.
- An airway obstruction.
- A drug overdose.
- Anaphylaxis.
- Seizure disorders.
- Other reasons.

### ***General types***

There are three general types of cardiac arrest:

1. Ventricular standstill asystole (no heartbeat).
2. Ventricular fibrillation (erratic heartbeat).
3. Cardiovascular collapse (no pulse, no blood pressure).

### ***Symptoms***

The onset of cardiac arrest could take on the signs and symptoms of acute myocardial infarction, since this condition is often the prelude to cardiac arrest. At the onset of an arrest, a sudden loss of consciousness will occur. Respiration may slow rapidly and then cease. Blood pressure and pulse are absent. Profuse sweating appears and complete dilation of the pupils occurs in one minute.

### ***Treatment***

In cardiac arrest, both the circulatory and respiratory functions shut down completely; thus time is of the essence. If treatment is not rendered quickly, the oxygen level will drop rapidly in the tissues and leads to biological death. The brain cells, the most sensitive tissue in the body, will be irreversibly damaged after four to six minutes without oxygen. If the heart can be forced to beat and the patient forced to breathe, the blood can be forced to circulate, and the brain and other tissues will receive their necessary supply of oxygenated blood.

The aim of treatment is to restore circulation. In the dental environment, the method of choice is CPR, where a heartbeat and respiration are created for the patient through external cardiac compression and ventilation. Activation of the Emergency Medical System (EMS) must also take place immediately.

**NOTE:** All dental health care providers must complete a course in CPR. The American Heart Association recommends level C certification for health care providers and routine recertification.

### **Congestive heart failure**

In this disorder, the left ventricle of the heart does not contract with enough force to support adequate circulation. When this happens, the blood backs up into the air sacs of the lungs and into the right

ventricle of the heart. The right ventricle does not force blood into the lungs, and oxygen is not passed through the lungs into the blood. This situation causes accumulation of fluid in the lungs.

### ***Symptoms***

Symptoms include undue fatigue, weakness, coughing, and acute respiratory stress from pulmonary edema, resulting in short, labored breathing. The patient may not tolerate a supine position and appears gray or cyanotic in color.

### ***Treatment***

Call for help immediately. Position the patient in an upright position and administer oxygen. Reassure the patient and monitor the vital signs until emergency assistance arrives.

## **608. Other medical emergencies**

A number of medical emergencies can arise when the patient suffers from diseases, including diabetes mellitus, epilepsy and cerebrovascular accident (CVA).

### **Diabetes mellitus**

This is a disease in which the patient is unable to metabolize sugar normally. Diabetes is controlled by a diet of low sugar intake (carbohydrates), pills, or daily injections of insulin. A physician regulates the individual's insulin need. The patient must follow the prescribed routine of diet and medication. If the prescribed routine for diabetes is not followed, severe conditions may occur in the patient's health. When this happens in the dental environment, emergency care becomes necessary. As it applies to diabetes mellitus, you may be faced with managing emergencies that arise from hyperglycemia and hypoglycemia.

### ***Hyperglycemia***

This is a condition that results from a decreased availability of insulin leading to elevated levels of glucose in the blood. Hyperglycemia may be precipitated by rapid weight gain, reduction of exercise, acute infection, and fever. Any of these factors would result in an increased insulin requirement. The patient ingesting too much sugar, or simply not taking the prescribed insulin could also cause insufficient insulin.

### ***Symptoms***

A patient experiencing hyperglycemia may complain of a dry mouth, fatigue, headache, blurred vision, nausea, and vomiting. The patient's skin may appear flushed, hot, and dry. The patient's breath may have a sweet, fruity odor referred to as *acetone breath*. Vital signs will show a rapid, weak pulse rate and lowered blood pressure. Ask when the patient ate last and if the prescribed insulin was taken. The patient may become unresponsive to questions and become unconscious. Loss of consciousness during hyperglycemia is defined as a *diabetic coma*. A diabetic coma will not have a rapid onset; instead, it may take hours or days of neglect by the known diabetic patient for unconsciousness to occur. If a diabetic coma is present, the patient probably ate, but did not take the prescribed insulin.

### ***Treatment***

When a diabetic coma occurs (hyperglycemia—too much blood sugar) the patient needs insulin and other medication to reverse this condition.

### ***Hypoglycemia***

This is a condition that results from an overabundance of insulin in the system, characterized by low levels of glucose in the blood. Hypoglycemia is a condition that can present a rapid onset. Some factors that reduce the body's insulin requirements are weight loss, increased physical exercise, termination of prescribed drug therapies, and recovery from an illness. The most common cause of hypoglycemia is missing regular meals.

Hypoglycemia is the most acute condition of diabetes mellitus, and an unconscious state, defined as *insulin shock*, could occur. If insulin shock is present, the patient has probably taken insulin but has

not eaten. When too much insulin and too little food are taken into the body, the blood is rich in insulin and the sugar supply to the brain tissue drops, and unconsciousness or insulin shock follows.

#### *Symptoms*

Disorientation, confusion, or a change in a patient's mood, such as irritability, aggressiveness, or increased anxiety, may be early signs or symptoms of hypoglycemia. The patient may complain of hunger and nausea. As the condition progresses, the skin becomes cold and clammy to the touch. The patient may experience tachycardia (rapid cardiac rate) and become uncooperative. Unconsciousness and insulin shock could occur along with seizure activity.

#### *Treatment*

For the conscious patient, administering sugar, candy, orange juice, cola beverage, or other sugar-containing foods can reverse the process. For the unconscious patient, intramuscular administration of glucose or intravenous administration of dextrose in a 50 percent concentration is indicated by the dentist or physician. If the patient has lost consciousness and you are not sure whether the patient is suffering from diabetic coma or insulin shock, try placing a sugar cube under his or her tongue. If the condition is insulin shock, the response to glucose should be immediate. The hyperglycemic patient will not improve with glucose.

**NOTE:** Hypoglycemic can occur in patients who do not have diabetes. It is commonly referred to as *low blood sugar*. Patients who skip meals before dental treatment and are anxious about the treatment could experience a drop in the blood glucose level. Alcoholics suffer from hypoglycemic because of a lack of stored glycogen in the liver and poor nutrition.

### **Epilepsy**

Epilepsy is a neurological disorder usually characterized by involuntary convulsions of the muscular system called seizures. Most patients with a past history of seizures are on medication to control the convulsions; however, they could still occur. Psychologic stress and fatigue tend to precipitate the onset of a seizure. Some seizures are characterized by an observable change or altered emotional state in the individual. An increase in the anxiety level or depression may occur. This may be difficult for the dental staff to recognize because the change can occur hours before the convulsive stage and the start of dental treatment. At times, the convulsive seizures may be accompanied by loss of consciousness.

Epileptic seizures are generally categorized into two general types: *petit mal* and *grand mal*.

#### ***Petit mal***

These seizures are mild and of brief duration, similar to a short faint. A *petit mal* patient may have brief periods of staring into space.

#### ***Grand mal***

These seizures are much more severe. There could be a possible loss of consciousness followed by violent contractions of the muscles caused by stimulation to the brain cells controlling the muscular system. These seizures may last from two to five minutes.

#### *Symptoms*

Soon after the presence of a seizure, the patient may lose consciousness, and his or her arms and legs become rigid because of muscular contractions and relaxations. This is the actual convulsive stage of the seizure. Oral frothing and bleeding, caused by the patient's jaws closing on the tongue or cheek during the convulsion, can occur. The acute convulsive stage should last no longer than five minutes. Urinary and fecal incontinence may occur as the muscles return to their relaxed state. When consciousness is regained, the patient may experience a headache, muscle soreness, become disoriented, and relapse into a deep sleep.

### *Treatment*

Treatment is to protect the patient from self-injury during the muscle contractions. If a seizure begins while the patient is seated in the dental chair, do not attempt to move the patient to the floor. Instead, adjust the dental chair so that the patient is in a supine position. Move all possible dental equipment away from the patient to protect him or her from self-injury.

Maintaining an airway and monitoring vital signs, especially respiration, is the prime concern in management of the patient. Loosen any tight, binding clothing. Once a seizure begins, do not place any object, such as a heavily padded tongue depressor, between the patient's teeth to prevent biting the tongue. The only exception to this would be if the patient sensed a pending seizure, and the tongue depressor could be placed prior to the seizure. By attempting to place a padded tongue blade in the patient's mouth after a seizure starts, you could inflict damage to the patient's teeth and the soft tissues of the oral cavity.

After the convulsions end, administer oxygen and monitor the patient closely. In cases where the convulsive state of the seizure lasts longer than five minutes, the dentist should administer an anticonvulsant drug. Either diazepam (Valium) or pentobarbital (Nembutal), administered intravenously, is effective.

When a seizure patient regains consciousness, he or she will be fatigued and need rest. Do not question the patient. Keep the patient warm and away from onlookers, and attempt to maintain a free airway.

### **Cerebrovascular accident**

A CVA or *stroke* is a sudden interruption of the blood supply to the brain, resulting in damage to part of the brain. It can be caused by any of the following:

- Spontaneous rupturing of the arteries that supply blood to the brain.
- A clot that forms in the artery (thrombosis).
- An embolus that forms elsewhere and travels to an artery in the brain causing a blockage.

### **Symptoms**

Patients experiencing a stroke may exhibit the following eight signs and symptoms:

1. Flushed appearance and pounding pulse.
2. Intense headache.
3. Dizziness and confusion as to surroundings.
4. Nausea and vomiting.
5. Numbness or paralysis of speech and extremities.
6. Convulsions.
7. Loss of consciousness or coma.
8. Loss of control of body functions.

### **Treatment**

Place the patient in a semi-erect position, alert the dentist, and call a physician immediately. Monitor the patient's vital signs and, if necessary, administer oxygen. The patient may be conscious and aware of his or her surroundings, but unable to talk. Therefore, be as calm as possible, reassure the patient, and make him or her comfortable.

## Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

### 604. Shock recognition and treatment

1. What is shock? Shock is caused by what?
2. List the vital signs of a patient who is experiencing shock.
3. What is syncope? What are the signs and symptoms?
4. Briefly describe the treatment for syncope.
5. What causes postural hypotension? What are the signs and symptoms?
6. What is the treatment for postural hypotension? How can it be prevented?
7. Briefly describe how psychogenic shock occurs.
8. What is anaphylactic shock?
9. What may stimulate allergic responses in an individual?
10. What is the treatment for anaphylactic shock?

### 605. Drug related emergencies

1. What causes toxic reactions to drugs?
2. What is the most common allergic reaction to local anesthetics?
3. Describe the characteristics of anaphylactic shock.

4. What are the usual causes of a toxic reaction to a local anesthetic?
5. Briefly explain what is meant by hypersensitivity to local anesthetics.
6. What are the two types of reactions to penicillin, and when does each occur?
7. What is angioneurotic edema?

**606. Respiratory emergencies**

1. What is the primary sign of hyperventilation?
2. What is the treatment for hyperventilation?
3. What is the treatment for a dental patient experiencing an acute asthma attack?
4. What is indicated when an asthmatic attack does not respond with normal treatment procedures?
5. In most situations, what occurs when foreign bodies are lost in the pharynx?
6. What assistance should you provide if a patient is conscious with a partially obstructed airway and is able to cough effectively?
7. What is indicated when you hear a high-pitched noise when the patient tries to inhale?
8. How should partial obstructions with poor exchange be managed?
9. What should you do if a patient in the supine position has a partially obstructed airway?



10. What is the recommended procedure for partial obstructions with poor air exchange and complete obstructions?
11. What invasive emergency technique opens the airway at a point below the obstruction and is performed only by trained individuals?
12. What may treatment include if an object is swallowed and enters the esophagus and gastrointestinal tract?
13. What is the treatment if an object is aspirated into the trachea and bronchi?
14. What has happened to the patient in pulmonary arrest?
15. What is artificial ventilation? What percentage of oxygen does artificial ventilation provide?

**607. Cardiovascular emergencies**

1. What is angina pectoris?
2. How should a patient experiencing angina be positioned?
3. What is the treatment for the angina patient?
4. What can be used in acute episodes of angina pectoris when nitroglycerin does not give prompt relief? When is a call for emergency medical help necessary?
5. What is a myocardial infarction? What is another name for this condition?
6. Describe the treatment for a myocardial infarction.
7. What is cardiac arrest? What is another name for this condition?

8. After what length of time will brain cells be irreversibly damaged without oxygen?
9. What is the treatment of choice in the dental environment for cardiac arrest?
10. Explain how congestive heart failure occurs.
11. What is the treatment for congestive failure?

**608. Other medical emergencies**

1. What is diabetes mellitus?
2. What is hyperglycemia? What factors would result in an increased insulin requirement?
3. What is a diabetic coma? How long is the onset of a diabetic coma?
4. What has probably occurred if a patient goes into a diabetic coma?
5. What is hypoglycemia? How long is the onset?
6. What is the most common cause of hypoglycemia?
7. What is insulin shock? What has probably happened with a patient in insulin shock?
8. What is the treatment for the conscious patient experiencing hypoglycemia? What is it for the unconscious patient?
9. What should you do if the patient has lost consciousness and you are not sure whether he or she is suffering from a diabetic coma or insulin shock?

10. What is epilepsy?
11. Name and describe the two general types of epileptic seizures.
12. How long should the acute convulsive stage last? What is the treatment if it lasts longer?
13. Briefly state the treatment for a patient experiencing a seizure.
14. What is a cerebrovascular accident? What other term is used for this condition?
15. How do you treat a patient experiencing a CVA?

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### Answers to Self-Test Questions

#### 601

1. As soon as possible. Never.
2. These conditions may require supportive breathing from a mechanical source or other prompt actions to maintain life.
3. The swallowing mechanism is not efficient and it is of the utmost importance to maintain a patient's airway and, at the same time, prevent aspiration of liquids.
4. First, asphyxiation; second, hemorrhage; third, shock.
5. By making sure emergency routines are well established and practiced enough to meet the emergency needs whenever they arise.
6. In an area readily accessible at all times.
7. Relatively compact and easily identified with all items in the kit labeled or tagged with information pertinent to their use.
8. Items with a dated shelf life, such as medications and sterile instruments.
9. The administration of oxygen.
10. Generally, 2 or 3 ml syringes and needles for intramuscular and intravenous injections; scalpel and disposable blade; needles and suture material; rubber tubing or tourniquet; a cricothyrotomy needle; oropharyngeal airway; hemostats; and sterile gauze sponges.
11. (1) g, (2) b, (3) c, (4) a, (5) d, (6) e, (7) f.

#### 602

1. Always green.
2. Cylinder valve.
3. When it is open, it registers the amount of oxygen remaining in the cylinder.
4. Regulator control adjust handle.
5. Amount of oxygen administered.
6. The regulator control adjust handle.

7. A minimum of 6 liters per minute, and can be increased to 8–10 liters per minute for an adult.
8. The movement of the patient's chest.
9. An ambu-bag or air-bird. Applying intermittent pressure to the bag at the rate of 14 to 16 respirations per minute until normal breathing is restored.
10. The condition of the mask, hoses, regulators, and amount of oxygen remaining in the cylinder.
11. When the oxygen is registering below 500 psi or when the manufacturer's low level is reached.
12. Never.

**603**

1. The body's response to its environment, or how well the body is carrying out the essential activities of living.
2. It should be noted on the patient's AF Form 696.
3. Oral, rectal, axillary, and tympanic.
4. Turn the unit on by removing the probe from the storage well. Insert the probe into a disposable cover and place the probe tip into the patient's mouth under the front of the tongue. Hold the probe and keep the tip in contact with the tissue at all times. Do not allow the patient to reposition the probe. A tone will sound and the patient's temperature will be displayed.
5. The periodic expansion of arteries caused by blood forced through them with each contraction of the heart.
6. Rhythm, force, and rate.
7. In adults from 60 to 80 heartbeats per minute, and in children from 80 to 100 beats per minute.
8. The radial artery on the inner surface of the wrist (thumb side).
9. Use a watch with a second hand. Place the index and third fingers lightly on the area between the tendons. Never use the thumb. Count the pulse for 15 seconds and multiply by four. Note the rate rhythm, and force. If the pulse is irregular, count the beats for a full minute.
10. The inhalation and exhalation of air.
11. Approximately 17 breaths per minute.
12. The breathing rate will be rapid, shallow, and labored.
13. Respiration rates will be most accurate if patients think you are still taking their pulse. Use a watch with second hand to observe the rise and fall of the chest or abdomen (as one count) for 15 seconds. Multiply this by 4 and record on the appropriate forms. If the respirations are irregular, you must count a full minute for an accurate rate.
14. The force of the blood exerted against the walls of the arteries.
15. Systolic pressure is the highest pressure exerted on the circulatory system by the contraction of the left ventricle of the heart, which forces the blood out into the circulatory system. Diastolic is the lowest pressure of the circulatory system, which occurs momentarily when the heart muscle rests and takes in more blood prior to the next contraction.
16. The adult male systolic pressure ranges from 110 to 120 mm Hg, and diastolic pressure from 70 to 80 mm Hg. In the normal female, systolic pressure ranges from 100 to 110 mm Hg and diastolic pressure from 60 to 70 mm Hg.
17. The pulse pressure indicates the volume of blood the heart forces into the aorta during each contraction.
18. BP 132/74 R sitting.
19. When it is above 150/95. Hypotension or low blood pressure.
20. The patient should be reclined in a supine position or seated upright in the dental chair. Position the patient's right or left arm at heart level with the palm facing upward.
21. At the inner aspect of the elbow.
22. Place the blood pressure cuff with the "bladder" on the inner arm area near the brachial artery, approximately 1 to 2 inches above the elbow. Place the cuff so that the gauge of the sphygmomanometer faces you.
23. Place the fingertips on the radial artery near the thumb side of the inner wrist. Inflate the cuff until you can no longer feel the pulse. Then inflate the cuff an additional 30 mm Hg beyond the point at which you last felt the pulse.

24. Over the brachial artery at the inner area of the elbow on the upper arm.
25. The systolic pressure.
26. Near the point where the radial pulse disappeared.
27. The registration when the last sound of the heartbeat is heard.
28. A regular outline and each pupil is the same in size. Pupils to constrict when exposed to light and dilate when exposed to darkness.
29. Brain damage from trauma or a stroke.
30. Disease or dysfunction of the central nervous system or drug addiction.
31. Cardiac arrest.
32. Widely dilated with no response to light.

**604**

1. A condition that alters the normal flow of blood through the vascular system. Damage to the heart, sudden loss of a quantity of blood through hemorrhaging, and dilation of the vessels of certain regions of the body.
2. (1) Rapid but weak pulse.  
(2) Shallow, labored, and rapid respiration.  
(3) Eyes appearing dull or lusterless, and dilated pupils.  
(4) Drop in blood pressure.
3. A temporary loss of consciousness caused by insufficient blood to the brain. Pallor, clamminess, rapid but weak pulse, and decreased blood pressure.
4. Place the patient in a supine position with patient's feet elevated to a position higher than the head. Place a cool cloth on patient's forehead, or back of the neck. Prepare an ammonia inhalant and oxygen for use. Monitor pulse rate and blood pressure. Call for help if the condition does not improve. If the patient loses consciousness, break the ammonia inhalant and waft gently under the patient's nostrils. Oxygen can be administered.
5. When a patient has been in a supine position during treatment for a prolonged time and is abruptly returned to an upright position. Blood pressure usually very low, patient may lose consciousness or merely feel lightheaded or extremely dizzy, appear disoriented, or experience blurred vision.
6. Return the patient to the supine position, ensure an open airway is maintained, and monitor the patient's vital signs. It may be necessary to administer oxygen. When the patient begins to appear normal; return the patient to the upright position slowly with stops at various levels. Return your patients to the upright position very slowly.
7. The nervous system reacts to a stimulus of fright, fear, or pain and causes a temporary reduction of the blood supply to the brain. A momentary vascular dilation causes the blood to pool in the dilated vessels and the patient faints.
8. The most severe, allergic reaction of the body to a foreign protein substance in the blood.
9. Sensitivity to certain foods, the administration of a medication, or sting or bite of an insect.
10. Place the patient in a supine position and call for help immediately. Prepare epinephrine of 1:1,000, in a dosage of 0.3 to 0.5 ml, to be administered intramuscularly. If the reaction is severe, an additional dose may be administered. Oxygen will relieve the patient's distress and should be administered along with the antiallergic drug.

**605**

1. Administering too much of the drug or administering it too fast.
2. A rash, swelling, or redness.
3. A sudden circulatory or respiratory collapse. The blood pressure drops and respiration is impaired.
4. Injecting the solution directly into a blood vessel or administering too many carpules of local anesthetic.
5. Patients develop all of the symptoms of a toxic reaction, even when they receive only a minimal amount of the drug.
6. Immediate or anaphylactic type, which occurs within minutes to several hours after administration. Delayed or serum sickness type of reaction which occurs several days to 2 weeks after administration.

7. A form of giant urticaria (hives), characterized by localized painless swelling of subcutaneous tissue in various parts of the body.

**606**

1. Excessive, rapid respiration, or overbreathing.
2. Terminate the dental treatment as soon as possible. Reassure the patient and remove any visual cues from sight that may be upsetting the patient. Position the patient upright in the dental chair. Increase the carbon dioxide in the patient's blood by having the patient breathe into a paper bag or full face mask. Do not administer oxygen.
3. Stop the dental procedure immediately and position the patient upright. Allow the patient to use a bronchodilator. Oxygen administration is also appropriate during acute asthmatic attacks.
4. Administration of 0.3 ml of epinephrine intramuscularly is indicated, and should be repeated every 30 minutes if needed. Call for medical assistance in a severe attack.
5. They are either swallowed and enter the esophagus, or the patient may expel the item by coughing it up.
6. None, do not interfere.
7. Extreme respiratory difficulty.
8. As a complete obstruction.
9. Maintain the position and lower the head even more. In the head-down position, turn the patient to the right side. Encourage the patient to cough, if it does not occur spontaneously. Do not allow the patient to sit up if the object has progressed into the trachea.
10. The Heimlich maneuver.
11. The cricothyrotomy procedure.
12. Medical evaluation, x-rays, and followup to ensure the object has passed.
13. Medical assistance and evaluation, x-rays, and hospitalization for removal.
14. The patient has ceased breathing and requires emergency artificial ventilation immediately.
15. Breathing that is artificially maintained by one individual for another through the forced exchange of air in the lungs. 16 percent.

**607**

1. A condition caused by a decreased blood flow to the heart muscle as a result of a narrowing of the coronary artery.
2. Sitting upright at a 45-degree angle.
3. One to three nitroglycerin tablets administered sublingually. Oxygen may be administered in addition to the nitroglycerin.
4. An ampule of amyl nitrate crushed and held so the patient can inhale the vapors. If the pain persists beyond 10 minutes and 3 doses of nitroglycerin.
5. One or more of the three main arterial vessels that supply the heart muscle with oxygen and other life-sustaining nutrients becomes blocked stopping the coronary artery flow to some portion of the heart muscle causing the affected muscle to die from lack of oxygen. Heart attack.
6. Administering oxygen, maintaining the patient at rest in an upright position, monitoring vital signs, and calling a physician immediately. Reassure the patient in quiet tones and loosen the patient's tight clothing. Intramuscular or intravenous drugs to relieve pain may be administered by the dentist or physician. CPR may be required.
7. The sudden stop of effective heart muscle contraction that can occur spontaneously and without prior warning even in individuals with no suspected heart problems. Sudden death.
8. 4 to 6 minutes.
9. Restore circulation with CPR.
10. The left ventricle of the heart does not contract with enough force to support adequate circulation, causing the blood to back up into the air sacs of the lungs and into the right ventricle of the heart. The right ventricle does not force blood into the lungs, and oxygen is not passed through the lungs into the blood causing accumulation of fluid in the lungs.

11. Call for help immediately. Position the patient in an upright position and administer oxygen. Reassure the patient and monitor the vital signs until emergency assistance arrives.

**608**

1. A disease in which the patient is unable to metabolize sugar normally.
2. A condition that results from the decreased availability of insulin leading to elevated levels of glucose in the blood. Rapid weight gain, reduction of exercise, acute infection, fever, ingesting too much sugar, or simply not taking the prescribed insulin.
3. A loss of consciousness during hyperglycemia. A diabetic coma will not have a rapid onset. It could take hours or days of neglect.
4. The patient probably ate but did not take the prescribed insulin.
5. A condition that results from an overabundance of insulin in the system, characterized by low levels of glucose in the blood. May present a rapid onset.
6. Missing regular meals.
7. Hypoglycemia in an unconscious state. The patient has probably taken insulin but has not eaten.
8. Administering sugar, candy, orange juice, cola beverage, or other sugar-containing foods can reverse the process. Intramuscular administration of glucose or intravenous administration of dextrose in a 50 percent concentration is indicated by the dentist or physician.
9. Try placing a sugar cube under the patient's tongue. If the condition is insulin shock, the response to glucose should be immediate.
10. A neurological disorder usually characterized by involuntary convulsions of the muscular system which could be accompanied by loss of consciousness.
11. Petit mal seizures are mild and of brief duration, similar to a short faint. A petit mal patient may have brief periods of staring into space. Grand mal seizures are much more severe, with possible loss of consciousness followed by violent contractions of the muscles caused by stimulation to the brain cells controlling the muscular system. These seizures may last from 2 to 5 minutes.
12. No longer than 5 minutes. An anticonvulsant drug, either diazepam (Valium) or pentobarbital (Nembutal) should be administered intravenously by the dentist.
13. Primarily protect the patient from self-injury during the muscle contractions. If a seizure begins while the patient is seated in the dental chair, do not attempt to move the patient to the floor, place the patient in a supine position. Move all possible dental equipment away from the patient. Maintain an airway and monitoring vital signs, especially respiration. Loosen any tight, binding clothing. Do not place any object, such as a heavily padded tongue depressor, between the patient's teeth after the seizure begins.
14. A sudden interruption of the blood supply to the brain resulting in damage to part of the brain. Stroke.
15. Place the patient in a semi-erect position, alert the dentist and call a physician immediately. Monitor the patient's vital signs and administer oxygen, if necessary.

**Do the Unit Review Exercises (URE) before going to the next unit.**

## Unit Review Exercises

**Note to Student:** Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field Scoring Answer Sheet.

**Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).**

1. (601) Which is the *first thing* you would treat when remembering the order of treating injuries?
  - a. Shock.
  - b. Hemorrhage.
  - c. Asphyxiation.
  - d. Unconsciousness.
2. (601) Which dental emergency kit item is used as a mild stimulant for syncope?
  - a. Ammonia inhalant.
  - b. Ephedrine sulfate.
  - c. Pentobarbital.
  - d. Benadryl.
3. (601) How are the nitroglycerin tablets in the dental emergency kit used on patients?
  - a. As an antiallergic drug.
  - b. As a mild stimulant for syncope.
  - c. As a coronary dilator for angina pectoris.
  - d. When there is severe shock or an acute reaction to drugs.
4. (602) How is the amount of oxygen remaining in the cylinder registered?
  - a. Liter gauge.
  - b. Cylinder valve.
  - c. Pressure gauge.
  - d. Regulator control adjust handle.
5. (602) Masks for the oxygen equipment should be stored in
  - a. each DTR.
  - b. the oral surgery section only.
  - c. the medical supply section.
  - d. dental supply.
6. (602) When would you place the oral nasal mask over patient's mouth and nose?
  - a. Before adjusting oxygen flow.
  - b. After adjusting oxygen flow.
  - c. With use of the Ambu-bag.
  - d. Never.
7. (602) You should adjust the oxygen flow rate of the portable oxygen equipment to a *minimum* of 6 liters per minute. For an adult, this flow rate can be increased to
  - a. 2 to 4 liters per minute.
  - b. 4 to 6 liters per minute.
  - c. 6 to 8 liters per minute.
  - d. 8 to 10 liters per minute.



8. (603) The *normal* pulse rate for adults is
  - a. 80 to 100 heartbeats per minute.
  - b. 60 to 80 heartbeats per minute.
  - c. 50 to 80 heartbeats per minute.
  - d. 40 to 60 heartbeats per minute.
9. (603) The *most* commonly used site for taking pulse is at the
  - a. carotid artery, which is located below the angle of the mandible and to the side of the trachea.
  - b. radial artery, which is located on the inner surface of the wrist.
  - c. radial artery, which is located on the outer surface of the wrist.
  - d. carotid artery, which is located in the bend of the elbow.
10. (603) When counting a patient's respiration, you should
  - a. count the rise of the chest only.
  - b. count the fall of the chest only.
  - c. use the rise and fall of the chest as one respiration.
  - d. use the rise and fall of the chest as two respirations.
11. (603) The *normal* adult respiration rate for a relaxed person is
  - a. 15 breaths per minute.
  - b. 17 breaths per minute.
  - c. 19 breaths per minute.
  - d. 21 breaths per minute.
12. (603) Systolic pressure is *best* described as the
  - a. highest pressure exerted on the circulatory system.
  - b. lowest pressure exerted on the circulatory system.
  - c. normal adult respiration rate for a relaxed person.
  - d. heartbeat detected near the surface of the skin.
13. (603) The volume of blood the heart forces into the aorta during each contraction is indicated by the
  - a. circulatory pressure.
  - b. systolic pressure.
  - c. diastolic pressure.
  - d. pulse pressure.
14. (603) In death and near-death states, a patient's eye pupils will appear
  - a. constricted before light is directed into the eyes.
  - b. constricted when light is directed into the eyes.
  - c. dilated when light is directed into the eyes.
  - d. widely dilated, with no response to light.
15. (604) All are steps to take for syncope symptoms before giving oxygen and ammonia inhalant *except*
  - a. apply cool cloth to patient's forehead, or back of neck.
  - b. monitor pulse rate and blood pressure.
  - c. position in supine position.
  - d. elevate head.
16. (604) If your patient show signs of postural hypotension, your *first* action should be to
  - a. administer oxygen.
  - b. monitor vital signs.
  - c. apply cold compress to head and neck.
  - d. return patient to supine position.

17. (604) As a dental assistant, when do you prepare the sterile syringe for a patient experiencing anaphylactic shock?
  - a. At the request of the clinic commander.
  - b. At the request of the dentist present.
  - c. Upon receiving emergency kit.
  - d. After oxygen is administered.
18. (604) What drug may initially be administered intramuscularly for the treatment of anaphylactic shock?
  - a. Epinephrine of 1:10,000.
  - b. Epinephrine of 1:1,000.
  - c. Antihistamines.
  - d. Corticosteroids.
19. (605) What type of reaction is caused by administering too much of a drug or administering it too quickly?
  - a. Toxic.
  - b. Allergic.
  - c. Serum sickness.
  - d. Hypersensitivity.
20. (605) When a patient suffers from a toxic reaction, place patient in the supine position then
  - a. place ammonia inhalant under nose.
  - b. give Epinephrine 1:1,000.
  - c. monitor vital signs.
  - d. administer oxygen.
21. (605) What type of penicillin reaction is characterized by urticaria, angioneurotic edema, fever, pain in the joints, and swelling?
  - a. Delayed.
  - b. Immediate.
  - c. Anaphylactic.
  - d. Hypersensitivity.
22. (606) Excessive, rapid respiration or over breathing is the *primary* sign of
  - a. asthma.
  - b. hyperventilation.
  - c. pulmonary arrest.
  - d. an airway obstruction.
23. (606) Your patient has a partially obstructed airway and the object has progressed into the trachea. In this situation, you would
  - a. allow the patient to sit up.
  - b. position the patient in the supine position.
  - c. have the patient lying down in the head-down position, then turn the patient to the left side.
  - d. have the patient lying down in the head-down position, then turn the patient to the right side.
24. (607) A patient has decreased blood flow to the heart muscle as a result of a narrowing of the coronary artery. This condition is called
  - a. angina pectoris.
  - b. hypoglycemia.
  - c. heart failure.
  - d. heart attack.

- 
- 
25. (607) The coronary artery flow to some portion of a patient's heart muscle is stopped. This causes the affected muscle to die from lack of oxygen. This patient has a condition known as
- congestive heart failure.
  - myocardial infarction.
  - angina pectoris.
  - sudden death.
26. (607) Which is *not* a treatment for a patient suffering myocardial infarction?
- Administer oxygen.
  - Monitor vital signs.
  - Administer epinephrine
  - Place patient in upright position.
27. (607) How long does it take to irreversibly damage brain cells when there is no oxygen?
- 1 to 3 minutes.
  - 2 to 3 minutes.
  - 2 to 4 minutes.
  - 4 to 6 minutes.
28. (608) You have a patient who is unable to metabolize sugar normally. This patient has a disease called
- epilepsy.
  - hypoglycemia.
  - diabetes mellitus.
  - angioneurotic edema.
29. (608) What condition is defined as a loss of consciousness during hyperglycemia?
- Insulin shock.
  - Diabetic coma.
  - Low blood sugar.
  - Psychogenic shock.
30. (608) What condition is defined as an unconscious state of hypoglycemia?
- Insulin shock.
  - Diabetic coma.
  - Psychogenic shock.
  - Anaphylactic shock.
31. (608) What condition is a neurological disorder *usually* characterized by involuntary convulsions of the muscular system?
- Postural hypotension.
  - Psychogenic shock.
  - Hypoglycemia.
  - Epilepsy.
32. (608) Which emergency condition is a sudden interruption of the blood supply to the brain, resulting in damage to part of the brain?
- Heart attack.
  - Angina pectoris.
  - Congestive heart failure.
  - Cerebrovascular accident.

**Please read the unit menu for unit 2 and continue ➔**

## **Student Notes**

## Unit 2. Safety and Health in the Dental Environment

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**A**S A DENTAL ASSISTANT, safety should be a major concern to you, not only for yourself, but also for your patients. Safety and health are important to the Air Force. Injuries and avoidable illness, due to faulty, incomplete, or misunderstood infectious disease control practices cost the Air Force millions of dollars in lost time and medical expenses each year. In this unit, you will study the Air Force Occupational Safety and Health (AFOSH) program, general safety principles, safety hazards specific to dental treatment facility, and accident reporting procedures.

### 2-1. Safety and Health

There are several things you need to know to help make your dental treatment facility a safe and healthy working environment. We begin by looking at the AFOSH program and some general safety principles that everyone should know.

#### 609. Safety and health programs and publications

The Occupational Safety and Health (OSH) Act of 28 April 1971 directs the Department of Labor to develop and enforce standards to ensure safe and healthful working conditions for all employees in the private sector of the American work force. Section 19 of the OSH Act directs federal agencies to have and use comprehensive occupational safety and health programs that are consistent with those areas in the OSH Act that apply to the civilian work force.

#### **AFOSH program**

The Air Force conducts an extensive AFOSH program to protect all Air Force personnel from work-related deaths, injuries, and illnesses. This program includes all safety, fire prevention, and health activities that affect the safety and health of Air Force personnel in the workplace. The primary concern of the Air Force is to make safety a way of life for all members, educating them on safety benefits, and helping them to realize that any safety violation can cause unnecessary risks and a potentially dangerous situation.

For a safety program to be effective, it requires a concerted effort to identify sources of hazards. Air Force personnel must follow program requirements to support a safety program. The program requires that commanders provide all Air Force personnel a safe and healthful work environment to the extent that recognized hazards have been eliminated or controlled. It requires that Air Force facilities, work areas, such as dental treatment facilities, and equipment items comply with safety, fire, and health guidance. Additional requirements are that unsafe and/or unhealthy working conditions be eliminated or controlled through the use of engineering changes, administrative controls, or revised procedures.

#### ***Publications***

Safety and health information is available in various publications, such as Air Force Occupational Safety and Health Standards, the Inspector General Briefs, Newsletters, American Dental Association (ADA) council reports, product reports, journals, acts of Congress, and Presidential proclamations.

AF Index (AFIND) 17, *Air Force Occupational Safety and Health (AFOSH) Standards; Occupational Safety and Health Administration (OSHA)*, and *National Institute of Occupational Safety and Health (NIOSH)* provides a list of publications concerned with occupational safety and health. For example, some of the Air Force Instructions (AFI) which apply to health and safety are: AFI 91-202, *The US Air Force Mishap Prevention Program*; AFI 91-204, *Safety Investigations and Reports*; and AFI 91-302, *Air Force Occupational and Environmental Safety, Fire Protection and Health (AFOSH) Standards*. These are just a few instructions and standards that apply. We will look at one other standard that specifically applies to medical facilities.

AFOSH Standard 91-8, *Medical Facilities*, applies to all Air Force military and civilian personnel. Some of the purposes of this standard are to:

1. Assist the managers of USAF medical organizations in maintaining a safe environment.
2. Administer a safety program compatible with Air Force directives, National Fire Protection Association (NFPA) Codes, Standards of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), and pertinent federal regulations.

Information provided in this standard highlights hazards that are unique or particular to health care facilities and activities.

### ***Offices of primary responsibility***

Air Force-wide responsibility for the safety aspect of AFOSH is the Office of the Inspector General (IG), Headquarters United States Air Force (HQ USAF). The Office of the Surgeon General (SG), HQ USAF, is responsible for health standards and determining how they apply to Air Force personnel, operations, equipment, and facilities.

### ***Local responsibilities***

Local responsibilities are divided into programs, surveys, and inspections. The responsibility for implementing programs for occupational safety, health, fire, and accident prevention is delegated to unit commanders, functional managers, and supervisors in their respective areas of responsibility. Wing, group, and installation authorities conduct occupational safety, health, fire, and accident surveys and inspections. These surveys and inspections must be conducted in all workplaces at least once a year and high-hazard workplaces at least twice a year. These inspections and surveys can be conducted with or without prior notice.

Supervisors are key players in the AFOSH program because they are directly responsible for maintaining safe and healthful environments in their work areas. Safety inspections are one of the principal methods of locating hazards and helping determine what actions are necessary to provide a safe environment for medical personnel, patients, and visitors. Supervisors conduct frequent inspections of their areas to monitor unsafe conditions or unsafe acts by employees, determine the reasons for an unsafe condition, and find solutions to correct unsafe conditions.

The dental squadron commander (DSC) or dental flight commander is responsible for ensuring that the dental facility meets all health and safety requirements for both staff and patients. To meet this responsibility, the DSC must have total cooperation of all personnel in the facility. Other individuals and agencies offering valuable assistance in identifying problems and standards, continuing training, and evaluation of various aspects of the program include the following:

- Public Health.
- Base environmental engineer.
- Base safety officer.
- USAF Dental Evaluation & Consultation Service.
- Base fire department.

Dental personnel must comply with federal, Air Force, state, and local regulatory standards. Therefore, specific operating instructions are essential to establish clear policies and protocols. For example, dental personnel must properly manage and dispose of regulated medical waste. A local operating instruction will establish the policy and protocol to meet the regulatory standards. These operating instructions are very important since state and local regulatory standards may vary.

### ***Training***

The DSC, or designated representative, must document that all dental personnel receive occupational safety and health training on AF Form 55, Employee Safety and Health Record. The training must ensure that all female personnel are made aware of hazards and precautions relevant to pregnancy.

### **USAF Dental Evaluation and Consultation Service**

The USAF Dental Evaluation and Consultation Service (DECS) was established in 1976 to provide guidance and assistance to USAF dental personnel. DECS has investigative, consultative, laboratory, research and clinical capabilities. Its mission is diversified and is specifically designed to solve operational problems, evaluate methods, techniques, procedures, equipment and dental materials as identified by the office of the Air Force Surgeon General (AF/SG).

The DECS supports military medical centers, dental clinics, and dental training programs by providing continuing education lectures and technical assistance. DECS provides guidance for occupational, safety and environmental health matters and for infection control. It also provides guidance for facility design, construction, and alteration.

Air Force dental officers and technicians staff the Dental Evaluation and Consultation Service. It is located in a tri-service research facility at Great Lakes Naval Training Center in Chicago. DECS is host to an elaborate website which disseminates current and up to date information pertaining to its activities. Dental personnel and others are encouraged to visit the website and contact DECS personnel with questions or request for assistance.

## **610. General safety principles**

Injuries from hazards occur for a variety of reasons including fatigue, ignorance, haste, defective equipment, carelessness, clutter, inadequate space, inadequate lighting, or improper storage. For these reasons, the following general safety principles, beginning with preoperational training and ending with preoperative planning, are designed to alert you to safety consciousness.

### **Preoperational training**

Preoperational training occurs before operating equipment or performing a procedure. You must know the proper way to operate equipment or perform a procedure if you are to do it safely. You are taught this either in a formal technical course or by your supervisor in on-the-job training—perhaps both. The equipment you are using may vary from the equipment you learned to use in technical school. Regardless of the equipment you are using, your trainer or supervisor should review the manufacturer's operating instructions and safety precautions with you before use. If the equipment is unfamiliar, make sure that your trainer or supervisor explains all aspects of the equipment thoroughly.

Preoperational training is especially important if you acquire new equipment. Don't assume that because you are a skilled operator of the old equipment, you can operate the new equipment safely. Since such things as operating speeds, operating controls, and guards may differ, you must read the manufacturer's operating instructions for the new equipment very carefully. This principle of safety demands that you know your equipment and know how to operate it safely. Be sure to ask your supervisor for instructions and read the operating instructions before you operate any new or unfamiliar equipment.

Procedures involving no equipment also require complete familiarization. One good example of this is basic cardiac life support (BCLS). Properly performed, BCLS will save a life. Improperly performed, BCLS may still save the patient's life, but will also cause injuries and possible disfigurement. The Air Force considers this type of training so important that refreshers are required

by regulation for BCLS and similar procedures. You must know your equipment and procedures to safely perform your job. Training before beginning is the key.

### **Discipline**

Basically, discipline can be broken down into two categories—imposed discipline and self-discipline. Imposed discipline is similar to what you received in basic training. Someone else told you how, what, when, where, and how often to perform a task. Self-discipline, on the other hand, requires you to think, act, and govern your own behavior. Self-discipline is necessary for administering safe patient care.

As you gain experience, many techniques will become second nature for you. You'll develop a routine. Your work may become automatic. This is when an accident will most likely occur. Safety should never become automatic; it must be a conscious, disciplined effort on your part. Discipline yourself to always check all safety aspects associated with a treatment or procedure. Your supervisor does not have time to do your safety checks for you every time you are going to do something. You must take the initiative and incorporate safety as part of the total treatment. Safety is not just a good idea—it is a must!

To illustrate the point of self-discipline, let's consider electrically powered equipment. In any facility, supervisors and their personnel should routinely check electrically powered equipment for frayed wiring, loose connections, and proper grounding. However, who has the primary responsibility for checking equipment you use in your clinic for safety prior to using it? The answer, of course, is *you*. This is because the supervisor simply cannot check all equipment each time before it is used. Consequently, you must use self-discipline to minimize the risk of injury or loss of life to yourself and others.

### **Alertness**

*“Did you see the game last night?” “I heard that Sue was dating Bob.”* Aside from having nothing to do with patient care and sometimes bordering on a lack of professionalism, conversation can be a distracter. Alertness means that you are paying attention to what you are doing, not just now and then, but all the time. What would happen if you were not paying attention during a procedure? Unless you pay close attention, you may improperly perform a procedure, resulting in an accident. Constant alertness is a prime requirement in avoiding such accidents. The principal enemies of alertness are external and internal *distractions*. These are distractions that are either mental or physical. You must do your best to keep from being sidetracked by distractions that can occur at any time. Everything you do is important enough to require your full attention. Be aware of distracters that occur around you (noise, talking, etc.) as well as mental distracters (trouble at home, finances, etc.). Both types must be avoided to keep from overlooking safety item that produces disastrous results.

### **Unsafe practices**

While it is not practical to discuss every kind of unsafe practice, we can consider some of the most common types of unsafe practices that occur while operating equipment, using equipment, and handling materials. In addition, we should mention the general safety principles that apply in each case.

- **Horseplay.** Not only unprofessional, but can also lead to serious injury or damaged equipment. There is no place for stunts or practical jokes on the job. For example, injury or eye infection resulting from spraying someone with water from a contaminated 3-way syringe can be a serious matter.
- **Incorrect lifting.** When lifting heavy objects, the main point to remember is not to bend your back, if you can avoid it. Keep your back as straight as possible. The idea is to lift with your legs, not your back. Squat down; get a firm grip underneath the object, then lift slowly with your legs. If the object is too heavy for you to lift alone, get someone to help with the lifting.



- Working too fast. Working as fast as you can and taking shortcuts wherever possible is not in the best interest of patients. Work at a moderate, consistent pace whenever possible. Undue haste may cause a mistake in judgment and result in an accident.
- Using an instrument for a purpose other than that for which it was designed. For example, it is unsafe to use a dental chisel as a screwdriver. Its cutting edge is likely to slip off the screw and lacerate some part of your body. You may also ruin the chisel in the process.
- Incorrect use of knives. It is potentially unsafe to cut toward yourself. A slight slip may cause you to cut yourself severely. Always cut *away* from yourself after making *sure* that no one else is in the cutting path.

### **Mental and physical fitness**

While mental and physical fitness are both complex subjects, they can be handled in the same manner. The body and brain need proper nutrition, exercise, and rest. Use only drugs that are prescribed for you, and get the exercise and rest you need. Also, keep alert for any signs of health problems. Because you are in direct patient contact, protect yourself and other patients from transmission of diseases. If you suspect you may have a communicable disease, see a doctor immediately. Be especially attentive to your eyesight and hearing. Faulty eyesight or hearing is a prime cause of accidents. If you have blurred vision or suspect a hearing problem, see a doctor immediately. In general, do all you can to stay healthy. This greatly reduces the chance of an accident. Proper exercise, nutrition, and rest will increase your work performance and safety awareness.

### **Proper equipment maintenance**

If equipment or instruments are not in good condition, one or both of the following situations may occur:

1. Loss of job efficiency, since you won't be able to turn out as much work.
2. A safety hazard.

To keep your equipment in peak working condition; inspect it for loose or worn parts as well as parts needing replacement and/or adjustment. Electrical switches should work properly. If the equipment hesitates when switched on, there may be a problem. Even though the equipment runs, the switch may be defective and could cause a shock. The defective switch may prevent you from shutting off equipment; thereby causing a potential hazard.

Before operating any equipment, become thoroughly familiar with its parts and familiarize yourself with the safety hazards that may develop as a result of defective or worn parts. Know what hazards to look for and look for them before and after each use.

When using any kind of cutting instrument, the cutting edges should be sharp and the instrument replaced when the cutting edge becomes too thin. A cutting edge that is dull will slip and one that is too thin will break. Either situation can cause an injury.

### **Environmental safety**

Your work area should be conducive to safety. Your immediate surroundings can help or hinder you from a safety standpoint. You must be aware of good housekeeping in the workplace. To reduce the chance of accidents, keep your instruments in their proper place; keep floors, countertops, instruments, and equipment clean. Keep out only the items you actually use, and when not in use put them away properly. Keep your work area clean, neat and well organized.

The *layout of equipment* is another important safety factor. Position equipment so that you will have sufficient space to handle the materials you are working on without creating a hazard to yourself or others.

Arrange storage areas so that there is no congestion. Equipment and supplies have to be readily accessible; store and label flammable or caustic materials in accordance with local directives.

Always keep medication areas clean and neat. Keep controlled medications locked up. Wipe up spills promptly. Ensure you dispose of syringes, needles, and unused medications properly.

Administrative areas also have safety concerns. Close file cabinet drawers and desk drawers after use. One scraped shin will usually reinforce this principle.

Drink, eat, and smoke only in approved areas. Never place a drink or liquid on a piece of electrical equipment, whether the equipment is on or off. Eating in patient care areas is very unprofessional and presents a potential health hazard for you. Smoking is offensive to many people as well as a health hazard for the smoker and nonsmoker.

### **Preoperational planning**

Proper planning must precede operation. No matter what you are getting ready to do, think about it and plan your activity properly so that you can observe necessary safety precautions. The amount of advanced planning you do depends on the nature and difficulty of the task. Some tasks require more advanced planning than others. All tasks, however, regardless of their relative size, require at least some preplanning.

The most important thing to keep in mind when planning or thinking through a task is to check any pertinent safety instructions. These instructions may concern the materials you work with, protective clothing, or the type of equipment you use. Be sure to study safety instructions carefully, especially if the task or equipment is new to you. As you begin each day's work, even on comparatively simple tasks that you are familiar with, it's a good idea to plan ahead to ensure that all necessary safety principles are observed. If protective clothing, safety glasses, and other protective items are called for, are they available to you? If not, know how to obtain them before starting.

Think safety at all times. Look for these safety principles in your assigned tasks; if you are *safety conscious*, you'll find them. Remember, "*The life you save may be your own.*"

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### **Self-Test Questions**

**After you complete these questions, you may check your answers at the end of the unit.**

#### **609. Safety and health programs and publications**

1. What act directs the Department of Labor to develop and enforce standards to ensure safe and healthful working conditions for all employees in the private sector of the American work force?
2. What extensive program does the Air Force conduct to protect all Air Force personnel from work-related deaths, injuries, and illnesses?
3. Where can you find safety and health information?
4. What standard provides information highlighting hazards that are unique or particular to health care facilities and activities?
5. Name the OPR for AFOSH.

6. Who is responsible for ensuring that the dental facility meets all health and safety requirements for both staff and patients?
7. What other individuals and agencies offer valuable assistance in identifying problems and standards, continuing training, and evaluation of various aspects of the program?
8. What form is used to document the occupational safety and health training personnel receive?
9. What is the mission of the Dental Evaluation and Consultation Service?

**610. General safety principles**

1. When should preoperational training occur?
2. Why is complete familiarization needed to safely perform a procedure that does not involve equipment?
3. What type of discipline is necessary for safely administering patient care?
4. Who has the responsibility to check all safety aspects associated with treatment, procedures, or equipment?
5. How does alertness relate to safety?
6. Why is horseplay considered an unsafe practice?
7. How do you safely lift objects?
8. Why can working too fast be unsafe?
9. What situations may occur if equipment or instruments are not maintained in good condition?

10. What is meant by environmental safety?
11. What determines the amount of preoperational planning necessary for a task?
12. What is important to check when planning or thinking through a task? Why?

## **2-2. Safety Hazards**

There are safety concerns associated with the dental treatment facility that you must know. In this section we will include the following: hazardous materials, gases, chemicals, mercury, ionizing radiation, infection control, and exercising safety practices on the job. In addition, you will study how to handle and report accidents, incidents, or hazards.

Another major safety principle is to recognize physical hazards that exist in the dental treatment facility and then take the necessary steps to eliminate, reduce, or avoid them.

### **611. Hazardous materials**

The federal Occupational Safety and Health Administration (OSHA) established regulations regarding the rights of employees with respect to the potential dangers associated with hazardous chemicals in the workplace. The goal is to reduce the risk of injury or illness caused by hazardous chemicals in the workplace. To accomplish this goal requires information and communication; therefore, OSHA issued *The Hazard Communication Standard*. This standard helps protect your right to work in a safe and healthful environment. It requires that you be informed about hazardous chemicals in your workplace and trained to work safely with these materials. The standard requires the employer to develop, implement, and maintain a written hazard communication program that includes labeling, material safety data sheets (MSDS), and employee training. You will study labeling, MSDS, training requirements, and some general handling precautions.

#### **Labeling and MSDS**

Dental products considered hazardous should come from the manufacturer with a label identifying the chemicals and containing an appropriate hazard warning. You must pay attention to these warnings. The manufacturer must supply MSDSs for products that contain a hazardous chemical. An up-to-date file of these sheets must be maintained, and available to all employees. You should take time to locate where this material is kept and to study these sheets because they contain valuable data concerning precautions and the safe handling of each product.

#### **Training**

The employer must provide training for all new employees when a new hazardous material is introduced into the workplace and when procedures for safe handling and emergencies are changed. The training may take place at staff meetings or through continuing education. During the training, the hazards of the chemicals and their handling should be identified so that the employees easily understand them. The employer is responsible for providing the training. You must learn how to handle these materials in a safe manner and routinely follow all of the safety precautions.

#### **General precautions for handling materials**

If you know the general precautions for handling materials, you can easily prevent hazardous situations or accidents. When you handle chemicals, follow the manufacturer's instructions. Know and use the proper cleanup procedures. You must dispose of all hazardous chemicals according to the MSDS instructions and applicable local, state, and federal regulations. For your own protection, avoid

skin contact with chemicals and minimize chemical vapor in the air whenever possible. Wear protective eyewear, gloves, and mask to protect yourself. Never leave chemical bottles open. Vapors can escape into the air and chemicals can be easily spilled when bottles are left open. Do not use a flame near flammable chemicals. You are inviting an accident to occur if containers of chemicals are left open. Never eat or smoke in areas where chemicals are used. Eating can cause chemicals to be ingested and smoking can cause chemicals to ignite or explode.

## 612. Gas and chemical hazards

A variety of gases and chemicals are used or produced in dental facilities. It is important that you are aware of the hazards and take the necessary precautions.

### Gases

You must label, store, and use canisters of gases, such as oxygen, nitrogen, and propane according to published standards. The use of nitrous oxide conscious sedation requires special training and protective devices for the operating personnel. Only ADA approved analgesia machines, with scavenging devices and adequate ventilation, must be used. This is necessary to prevent possible dangers of teratogenesis (production of physical defects in offspring in utero) and other problems associated with exposure. Nitrous oxide machines, lines, hoses, and masks should be checked regularly for leakage.

### Toxic fumes and vapors

Mixing impression materials and denture materials, using adhesives, solvents, acids, mixing radiographic processing solutions, and mixing and spraying some disinfectant agents can emit toxic fumes and vapors. Besides the danger from fumes and vapors, direct contact with many materials, such as etchant acids, radiographic solutions, endodontic materials, or bleaching agents can cause chemical burns of the skin or eyes. If you come in direct contact with any of these you should wash the chemical off with large amounts of water and a pH-balanced soap. Acid soaked items should always be handled with forceps or gloves.

### Chemical storage

Proper storage of chemicals is critical for safety. The types of container and cabinet, security, and proximity to other chemicals, materials, heat, or open flame are areas that need consideration and control. Federal and state regulations require proper handling and storage of hazardous chemicals.

Proper ventilation can eliminate hazards associated with most gases and chemicals. Instructions must be written for the safe use, storage, clean up, and disposal of hazardous or contaminated items. Storage rooms must be properly furnished and maintained. Personal protective equipment (PPE), such as masks, shields, rubber gloves, rubber or plastic aprons, eyewear, and eyewash stations must be available when gases and chemicals are used. The table discusses some of the specific chemicals used in dentistry and their precautions.

Chemicals Used In Dentistry	
Specific Chemicals	Examples and Precautions
Organic chemicals	<p>Examples of organic chemicals include alcohols, ketones, esters, solvents, and monomers, such as methyl methacrylate. Use these precautions:</p> <ul style="list-style-type: none"> <li>• Avoid skin contact and excessive inhalation of vapors.</li> <li>• Always work in well-ventilated areas with these types of chemicals.</li> <li>• When not in use, keep containers tightly closed and stored on flat, sturdy surfaces.</li> <li>• After each use, clean the outside surfaces of the containers to prevent residual material from contacting the next user.</li> </ul>
Acid etchants	<p>These are solutions and gels used for acid etch techniques in restoring teeth with composite material. Use these precautions when handling these products:</p> <ul style="list-style-type: none"> <li>• Always wear protective eyewear and rubber gloves to avoid skin contact.</li> </ul>

Chemicals Used In Dentistry	
Specific Chemicals	Examples and Precautions
	<ul style="list-style-type: none"> <li>• Always handle acid-soaked items with forceps or gloves.</li> <li>• If spills occur, use a commercial acid spill cleanup kit.</li> <li>• In the event of eye or skin contact, rinse the area with large amounts of running water.</li> </ul> <p><b>NOTE:</b> Spill kits and eyewash stations are pre-located in a work area and you need to know these locations.</p>
Flammable liquids	<p>Solvents such as acetone and alcohol are examples. Use these precautions when using flammable liquids:</p> <ul style="list-style-type: none"> <li>• Always have adequate ventilation.</li> <li>• Never use where sparks or flames are present.</li> <li>• Have a fire extinguisher available.</li> </ul> <p><b>NOTE:</b> Store flammable liquids in tightly covered containers in designated storage cabinets.</p>
Gypsum products	<p>These products, which include dental plaster and stone, are considered hazards because of their powder form and dust particles which are created in their use. When handling the powder form or trimming cast use these precautions:</p> <ul style="list-style-type: none"> <li>• Use protective eyewear, a mask, and</li> <li>• Work in areas with an exhaust system.</li> <li>• Minimize your exposure to the powder during handling.</li> </ul>

### Mercury hazards

At room temperature mercury is a liquid; with increased heat it changes to vapor. In the liquid state, mercury is not readily absorbed; however, mercury vapors are potentially toxic. Dental personnel encounter mercury toxication primarily from two sources.

1. *Via direct absorption into the tissues* through contact or handling of mercury and mercury-containing compounds.
2. Upon *inhalation of vapors* that are emitted through a volatilization of mercury and mercury-containing substances.

Mercury contamination in the dental treatment facility is not always associated with noticeable gross spills. Over a period of time, an accumulation of contaminating mercury can reach unsafe levels. Handle mercury in a safe and hygienic way. You can keep occupational exposure to mercury to a minimum by following specific rules and instructions.

Using precapsulated amalgam virtually eliminates the chance of mercury spills and reduces vapors during trituration. Never heat/store amalgam or mercury near heat sources. Heat causes the mercury to vaporize. Grinding or polishing amalgam creates heat as a result of friction, which in turn produces mercury vapors that are easily inhaled by the dentist, assistant, and patient. To avoid concentrations of mercury vapor during these procedures, use water spray and high volume evacuation (HVE). The water spray cools the amalgam and flushes the debris, while the high volume evacuator removes large amounts of contaminated air from the working area.

Prepare dental amalgam over a large rimmed receptacle such as a stainless steel or plastic tray. The receptacle should be impervious to mercury and be cleaned each day to prevent an accumulation of mercury and subsequent vapors.

Mercury and amalgam continually give off vapor. It is important to close the amalgam capsule immediately after removing the amalgam mass. The capsule contains a high concentration of vapors from the freshly mixed amalgam. If the capsule is left open, vapors escape and contaminate the air we breathe. Close used amalgam capsules and then dispose as normal trash.

Recover and recycle the scrap amalgam generated in the dental treatment room (DTR). Scrap amalgam is classified as uncontaminated or contaminated. *Uncontaminated scrap amalgam* consists of unused freshly mixed amalgam recovered from the amalgam well. Store uncontaminated excess scrap amalgam dry, in an airtight container labeled *SCRAP AMALGAM*.

*Contaminated scrap amalgam* collects into the strainer of the solids separator of the HVE system. The strainer is commonly known as the *amalgam trap*. Because high volume evacuator also removes blood and other potentially infectious material (OPIM) from the mouths of patients, this amalgam requires special handling precautions. Sanitize or disinfect contaminated scrap amalgam intended for recovery and recycling and store dry in a sealed container.

You may sanitize the amalgam using the following procedure:

1. Use a commercial HVE cleaning solution according to the manufacturer's instructions to clean the vacuum line (hose) and amalgam trap.
2. Flush the lines with about 100 cc (4 to 5 ounces) of water to rinse the cleaning solutions from the amalgam.
3. Remove the lid from the amalgam trap and allow air to pass through the trap until the amalgam is nearly free of water. This usually takes no more than five minutes.
4. Inspect the trap; remove any tissue or large tooth fragments with a pair of cotton forceps. Place any tissue debris in a red bag container for disposal. Always be sure to wear your PPE, especially gloves and protective eyewear, when you open the amalgam trap and handle items inside it. Remove the strainer and empty the contents onto a paper towel. Replace the strainer and the solid separator lid. If necessary, allow any scrap amalgam to dry, and then transfer it into a sealed, airtight container. Refiners may require that scrap amalgam be disinfected. You can use the following procedure to disinfect the contents of the amalgam trap:

1. Prepare a solution of 1:10 sodium hypochlorite or other hospital grade cleaner/disinfectant, such as a phenolic detergent or iodophor. *Do not use* glutaraldehydes such as Cidex or products containing high levels of alcohol.
2. Flush the HVE lines with 100 cubic centimeters (cc) of disinfectants. Use an intermittent technique to avoid damaging the suction equipment.
3. When almost all of the liquid has been drawn into the system, turn off the HVE on your individual unit. This will ensure contact of the disinfectant with the contents of the trap.
4. Allow the trap and contents to stand for the contact time listed on the disinfectant label (10 minutes for sodium hypochlorite).
5. Flush the lines with 100 cc of clean water to rinse the scrap amalgam.
6. Follow the remaining procedures previously given to sanitize scrap amalgam after rinsing.

For guidance on turning in recovered scrap amalgam for recycling, contact your local Defense Reutilization and Marketing Service (DRMS). Do *not* place scrap amalgam into the red bag containers for regulated waste. Since regulated waste is generally incinerated this action would cause mercury vapors to be emitted. In some community governments, decontaminated scrap amalgam may be discarded into nonregulated waste systems. However, before you discard amalgam into any waste system check with the hazardous waste manager for local disposal guidance.

Periodically, check amalgamators and capsule storage areas for evidence of capsule leakage. Immediately clean any known mercury spills. There are several approved techniques. For small spills, the recommended technique is vacuum aspiration through a water trap, followed with the use of a wet "HgX" (mercury vapor decontaminant) or calcium polysulfide treatment. For large spills on nonporous floor surfaces, use a commercial mercury vacuum system, followed by a decontaminating washdown. Never use a household vacuum cleaner to clean up any size mercury spill and always

avoid direct skin contact with mercury. Contact local bioenvironmental engineering (BE) and civil engineering (CE) personnel for assistance and to verify decontamination efforts following large spills.

Dental personnel are required to receive an annual briefing regarding mercury hygiene and potential mercury hazards. The rules and instructions given are for your protection. If you follow the rules and instructions, contamination of the environment and personnel is kept to minimum standards.

### **613. Physical hazards**

When you think of physical hazards, working with moving parts of equipment or sharp instruments may come to mind. These are not the only physical hazards you need to be concerned with. Fire hazards and burns are also to be considered. By understanding how to properly operate equipment and knowing what decreases the risk for these hazards is useful.

#### **Burns**

The major causes of burns are inattentiveness and rushing through a task. There are two types of burns possible in the dental treatment facility: thermal and chemical. Whether chemical or thermal, burns are injuries that can be avoided by exercising caution.

Open flames and hot surfaces cause *thermal burns*. Common dental items using open flames are Bunsen burners and torches. Dental items that may be hot include compound and wax heaters, sterilizers, and items in the sterilizers, such as instruments. Constant awareness of the use, condition, and location of these items is essential to prevent thermal injury. Equipment should be located in an area convenient for use while minimizing the chance of accidental burns. Flames are difficult to see so make a habit of keeping them away from flammable liquids, materials, and yourself. Always use heat-resistant gloves or the device supplied by the manufacturer to remove items from sterilizers. Always allow sterilized items to cool before using. Never take items out of the sterilizer and place them directly on the instrument tray or directly into a patient's mouth.

*Chemical burns* result from contact with caustic agents. Whereas damage from a thermal burn ceases when the heat source is removed, chemical burns may continue below the skin long after removing the agent from the skin's surface. A caustic chemical burn must be neutralized. When handling caustic chemicals, know what the neutralizer is and where it is located. Often, the neutralizer cannot penetrate the skin with the same efficiency as the caustic agent. Immediate treatment by professional medical personnel is essential.

Chemical burns of the eyes and skin can result from careless use of many materials such as etchant acids, radiographic solutions, endodontic materials, and bleaching agents. Proper storage of chemicals is critical for safety. Things that must be considered when designating areas for storage of chemicals should include: proximity to other chemicals, heat, or open flame; types of container and cabinet.

#### **Fire hazards**

A major physical hazard is a fire. Three elements are necessary for fire. The elements are fuel, oxygen, and heat. Before you can have a fire, you must have fuel. In order for combustion to occur, sufficient oxygen must be present. However, fuel and oxygen alone are not enough. The third element requirement is heat. Therefore, with fuel that is hot enough combined with sufficient oxygen and combustion, fire does occur.

The secret to extinguishing a fire is to remove any one of the three elements necessary for combustion. Keep all three of these elements (fuel, oxygen, and heat) separated, except when necessary, and you will prevent an accidental fire.

To prevent a fire in the clinic, take the following precautions:

- Control flame sources, such as torches and burners.
- Do not use flammable materials around fire or heat sources.
- Make sure all gas hoses, valves, and connections do not leak and are in good working order.



- Store flammables properly and label them for quick identification.
- Coordinate with Biomedical Equipment Technician (BMET) personnel to schedule periodic inspection of proper wiring including grounding, shielding, and load capacity.

In the event of a fire, you must know where to exit the building you work in. Building evacuation plans must be current and posted in conspicuous areas. Hallways and fire exits must not be obstructed. Evacuation plans must be prepared and maintained according to the local base fire-protection directives. Know the evacuation plan for the building you work in.

#### **614. Exercising safety practices during job performance**

There are several other hazards or safety items associated with the dental environment. These include allergens and sensitizing agents, visible light, injury by projectile, noise, lighting requirements, and psychological effects.

##### **Allergens and sensitizing agents**

Many patients or personnel may be allergic to one or more of the materials used in the dental facility. Other individuals may develop allergies or sensitivities from the use or misuse of materials. Dust from poor housekeeping, grinding, buffing and polishing can become hazards. Chemicals in medicaments, disinfectants, sterilizer solutions, formalin, solvents, acrylic resins, local anesthetics, impression materials, radiographic solutions, waxes, cements, unset composites, and sealants are just a few of the many chemical agents that could become hazards.

Necessary precautions against allergens and sensitizing agents include the following:

- Regular, thorough house cleaning to prevent accumulation of irritants.
- Ventilation with air exchange commensurate with the working conditions.
- Adequate filtration and air cleaning.
- Proper humidity levels.
- Dust collectors.
- Rubber gloves.
- Masks.
- Protective aprons.
- Protective eyeglasses.

##### **Visible light**

The use of photo-initiated dental materials has increased dramatically. Many restorative resins, bases/liners, impression materials, and periodontal dressings are now visible light polymerized materials. Repeated exposure to the curing light from the visible light polymerization unit can cause damage to the retina. When using visible light polymerization procedures use protective filtering lenses, goggles, or shields. It is also recommended that you do not stare at the light source or reflected light during the polymerization period.

##### **Injury by projectiles**

Patients and staff members can be injured by projectiles or debris generated by cutting, scaling, polishing, or irrigating procedures. Aspiration of projectiles by the patient is also a possible hazard. Actions that prevent projectile injuries include the use of rubber dams and the wearing of protective eyeglasses or goggles by patients and staff members.

##### **Noise**

In the dental facility, several devices have the potential to produce noise levels that may cause a hearing loss in exposed personnel. The potential for hearing loss is directly related to the intensity of the noise, the duration of the exposure, and the sensitivity of the individual. The proper use and

maintenance of equipment and the proper use of protective ear devices, when appropriate, are all important to prevent occupational hearing loss.

### **Lighting requirements**

Adequate lighting is necessary in dental facilities. Optimal intensity levels and color quality should be established for task and ambient lighting. Improper contrast or ratio of intensity between work areas and ambient light can cause visual problems. Inadequate or poorly placed lighting in hallways, stairwells, and rooms can cause accidents.

### **Psychological effects**

Some aspects of the dental environment have psychological effects on staff and patients. Every effort should be made to maximize the positive psychological effects by optimal use of such interior design features as lighting, wall color, texture and decorations, furnishings, and floor coverings.

## **615. Handling and reporting accidents**

In spite of our best efforts to make the dental treatment facility a safe and healthful place to work, accidents may occur. Fortunately, most accidents and mishaps are no more than minor annoyances. They rarely cause damage that cannot be quickly repaired and injuries, if any, are usually slight. However, an accident or injury of a more serious nature could happen, so reporting an accident is an important part of any safety program.

Any accident involving the following must be reported:

- Air Force personnel (on or off duty) or equipment.
- Costs of \$1,000 or more to recover.
- Death, dismemberment, unconsciousness, lost duty days, or reassignment (even on a temporary basis) to another job due to injuries suffered.
- Medical attention greater than first aid.

If you are involved in or witness an accident where any of these factors apply, report it as soon as possible to your supervisor.

When you witness or are involved in an accident, your *first concerns* are the immediate removal of accident victims from hazardous situations and emergency first aid. Next, contain the hazard, if you can do so without unnecessarily exposing yourself and other personnel to danger. Otherwise, clear the area and call emergency personnel to the scene as quickly as possible.

When the accident is controlled, notify your supervisor and the supervisor of any injured personnel as quickly as possible. Include the following information in your report:

- What happened.
- The name, rank, social security number (SSN), and organization of all personnel directly involved.
- A brief, general description of injuries sustained by personnel; including you.
- The damage done to facilities, vehicles, equipment, and materials.

Remain available to answer any questions or provide additional information, as needed. Following your initial notification, your supervisor will contact his or her supervisor or unit commander, the unit safety officer or noncommissioned officer (NCO), and the base emergency response agency, if necessary, provided this has not already been done. These agencies and personnel, according to the nature and severity of the accident, may be required to contact additional agencies and personnel.

**AF Form 765, Medical Treatment Facility Incident Statement**

Accurate, detailed information is the key when reporting accidents, incidents, or hazards. All accidents or incidents that occur in a medical treatment facility (MTF) are reported on AF Form 765. This form may also be used to report situations in the MTF that could result in an accident.

For accidents which occur in areas other than MTFs, you, your supervisor, and all personnel concerned with the accident may be called upon to fill out various forms concerning the accident and your (their) involvement with it. These forms normally originate in base, wing, group, or unit safety offices. Your unit safety representative is available to help you fill them out correctly.

**AF Form 457, USAF Hazard Report**

If a situation or condition exists which could have a potential for personal injury, or equipment or facility damage, report this to your supervisor and complete an AF Form 457. Your unit safety representative can provide assistance when you are completing this form.

Accurate, detailed information is extremely important when reporting accidents, incidents, or hazards. The report acts as a record that can point out accident trends, high hazard areas, and frequency and severity of incidents involving people and equipment. The report may indicate the need for safety training or be used to formulate accident prevention measures.

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**Self-Test Questions**

**After you complete these questions, you may check your answers at the end of the unit.**

**611. Hazardous materials**

1. What has OSHA issued to reduce the risk of injury or illness caused by hazardous chemicals in the workplace?
2. What does *The Hazard Communication Standard* require of the employer?
3. Who must supply MSDSs for products that contain a hazardous chemical?
4. When must the employer provide hazard communication training?
5. How must you dispose of all hazardous chemicals?
6. Why should you never eat or smoke in areas where chemicals are used?

**612. Gas and chemical hazards**

1. How must you label, store, and use canisters of gases, such as oxygen, nitrogen, and propane?
2. What types of materials used in dentistry can emit toxic fumes and vapors?
3. What things need consideration and control for proper storage of chemicals?
4. What type of equipment must be available when gases and chemicals are used?
5. Give three examples of organic chemicals.
6. What should you avoid when handling these chemicals?
7. What action is necessary in the event of eye or skin contact with acid etchants?
8. What are the safety precautions when using flammable liquids?
9. Why are gypsum products considered hazardous?
10. What state is mercury in at room temperature?
11. What changes mercury into a vapor state?
12. What is in mercury that is potentially toxic?
13. What are the two primary sources of mercury toxication for dental personnel?
14. What virtually eliminates the chance of mercury spills and reduces vapors during trituration?

15. How can concentrations of mercury vapor be avoided when grinding or polishing amalgam?
16. Why is it important to close the amalgam capsule immediately after removing the amalgam mass?
17. How should used amalgam capsules be disposed?
18. Define uncontaminated scrap amalgam.
19. How is uncontaminated scrap amalgam treated and stored?
20. What is contaminated scrap amalgam?
21. Why does it require special handling precautions?
22. What is required if contaminated scrap amalgam is intended for recovery and recycling?
23. Why isn't scrap amalgam placed in the red bag containers for regulated waste disposal?
24. How are small mercury spills cleaned?
25. What is required to clean up a large mercury spill on nonporous floor surfaces?
26. How often are dental personnel required to receive a briefing regarding mercury hygiene and potential mercury hazards?

**613. Physical hazards**

1. What are the major causes of burns?
2. What two types of burns are possible in the dental treatment facility?
3. Name the causes of thermal burns and give examples of each.
4. Briefly describe how to remove items from sterilizers.
5. What causes a chemical burn?
6. How does damage from a thermal burn differ from a chemical burn?
7. What type of materials can cause chemical burns of the eyes and skin if used carelessly?
8. What considerations must be made when designating areas for storage of chemicals?
9. How can you prevent accidental fires from starting?

**614. Exercising safety practices during job performance**

1. List the necessary precautions to prevent hazards from allergens and sensitizing agents.
2. What should you use to prevent damage to the retina from the curing light of the visible light polymerization unit?
3. What actions prevent projectile injuries?
4. How can occupational hearing loss be prevented?

5. What can cause visual problems in work areas?
6. How can positive psychological effects be maximized in the dental environment?

**615. Handling and reporting accidents**

1. When are you required to report accidents?
2. What are your first concerns whenever you witness or are involved in an accident?
3. Who is the first person you should notify after the accident is under control?
4. What information should you include in your report?
5. What form should you use to report accidents which occur in a medical treatment facility?
6. What form should you use to report a situation or condition which could have a potential for personal injury, or equipment or facility damage?
7. Why is accurate, detailed information extremely important when reporting accidents, incidents, or hazards?

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**Answers to Self-Test Questions****609**

1. The Occupational Safety and Health Act (OSH Act) of 28 April 1971.
2. The AFOSH program.
3. AFOSH Standards, the Inspector General Briefs, Newsletters, ADA council reports, product reports, journals, acts of Congress, and Presidential proclamations. AFIND 17, Air Force Occupational Safety and Health (AFOSH) Standards; Occupational Safety and Health Administration (OSHA), and National Institute of Occupational Safety and Health (NIOSH) provides a list of publications concerned with occupational safety and health.
4. AFOSH Standard 91-8.
5. For safety the OPR is the Office of the IG and for health the Office of the SG, HQ USAF.
6. The DSC.

7. Base environmental engineer, public health, base safety officer, USAF Dental Evaluation & Consultation Service, and the base fire department.
8. AF Form 55.
9. Solve operational problems, evaluate methods, techniques, procedures, equipment and dated materials as identified by the AF/SG.

**610**

1. Before operating equipment or performing a procedure.
2. Improperly performed procedures cause injuries and possible disfigurement.
3. Self-discipline.
4. You.
5. Unless you pay close attention, you may do something wrong, resulting in an accident. Constant alertness is a prime prerequisite in avoiding accidents.
6. It can lead to serious injury or damaged equipment.
7. Lift with your legs, not your back.
8. Working as fast as you can and taking shortcuts wherever possible certainly is not in the best interest of patients. Undue haste may cause a mistake in judgment and result in an accident.
9. Loss of job efficiency and a safety hazard.
10. Keeping your work area clean, neat and well organized.
11. The nature and difficulty of the task.
12. Any pertinent safety instructions. These instructions may concern the materials you work with, protective clothing, or the type of equipment that you use.

**611**

1. *The Hazard Communication Standard.*
2. The standard requires the employer to develop, implement, and maintain a written hazard communication program that includes labeling, MSDSs, and employee training.
3. The manufacturer.
4. To all new employees, whenever a new hazardous material is introduced into the workplace, and whenever procedures for safe handling and emergencies are changed.
5. According to the MSDS instructions and applicable local state, and federal regulations.
6. Eating can cause chemicals to be ingested and smoking can cause chemicals to ignite or explode.

**612**

1. According to published standards.
2. Impression materials, denture materials, adhesives, solvents, acids, radiographic processing solutions, and some disinfectant agents.
3. The type of container and cabinet, security, and proximity to other chemicals, materials, heat, or open flame.
4. PPE, such as masks, shields, rubber gloves, rubber or plastic aprons, eyewear, and eyewash stations.
5. Any three of the following: alcohols, ketones, esters, solvents, and monomers, such as methyl methacrylate.
6. Skin contact and excessive inhalation of vapors.
7. Rinse the area with large amounts of running water.
8. Always have adequate ventilation, never use where sparks or flames are present, and have a fire extinguisher available.
9. Because of their powder form and dust particles which are created in their use.
10. Liquid.
11. Heat.
12. Vapor.



13. (1) Via direct absorption into the tissues through contact or handling of mercury and mercury-containing compounds, (2) Upon inhalation of vapors that are emitted through a volatilization of mercury and mercury-containing substances.
14. Using precapsulated amalgam.
15. Use water spray and HVE.
16. The capsule contains a high concentration of vapors from the freshly mixed amalgam. If the capsule is left open, vapors escape and contaminate the air we breathe.
17. Close capsules and then disposed as normal trash.
18. It is unused freshly mixed amalgam recovered from the amalgam well.
19. Store dry in an airtight container labeled SCRAP AMALGAM.
20. Amalgam that collects into the strainer of the solids separator, commonly known as the amalgam trap.
21. Because HVE also removes blood and OPIM from the mouths of patients.
22. Must be sanitized or disinfected and stored dry in a sealed container.
23. Since regulated waste is generally incinerated this action would cause mercury vapors to be emitted.
24. Vacuum aspiration through a water trap, followed with the use of a wet "HgX" (mercury vapor decontaminant) or calcium polysulfide treatment.
25. A commercial mercury vacuum system may be used, followed by a decontaminating washdown. Never use a household vacuum cleaner to clean up any size mercury spill and always avoid direct skin contact with mercury. Bioenvironmental engineering personnel must verify decontamination efforts following large spills.
26. Annually.

### 613

1. Inattentiveness and rushing through a task.
2. (1) Thermal, (2) chemical.
3. (1) Open flames: Bunsen burners and torches, (2) Hot surfaces: compound and wax heaters, sterilizers, and items in the sterilizers, such as instruments.
4. Always use heat-resistant gloves or the device supplied by the manufacturer to remove items from sterilizers.
5. Contact with caustic agents.
6. Damage from a thermal burn ceases when the heat source is removed, chemical burns may continue below the skin long after removing the agent from the skin's surface. A caustic chemical burn must be neutralized.
7. Materials such as etchant acids, radiographic solutions, endodontic materials and bleaching agents.
8. Proximity to other chemicals, heat or open flame, types of container and cabinet.
9. Keep all three elements (fuel, oxygen, and heat) necessary for a fire from getting together simultaneously.

### 614

1. Regular, thorough house cleaning to prevent accumulation of irritants; ventilation with air exchange commensurate with the working conditions; adequate filtration and air cleaning; proper humidity levels; dust collectors; rubber gloves; masks; protective aprons; and protective eyeglasses.
2. Protective filtering lenses, goggles, or shields.
3. The use of rubber dams and the wearing of protective eyeglasses or goggles by patients and staff members.
4. The proper use and maintenance of equipment and the proper use of protective ear devices, when appropriate.
5. Improper contrast or ratio of intensity between work areas and ambient light.
6. Optimal use of such interior design features as lighting, wall color, texture and decorations, furnishings, and floor coverings.

### 615

1. Any accidents involving: Air Force personnel (on, or off duty) or equipment; costs of \$1000 or more to recover; death, dismemberment, unconsciousness, lost duty days, or reassignment (even on a temporary basis) to another job due to injuries suffered; or medical attention greater than first aid.

2. Immediate removal of accident victims from hazardous situations and emergency first aid.
3. Your supervisor and the supervisor of any injured personnel.
4. What happened; name, rank, SSN, and organization of all personnel directly involved; brief, general description of injuries sustained by personnel, including yourself and briefly describe the damage done to facilities, vehicles, equipment, and materials.
5. AF Form 765.
6. AF Form 457.
7. The report acts as a record which can point out accident trends, high hazard areas, and frequency and severity of incidents involving people and equipment. It may also indicate the need for safety training or be used to formulate accident prevention measures.

**Do the Unit Review Exercises (URE) before going to the next unit.**

## Unit Review Exercises

**Note to Student:** Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

33. (609) Which office has primary responsibility for the safety aspect of AFOSH?
  - a. Wing commander.
  - b. Inspector General.
  - c. Unit commander.
  - d. Surgeon general.
34. (609) Why are supervisors considered key players in the AFOSH program?
  - a. Are directly responsible for maintaining safe environments.
  - b. Train personnel on equipment.
  - c. Are in a position to fix hazards.
  - d. Regulation dictates.
35. (609) The DSC is responsible for ensuring the dental facility meets all health and safety requirements. Which is *not* an example of cooperating agencies?
  - a. USAF Dental Evaluation and Consultation Service.
  - b. Safety Office.
  - c. Fire Department.
  - d. Training Office.
36. (609) Providing guidance on techniques and procedures to the USAF dental personnel is an example of whose responsibility?
  - a. Dental Evaluation and Consultations Services.
  - b. Dental squadron commander.
  - c. Base safety office.
  - d. Public Health.
37. (610) Why do you, as the assistant, have the primary responsibility to perform a safety check of equipment in your work area?
  - a. You are the one using the equipment.
  - b. Your supervisor cannot check all equipment prior to every use.
  - c. You were trained on the equipment at one time.
  - d. Your supervisor is teaching you a routine.
38. (610) Why is being alert one of the major principles of safety?
  - a. Avoids accidents.
  - b. Ensures discipline.
  - c. Limits gossip of patients.
  - d. Increases working speed.
39. (610) Being distracted is an example of *not* being
  - a. mentally fitness.
  - b. physically fitness.
  - c. disciplined.
  - d. alert.
40. (610) By keeping floors, countertops, instruments, and equipment clean, you are practicing
  - a. environmental safety.
  - b. fire hazard reduction.
  - c. preoperational planning.
  - d. proper equipment maintenance.

41. (610) The best example of preoperational planning is to know the
  - a. amount of supervision available.
  - b. attitude of your supervisory personnel.
  - c. nature and difficulty of the tasks to be accomplished.
  - d. number of regulatory publications imposed upon you.
42. (610) Making sure you have all necessary protective items available prior to doing a task is an example of
  - a. fire hazard reduction.
  - b. environmental safety.
  - c. preoperational planning.
  - d. proper equipment maintenance.
43. (611) Why should you take time to study MSDSs?
  - a. Fulfill annual safety training requirements.
  - b. Will be taught in the Hazardous Materials Course.
  - c. Are disposed of after everybody has reviewed them.
  - d. Contain information on safe handling of each product.
44. (612) Acid soaked items should *always* be handled
  - a. as little as possible.
  - b. with forceps or gloves.
  - c. in well-ventilated areas.
  - d. using rubber tipped forceps.
45. (612) When sanitizing amalgam, what is the *next step* after flushing the lines?
  - a. Inspect the trap for tooth fragments.
  - b. Replace the strainer and separator lid.
  - c. Remove lid to allow air through.
  - d. Prepare sodium hypochloride.
46. (612) Which is the *best* example for storing scrap amalgam?
  - a. Under x-ray fixer in a tightly closed plastic container.
  - b. Under water in a tightly closed plastic container.
  - c. Dry in a sealed, air tight container.
  - d. Dry in an open container.
47. (612) When should a small Mercury spill be cleaned up?
  - a. Daily.
  - b. Immediately.
  - c. After the patient leaves.
  - d. As soon as it is convenient.
48. (613) If a chemical reaction of combustion takes place, then what is present?
  - a. Fuel, oxygen, and wind.
  - b. Oxygen, heat, and fuel.
  - c. Heat, fuel, and oxygen.
  - d. Wind, fuel, and heat.
49. (614) Which one of the following examples is used to prevent projectile injuries?
  - a. Wear of protective eyeglasses and face masks by staff members.
  - b. Use of rubber dams, and wear of protective eyeglasses by patients only.
  - c. Use of rubber dams, and wear of protective eyeglasses by patients and staff members.
  - d. Wear of protective eyeglasses by patients and staff members, and use of face masks by staff members.

50. (614) What example prevents occupational hearing loss?
- a. Protective ear devices.
  - b. Maintenance of equipment only.
  - c. Protective ear devices and equipment operation.
  - d. Maintenance of equipment and use of protective ear devices.
51. (615) What are your *first* concerns when you witness or are involved in an accident?
- a. Clear the area as quickly as possible.
  - b. Call emergency personnel to the scene.
  - c. Contain the situation that caused the accident.
  - d. Remove the victims from hazardous situations and render emergency first aid.

**Please read the unit menu for unit 3 and continue ➔**

## **Student Notes**

## Unit 3. Preventive Dentistry

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**T**HE ADAGE, “an ounce of prevention is worth a pound of cure,” summarizes the theory of preventive dentistry—the use of measures to prevent oral diseases and the progression of oral diseases. The USAF Preventive Dentistry Program was initially developed because of the poor oral health conditions within the military. It constitutes the most valuable and important element of the professional service provided by the base dental activity. Each Air Force dental activity must have the capability to provide a planned preventive dentistry program.

### 3–1. United States Air Force Preventive Dentistry Program

For any program to be functional, it must have clear and precise objectives. The USAF Dental Preventive Dentistry Program has excellent objectives, as attested to by the notable reduction of oral disease within the Air Force. These objectives directly support the USAF Dental Corps’ mission to achieve oral health to ensure readiness, achieve best value, and achieve excellence in all we do.

#### 616. Objectives of the Preventive Dentistry Program

The USAF Preventive Dentistry Program has the following objectives:

1. Prevent the occurrence, progression, and recurrence of oral disease.
2. Help patients establish a healthy oral environment.
3. Teach patients how to maintain a healthy oral environment.
4. Facilitate patient self-learning and personal responsibility for his or her oral health.
5. The maintenance of an esthetic and functional dentition for a lifetime.

#### Dentistry program phases

In order to meet these objectives, a continuing preventive dentistry program must be conducted at all Air Force installations that have dental service capability. The program includes three phases: a clinical, a community health, and a family member children’s phase. These different phases provide a range of services; including periodic dental examination, oral prophylaxis as needed, topical application of fluorides, systemic use of fluorides, use of a fluoride dentifrice, and plaque control (including patient education and counseling, home care, and dietary and nutritional instruction).

#### Continuing education program

All dental personnel should participate actively in the preventive dentistry program. Dental personnel should be provided resources to learn preventive dentistry philosophy and techniques. This information should be provided through the organized continuing education program on the base and through the proper local, state, and national professional meetings. Maximum use should be made of the training and ability of technicians to meet the needs of all areas of the program.

### **617. Clinical phase of the Preventive Dentistry Program**

The clinical phase of the program includes all aspects of preventive dentistry performed within the dental facility and consists of a team effort that involves all areas of dentistry. This phase includes all professional treatment of patients at the dental clinic. This professional treatment includes a periodic dental examination, health care instructions, dental prophylaxis, construction of mouthguards for participants in contact sports, and sealants.

#### **Periodic dental examination**

A periodic dental examination is scheduled for each active duty Air Force member. The purpose of this examination is to establish currency of dental health classification, early detection of oral pathology, and proper custody of dental health records.

Members are identified for a periodic dental examination (PDE) via the Dental Data System-Web (DDS-W). Each clinic designates a member of the dental staff to request and print rosters from the DDS-W according to organization and date of last examination. The dental representative will forward a roster to each unit identifying personnel requiring an examination. Each unit health monitor (UHM) coordinates the scheduling of the dental examinations with the dental facility. UHMs send annotated appointments notifications to advise members when to report for their examination.

#### **Health care instructions**

On a continuing basis, a dentist or trained technician counsels each patient on dental health needs. Individualized programs that are positively oriented can achieve patient motivation best. It's important to encourage a high level of self-motivation. In addition to individualized counseling, plaque control lectures and small group counseling sessions devoted to teaching special home care skills may be used. Notation in the patient's record may be made indicating the individual's progress in control of dental plaque. Any special examinations should be performed with patient counseling. Counseling should include the following care:

1. Self-evaluation methods.
2. Plaque control techniques.
3. Importance of retaining natural dentition.
4. Adjunctive oral hygiene devices.
5. Cariogenicity of food.
6. Problems associated with use of tobacco products.

#### **Dental prophylaxis**

When required, each active duty member should be provided a thorough dental prophylaxis as an important part of the USAF preventive dentistry program. This encounter is an ideal time to present oral hygiene instructions. Oral prophylaxis procedures are discussed in detail later in this volume. A thorough prophylaxis includes the following steps:

1. Removal of plaque, exogenous stains, and calculus from the supragingival surfaces of the teeth.
2. Polishing of the teeth, as needed.
3. Application of an approved topical anticarcinogenic agent, as needed.

Along with the prophylaxis, give the patient dental health counseling. It's a good idea to have patients demonstrate personal cleaning techniques. This gets the patients to participate in the counseling sessions and allows the patients to immediately receive feedback on their performance of cleaning techniques. Counsel the patients on the following practices:

1. Selection of a proper toothbrush.
2. Proper technique needed for effective daily cleaning of oral hard and soft tissues.
3. Importance of daily use of dental floss to clean the proximal surfaces of the teeth.



4. Use of disclosing agents and fluoride dentifrices. (Emphasize that the fluoride dentifrice is only an aid to dental health. Total oral health depends on physically removing the plaque with the brush and floss.)
5. Methods for cleaning prosthodontic appliances and maintaining the supporting tissues.
6. Diet, consistency of food, frequency of eating, and food habits for proper nutrition and dental health.
7. Effects of tobacco use, when necessary.

When you provide dental health counseling, remember to vary your counseling style because different individuals have different lifestyles. Therefore, personalize your counseling to meet the needs of your patient. For example, some people are office workers who can keep their toothbrush and dental floss in their desk. Others may work on the flightline and don't have this convenience. Direct each counseling session directly at the counselee's particular circumstances.

Do not limit yourself when presenting oral hygiene ideas. The philosophy of one highly esteemed periodontist is, "Take the bathroom boredom out of brushing." This philosophy has great merit and can be applied to many of your counseling sessions. Encourage your patients to floss or brush without paste while watching television. Promote the idea of keeping a small floss dispenser and toothbrush in convenient locations, such as in the desk drawer, workshop, living room, or the glove compartment of their automobile. Encourage patients to turn some of their idle time into a productive oral hygiene effort. Encourage them to have their families do the same. Families who brush and floss do not suffer tooth loss.

After you have completed the counseling session, make the appropriate entries on AF IMT 644, Record of Dental Attendance, which will later be transferred to the patient's permanent record. Make notations to indicate the individual's progress in the control of dental plaque.

### **Sealants**

Pit and fissure sealants should be applied where indicated for all children and adults. This is a very important preventive dental service that has had proven benefits for all patients, regardless of age.

### **Construction of mouthguards**

Participants in contact sports can use off-the-shelf commercial mouthguards, or they may receive custom mouthguards from the dental service. Instruct recipients on how to clean and maintain them.

### **Effects of tobacco use**

It is the responsibility of all dental staff to provide patients who use tobacco with the opportunity to enter a tobacco cessation program. As professionals, we can play a major role in preventing tobacco use. It is not our job to criticize the patient, but we can educate the patient on the effects of tobacco use.

Look first to the patient's health history to determine if he or she uses tobacco products. You can also examine the patient's oral cavity for stains, or lesions, that are common to tobacco use. Once you are sure that the patient is positive for tobacco use, you can begin your counseling regarding relevant effects of tobacco use.

## **618. Community health phase of the Preventive Dentistry Program**

You, as a successful salesperson, must know your product, believe in the product, and be energetic and enthusiastic about it. Your product is preventive dentistry. The success of your program depends on how you present the information and goals of your program. The community health phase of the USAF Preventive Dentistry Program is composed of those aspects of preventive dentistry intended to publicize the program, educate the Air Force community, and implement procedures needed to improve the general dental health of the community. This phase complements and reinforces the clinical phase by promoting good oral health habits in the Air Force community.

**Oral health education**

As a dental assistant journeyman, you believe in dental health and overall wellness, you know how to care for your mouth, you understand the necessity of professional dental care, and you believe in fluoridation of the communal water supply. Since you believe in all these things, it seems that if you told others, they would believe also. Promoting dental health is not that easy; it takes more than telling. You must persuade them. Realize that you are asking people to change or modify their habits. Many of them have been cleaning their mouths the same way for years—just telling them that your way is better most likely will not suffice. Some people are easy to sell, others are difficult. Your goal is to educate them through the sensible use of ethical publicity.

Material used in oral health education must be programmed in clinic budget planning. Avoid overt or implied endorsement of commercial products. Group education is most effective when repeated during the year. It should include the use of the following media:

- Oral health displays.
- Oral health posters.
- Oral health literature handouts.
- Military radio and television broadcasts.
- Base newspaper articles.
- Group health talks.
- AF Base Exchange (BX).

The community health phase activities should be coordinated with the local health promotion committee when possible.

**USAF preventive dentistry displays**

You can prepare simple, inexpensive displays with assistance from the base education services office and training personnel whom are responsible for training aids and graphics. Displays should be changed periodically.

**Oral health posters and literature handouts**

Oral health posters can be procured through the American Dental Association (ADA) or from other sources. Posters and handouts needed to support special projects may be prepared locally and must be coordinated with the proper officials (see AFI 33-360, Vol 1, *Publications and Forms Management*, and DoDD 5330.3 Defense Automated Printing Service (DAPS)). A variety of handouts can be procured from the ADA. Handouts may also be prepared locally to support special projects. Copyright permission can be obtained from national professional organizations to reproduce their literature. Coordinate handouts designed for specific categories of patients (such as expectant mothers and parents of young children) with the medical service having primary or collateral responsibility for these patients.

**Radio and television broadcasts**

Where available, these media may be used to publicize base programs. The base information office can help you prepare a script. The base film library should have or can obtain films and videotapes for television viewing.

**Base newspaper articles**

A series of articles suitable for publishing in the base newspaper may be obtained from the ADA. Articles should not be printed continually but rather periodically for maximum effect. Articles and illustrations prepared locally must be carefully edited and approved by your preventive dentistry officer and the dental squadron commander (DSC). This is done to ensure accuracy and ensure that the article presents a favorable image of the dental services.

### **Group lectures**

Talks may be given in conjunction with commander's call, base orientation for newly assigned personnel, staff meetings, Parent-Teacher Association (PTA), spouses' club, schools, teen groups, scouts, and similar organizations. They may also be given for special groups such as prenatal patients, personnel on flying status, and personnel on permanent change of station (PCS) movement orders. These group talks should be brief and limited to one subject such as dental caries. They may be illustrated with slides or short motion pictures. The ultimate objective is to acquaint the group with the overall preventive dentistry program.

### **Base Exchange and commissary**

The availability of suitable home care items in the BX is essential for the success of the preventive dentistry program. The BX manager may assist in obtaining these items. Implied endorsement of particular brands must be *avoided!* Promotional emphasis should be directed toward the principal items required for good oral hygiene—namely, the toothbrush and dental floss—and not toward supplemental aids, such as toothpaste. Many bases have BX and commissary advisory committees representing consumers. These committees frequently include hospital representatives who can influence the availability of items in the BX and commissary.

## **619. Family member children's phase of the Preventive Dentistry Program**

It's sometimes difficult to get adult patients to modify their cleaning techniques. With children, it's often easier to teach the correct oral health techniques. The children's program is a very important part of the USAF Preventive Dentistry Program.

### **Family member children's phase intent**

This phase of the program is composed of those aspects of dental health that apply exclusively to dependent children. Each AF medical treatment facility having a dental capability and located in an area having a population of eligible children will establish and operate a dental health program for dependent children. To be eligible for participation, the dependent child must meet the criteria outlined in AFI 41-115, *Authorized Health Care and Health Care Benefits in the Military Health Services Systems (MHSS)*. Participation in the family member children's phase is voluntary. Individuals enrolled in the family member dental plan are ineligible for most services covered by the preventive dentistry program.

### **Program design**

At a minimum, the program will annually provide the following treatment for each eligible child:

1. An appropriate dental examination performed by a dentist. The examiner will evaluate the patient's history and determine the presence of disease that would preclude the application of an anticarcinogenic agent. The examiner may also evaluate the patient for suitability of application of pit and fissure sealants. When routine dental care is not authorized, a treatment plan will not be initiated nor will the dentist indicate the specific treatment required. It's permissible to recommend that the dependent child visit a family dentist for further evaluation and relay the degree of urgency and importance. The dental technician should also perform an oral screening procedure before prophylaxis and call any unusual conditions to the attention of a dentist.
2. An oral prophylaxis.
3. Oral hygiene counseling.
4. Preventive dentistry education materials.
5. Pit and fissure sealants, when needed, may be applied if staffing and workload permit.
6. Oral hygiene aids, as indicated and when available.

7. A topical application of an anticarcinogenic agent to the teeth, unless contraindicated.
8. Mouthguards, when needed.

**Routine dental care**

Definitive dental treatment will not be performed in connection with this program unless the patient is located where dental care for family members is authorized.

**AF dependent school oral health programs**

The dental service should conduct oral health programs among children through dependent school and childcare programs. These programs should be coordinated with the base medical service, school authorities, and school nurses. Plan these programs as an orientation and introduction to the clinical phase of the annual family member children's program. They may include oral hygiene demonstrations and lectures required in the clinical phase when it's practical to conduct these preliminary procedures in the school area rather than in the dental treatment facility.

**National children's dental health month**

Base dental services should take part in this nationally recognized program as long as your clinic has the people and budget to do so. Contact the ADA well ahead of the February program for an informative planning packet. It's advisable to coordinate this dental health activity with the local dental society.

**Child abuse and neglect**

The base preventive dentistry officer, in consultation with the family advocacy officer, will establish a program to perform dental evaluations on those children referred from the medical treatment facility staff.

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**Self-Test Questions**

**After you complete these questions, you may check your answers at the end of the unit.**

**616. Objectives of the Preventive Dentistry Program**

1. State the objectives of the USAF Preventive Dentistry Program.
2. What are the three phases of the Preventive Dentistry Program?
3. Who should participate in the Preventive Dentistry Program?
4. How are dental personnel provided the information necessary for knowledge and understanding of the preventive dentistry philosophy and techniques?

**617. Clinical phase of the Preventive Dentistry Program**

1. List the five activities of the clinical phase of the Preventive Dentistry Program.
2. List the three purposes of the periodic dental examination.
3. What information should be provided to each patient in regards to health care instructions and preventive dentistry counseling?

**618. Community health phase of the Preventive Dentistry Program**

1. What is the intent of the community health phase of the Preventive Dentistry Program?
2. What should be your goal in the oral health education program?
3. When is group education most effective?
4. Where can you obtain assistance in the preparation of simple and inexpensive oral health displays?
5. What oral hygiene items sold by the BX should be given promotional emphasis?

**619. Family member children's phase of the Preventive Dentistry Program**

1. Why does a dentist perform an exam?
2. Under what conditions are pit and fissure sealants applied?
3. When do dependent children receive definitive dental treatment?
4. With whom must the AF dependent school oral health program be coordinated?

## **3-2. Oral Communication**

One of your most important duties is to give group dental health talks. When you have an assignment to give a health talk, give a good informative, helpful, and interesting talk. To do this, consider several things. First, who makes up the group? You may give talks in conjunction with commander's calls and base orientation for newly assigned personnel, and for other special groups such as prenatal and personnel on flying status. Each group has different interests and different reasons for hearing your talk.

Your first responsibility is gaining their interest and making them understand the importance of what you are saying. You have a definite advantage here. You know that dental disease is a personal concern and that it's possible for each person to prevent dental disease. Your message will give concerned individuals the knowledge to do this. To sell a product you must believe in it.

Again, you must also know your audience and aim your message at that particular group. A group of expectant mothers will respond to a message that is obviously a part of their complete obstetrical care. Keep a file on your different dental health talks. This reduces the amount of time used in selecting objectives, research, and organization of material.

### **620. Assisting with presentations**

Organization is the key to success for any presentation. In preparation for a big game, a competent coach will spend hours in planning the plays and watching the team execute them. The effective speaker also devotes much thought and preparation to each presentation. Be concerned with your goal and how to achieve it.

#### **Establishing objectives**

The first step in developing a presentation is to establish objectives. Decide what you expect your audience to learn as a result of your presentation. Once you have your objectives clearly in mind, select a method of presentation that will get your audience to that objective.

#### **Selecting a method of presentation**

No one presentation method is suitable for all situations. No single method is flexible enough to meet the needs of every audience in every learning situation. Choose which lecture method you'll present—guided discussion, demonstration, or performance method. However, the lecture or briefing method is often the core presentation method used. You can also combine methods, such as lecture/demonstration/performance, for your presentation.

#### ***Lecture***

Lecture is the method of teaching in which the speaker presents all the facts, principles, and ideas orally. The success of this method depends solely on the speaker. You can conduct the lecture in either a formal or informal manner.

The formal lecture does not allow audience participation. Normally it is used when presenting information to large groups. In the informal lecture, the listeners are encouraged to ask questions if they don't understand. Also, the speaker questions the audience in order to maximize interaction and to see if he or she is being understood.

The lecture method has two definite advantages. First, it permits the speaker to present many ideas in one presentation. Second, it's a convenient method for presenting information to large groups. Some of the disadvantages are that it limits audience participation, makes it difficult to evaluate the audience's understanding, and might not hold the audience's attention as well as other methods.

#### ***Discussion***

The discussion method is an orderly exchange of ideas with a goal in mind. It involves group interaction to solve problems and answer questions. As the discussion leader, it's your job to ask questions, pose problems, and direct the group participation. The discussion method promotes group

participation, stimulates effective thinking, allows you to correct misconceptions, and allows for individual expression. Its disadvantages are that it's time-consuming and people who might not have enough basic knowledge to make the discussion worthwhile limit it.

### ***Demonstration***

The demonstration method—"show and tell"—is the method in which you, the trainer, explain and show the audience exactly what you want them to do. This method enhances your verbal explanation by showing visually what you are saying. The demonstration method is useful because it shows and tells the audience how to perform. One disadvantage of this method is that it demands greater skill on the part of the trainer. For instance, you must often perform the task in a position that is abnormal in order for the audience to see. Another disadvantage is that the audience does not perform during the demonstration, so you can't evaluate their skills.

### ***Performance***

The performance method lets your audience practice and perform under close supervision. Normally the performance method is used with the demonstration method. Its advantages are that it provides individual guidance and evaluation for each person, and permits audience members to apply their knowledge to practical situations. The major disadvantages of the performance method are that it is time-consuming and requires a higher trainer-to-student ratio than other methods.

Each method of presentation has both advantages and disadvantages. Select the method or combination of methods that best presents your lesson. The method must provide the means to get the students to understand the lesson objective. Once you select the presentation method, prepare your lesson plan.

### **Writing a lesson plan**

A person who builds a house uses a blueprint, an orchestra leader uses sheet music, a jet engine mechanic uses a schematic diagram, and an effective trainer uses a lesson plan. The lesson plan is a written plan of your presentation. Most speakers use a lesson plan with an outline format. The outline helps you present your lecture in a planned, logical order without omitting any material. To organize the lesson effectively, first divide it into parts. A frequently recommended division breaks the lesson into an *introduction*, a *body* (or subject development), and a *conclusion*.

The introduction should gain the audience's attention and focus on the subject. Next it should provide motivation for the audience to learn. Finally it should present an overview of what is going to be covered during the presentation. The introduction prepares the audience for learning.

The body is the main part of the lesson. Here you develop the subject matter in a way that helps your audience achieve the desired learning. To do this, arrange the main points of your lesson so that each main point relates logically to the next main point. Usually this relationship is developed in one of several ways—from past to present, simple to complex, known to unknown, or from most frequently used to less frequently used. Under each main point in the lesson plan are the subpoints.

Each subpoint should support the main point it is listed under and it should lead logically into the next subordinate point. Use meaningful transitions from one point to another. These transitions keep the audience aware of where they have been and where they are going. Organizing a lesson plan with a logical relationship of ideas that the audience can grasp is not an easy task. This type of organization is needed if your audience is to learn. Poorly organized material is of little or no value.

The conclusion should include three basic elements: summary, remotivation, and closure. The effective summary briefly retraces the important points of the presentation and relates them to the objective. This review and wrap-up of ideas reinforces the audience's learning and helps everyone retain what they have learned. Remotivation instills a desire to use what has been learned. The closure may consist of a quotation, statement, or any other device that will serve as a conclusion without reducing the audience's motivation.

### **621. Conducting presentations**

The effective use of training aids is not limited to any one phase of the learning process. Filmstrips, audiotape filmstrips, slides, and motion pictures can be used to enhance your presentations. Use training aids to supplement your instruction rather than replace a part of it.

#### **Training aids**

Choose your instructional aids to fit the individual learning situation. A training film can help you clarify directions and explanations. Using and explaining the actual item (for example, the removal of calculus or properly sharpening instruments) about which you are teaching will yield better results. There are many items in your career field that can be part of a demonstration or teaching experience. Realize that if the training aid does not contribute to the development of the audience's understanding, it's of no value. Be sure you use it with the purpose in which it was designed and built. *Always remember, training aids are provided to help supplement, not replace, good instruction.*

The equipment and materials needed for your instruction will vary with your presentation. A chalkboard, white board, or flip chart is good for many different types of training sessions. If you need a movie or slide projector, you can usually check one out from the base audiovisual service center. Write the ADA and request film catalogs. Many suppliers of dental materials have films available on a loan basis. Plan far enough in advance so that any required training aids can be ordered and received before your presentation is scheduled.

#### **Giving your presentation**

In a theater, the stage must be set before you raise the curtain. Similarly when you prepare to give an oral health talk, have the training area ready before the presentation. Have all equipment and supplies set up ahead of the scheduled presentation time. Have your presentation arranged and ready for showing, your audiovisual equipment cued, and other training aids and materials on hand and ready for use. Inadequate planning will interrupt your presentation. The better prepared you are, the more comfortable you'll be giving your presentation.

Your voice and body movements make up the physical aspect of your presentation delivery. Vary the pitch, rate, and force of your voice to emphasize points, and keep your voice interesting not monotonous. Use natural hand and body gestures, and try to avoid physical distractions such as coin jingling, pacing, and head scratching. Using direct eye contact shows your audience you are interested in them and also lets you check for any signs of doubt, confusion, and boredom. When you use the demonstration method, make sure your audience can see your demonstration. If your talk has been well planned, the presentation should pose no problems. Your lesson plan should lead both you and your listeners to the desired objectives. Throughout your speech, you are in a position to really help your audience. The information you give them might prevent later suffering, save them money, improve their appearance, and help them keep in good general health.



## Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

### 620. Assisting with presentations

1. List the three procedures required to establish an oral health talk.
2. Name two advantages of the lecture method.
3. What are the disadvantages of the lecture method?
4. What are the disadvantages of the discussion method?
5. What makes the demonstration method especially useful?
6. State the advantages of the performance method.
7. What are the major disadvantages of the performance method?
8. What are the objectives of the introduction of a lesson plan?
9. How should you develop the subject matter in the body of a lesson plan?
10. What three elements should you include in the conclusion of a lesson plan?

### 621. Conducting presentations

1. How can training films enhance your presentation?
2. When should you prepare all the equipment and supplies for a training session?

3. How can you keep your voice interesting during a presentation?
4. What do you gain by using direct eye contact?
5. Where should a well-planned presentation lead both you and your students?

---

### **Answers to Self-Test Questions**

**616**

1.
  - (1) Prevent the occurrence, progression, and recurrence of oral disease.
  - (2) Help patients establish a healthy oral environment.
  - (3) Teach patients how to maintain a healthy oral environment.
  - (4) Facilitate patient self-learning and personal responsibility for his or her oral health.
  - (5) The maintenance of an esthetic and functional dentition for a lifetime.
2.
  - (1) Clinical.
  - (2) Community health.
  - (3) Family member children's.
3. All dental personnel.
4. Through the organized continuing education program on the base and through the proper local state and national professional meetings.

**617**

1.
  - (1) Periodic dental examination.
  - (2) Health care instructions.
  - (3) Dental prophylaxis.
  - (4) Sealants.
  - (5) Construction of mouthguards.
2.
  - (1) Establish currency of the dental health classification.
  - (2) Early detection of oral pathology.
  - (3) Proper custody of the dental health record.
3.
  - (1) Self-evaluation methods.
  - (2) Plaque control techniques.
  - (3) Importance of retaining natural dentition.
  - (4) Adjunctive oral hygiene devices.
  - (5) Carcinogenicity of food.
  - (6) Problems associated with the use of tobacco products.

**618**

1. To complement and reinforce the clinical phase by promoting good oral health habits in the AF community.
2. To educate through the sensible use of ethical publicity.
3. When repeated during the year.
4. From the base education and training personnel who are responsible for training aids and graphics.
5. The principal items required for good oral hygiene; namely, the toothbrush and dental floss.

**619**

1. AFI 47-101.
2. To evaluate the patient's history and determine the presence of disease that would preclude the application of an anticarcinogenic agent.
3. When needed, if staffing and workload permit.
4. If the patient is located where dental care for family members is authorized.
5. The base medical service, school authorities, and the school nurses.

**620**

1. (1) Establish your objectives.  
(2) Select a method of presentation.  
(3) Prepare the lesson plan.
2. (1) It permits the speaker to present many ideas in one presentation.  
(2) It is a convenient method for presenting information to large groups.
3. It limits audience participation, makes it difficult to evaluate the audience's understanding, and does not hold the audience's attention as well as other methods.
4. It's time-consuming and limited to people having enough basic knowledge to make the discussion worthwhile.
5. It shows and tells the audience how to perform.
6. It provides for individual guidance and evaluation of each person and permits audience members to apply their knowledge to practical situations.
7. It's time-consuming and requires a higher trainer-to-student ratio than the other methods.
8. (1) To gain the audience's attention and focus them on the subject.  
(2) Provide motivation.  
(3) Present an overview of what is going to be covered during the presentation.
9. Arrange the main points of your lesson so that each main point relates logically to the next point.
10. (1) Summary.  
(2) Remotivation.  
(3) Closure.

**621**

1. They can help you clarify directions and explanations.
2. Before the scheduled presentation time.
3. By varying the pitch, rate, and force of your voice.
4. It shows your interest in the audience and also lets you check for signs of doubt, confusion, or boredom.
5. To the desired objectives.

**Do the unit review exercises before going to the next unit.**

## Unit Review Exercises

**Note to Student:** Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

52. (616) Clinical, community, and children's phases are an example of what program?
  - a. Continuing Education.
  - b. Preventive Dentistry.
  - c. General Dentistry.
  - d. Dental Safety.
53. (617) Once a member is identified as needing a periodic dental exam, what is the next step?
  - a. Schedule patient.
  - b. Verify with DDS-W system.
  - c. Contact members individually.
  - d. Forward roster to each unit health monitor.
54. (617) What is the *second step* when performing a dental prophylaxis?
  - a. Removal of plaque.
  - b. Fluoride treatment.
  - c. Floss, if needed.
  - d. Polish teeth, if needed.
55. (618) Which is a part of the community phase of the USAF Preventive Dentistry Program?
  - a. Dental prophylaxis.
  - b. Construction of mouthguards.
  - c. Fluoridation of the water supply.
  - d. Oral health program for food handlers.
56. (619) Where do you find the eligibility criteria for participation in the family member children's phase?
  - a. AFI 47-101.
  - b. AFM 41-101.
  - c. AFI 41-115.
  - d. AFM 41-115.
57. (619) Under what condition is pit and fissure sealants applied?
  - a. Upon request of a civilian dentist.
  - b. All clinics must provide the service.
  - c. When needed, if staffing and workload permit.
  - d. Only those children who have extensive caries.
58. (619) When do family member children receive definitive dental treatment?
  - a. Upon request of the hospital commander.
  - b. When authorized by the base dental surgeon.
  - c. Dependents do not receive definitive dental treatment.
  - d. If the patient is located where dental care for family members is authorized.
59. (620) What is the key to success for any presentation?
  - a. Organization.
  - b. Establishing objectives.
  - c. Preparing a lesson plan.
  - d. Selecting a method of presentation.

60. (620) What is the *first step* in developing a presentation?
- a. Establishing objectives.
  - b. Researching the material.
  - c. Preparing the lesson plan.
  - d. Selecting a method of presentation.
61. (621) You use training aids to
- a. grab the audience's attention.
  - b. supplement your instruction.
  - c. replace part of your instruction.
  - d. demonstrate materials.
62. (621) During your presentation, you can keep your voice interesting by
- a. varying the pitch, rate, and force.
  - b. maintaining a constant pitch, rate, and force.
  - c. varying the pitch and force but maintaining a constant rate.
  - d. maintaining a constant pitch and rate but varying the force.
63. (621) What can you do during your presentation to show your audience that you are interested in them and to check for signs of doubt, confusion, or boredom?
- a. Use direct eye contact.
  - b. Avoid physical distractions.
  - c. Use natural hand and body gestures.
  - d. Keep your voice interesting and not monotonous.

**Please read the unit menu for unit 4 and continue ➔**

## **Student Notes**

## Unit 4. Oral Prophylaxis Procedures and Dental Health Education

<b>4-1. Oral Prophylaxis Procedures .....</b>	<b>4-1</b>
622. Preparing for oral prophylaxis .....	4-1
623. Locating and removing calculus .....	4-6
624. Using periodontal equipment.....	4-6
625. Using periodontal instruments .....	4-10
626. Polishing teeth .....	4-17
627. Applying fluoride .....	4-18
628. Performing dental implant hygiene.....	4-19
<b>4-2. Dental Health Education.....</b>	<b>4-27</b>
629. Classifications of micro-organisms and oral cavity bacteria .....	4-27
630. Patient motivation.....	4-32
631. Instruct oral hygiene techniques .....	4-33

**O**RAL PROPHYLAXIS IS defined by the American Academy of Periodontology as the “removal of plaque, calculus, and stains from the exposed and unexposed surfaces of the teeth by scaling and polishing as a preventive measure for the control of local factors.” The term *prophylaxis* means *prevention of disease*. When you apply its broadest interpretation to the oral cavity, it includes all measures taken to prevent oral disease. Understanding what micro-organisms are found in the oral cavity will help you educate your patient on the oral hygiene techniques and devices used. Dental health instructions/counseling is one of your most important duties because it can motivate patients to improve their oral hygiene. This unit includes evaluation of records, the seating of the patient, instrument examinations, and contraindications to prophylaxis, micro-organisms, and proper oral hygiene techniques. You’ll begin with the evaluation of the patient’s dental health record.

### 4-1. Oral Prophylaxis Procedures

There are many steps in oral prophylaxis procedures; what you should do before seating the patient, and what instruments are used during treatment of the patient. The type of cleaning will decide the type of instruments you will use. As you perform the prophylaxis procedure, remember that you are treating a living, breathing human being. Your job is not to chastise the patient for past dental neglect, but to rehabilitate and educate the patient towards improved oral health.

#### 622. Preparing for oral prophylaxis

Before the patient enters the dental treatment room (DTR), evaluate their dental record for completeness. This folder should contain the patient’s dental record; current x-rays; current AF Form 696, Dental Patient Medical History; and any other applicable forms discussed in an earlier volume of this course. Check the patient’s past medical history and past history of periodontal disease. Check the recommendations that were made during previous dental health counseling sessions. If the patient has had radiographs taken since the previous oral prophylaxis, evaluate them for subgingival calculus and overhanging margins of restorations. Subgingival calculus will take on the appearance of a “spur” or deposit between the teeth, below the gingival margin as you view the x-ray. The few minutes of evaluation should tell you much about your patient. They help you evaluate your patient’s home care habits and possibly the patient’s attitude toward the care of his or her mouth.

#### Contraindications to prophylaxis

Evaluate the medical history of dental patients before treatment begins. AF Form 696 must be completed for all patients and signed by a dental provider. Use this form to find out whether there are any medical problems that can affect dental treatment. You, as the person performing the

prophylaxis, are responsible for reviewing each patient's medical history and initialing the AF Form 696 before beginning treatment. Any medical history, no matter how complete, is only as effective as the person who uses it. Discuss each question on the form. Examine all "yes" answers further as to what, when, where, how much, and how long. Update the health history at every appointment. If you have any questions about the answers or findings you receive, have a dental provider review the history with you and give you guidance before proceeding with treatment.

There are actually very few absolute contraindications for a dental prophylaxis. Be aware that a patient has not taken his or her required premedication for subacute bacterial endocarditis (SBE) prophylaxis or major joint prosthesis (primarily knee and hip replacements). Consult your clinic guidelines for the current recommendations of the American Dental Association (ADA) and affiliated groups such as the American Heart Association and American Academy of Orthopaedic Surgeons.

A common active infection that is a contraindication to any dental treatment, including a prophylaxis, is recurrent herpetic lesions (cold sores or fever blisters). It's best to reschedule the patient in 7 to 10 days when the lesions will be resolved. This is done to reduce your risk of acquiring an active herpetic infection on your fingers, eyes, or other body parts.

After you evaluate the record and perform all between-patient infection control procedures and general housekeeping, you are ready to seat the patient.

### **Patient and operator positioning**

Correct operator and patient positioning (1) prevents operator and patient fatigue and discomfort, (2) permits the operator to gain a clear view of the tooth being worked on, (3) allows easy access of instruments to the teeth, and (4) is time efficient.

Modern dental chairs are designed to provide the patient with the greatest amount of comfort possible and provide the operator with the best possible access to the patient's mouth. Remember your DTR is a very small and confined area, and there are many potential safety hazards. It may be necessary for you to guide your patient through some of the obstacles that may be in his or her path. Make sure the dental unit's light and bracket table are not in harm's way before seating your patient. Raise the dental chair to a height the patient can comfortably sit himself or herself without falling into the chair. Don't ever forget, you are responsible for the physical and psychological safety of your patient. Be cautious and caring, remembering the safety of your patient first.

### **Patient positioning**

Position the back of the patient's chair at about a 15-degree angle to the floor (slightly raised above the parallel position (fig. 4-1). The patient's heels should be even or slightly higher than the head. The top of the patient's head must be even with the end of the headrest for you to see and reach the patient's mouth. Check your patient for comfort. Be sure that the chair's position is within the limits of operation. (You should not have to lean over the patient to reach the water and air syringe.) If possible, position the bracket tray out of the patient's direct vision.

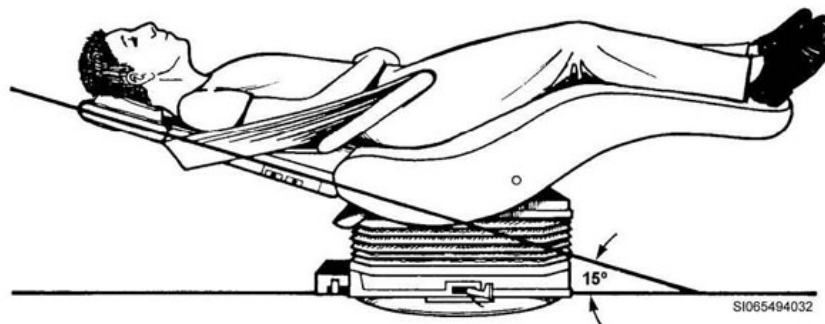


Figure 4-1. Patient positioning.



### ***Operator positioning***

Studies show that the seated working position is much less fatiguing than standing. To properly position yourself in the seated operator position, adjust the chair so that you are comfortable and your posture is correct. To maintain good working posture (fig. 4-2), position your feet flat on the floor, thighs parallel to the floor and against the back of the chair for support, back and head straight, and arms at waist level; also, keep your body weight evenly distributed.



**Figure 4-2. Seated operator position.**

Keep your unit light at arm's length above or in front of the patient. The light should be easy to reach but not near the patient's or operator's head. Illumination of the treatment area becomes more difficult when the light is positioned too close to the patient's head. In addition, the light generates a large amount of heat. The bracket table should be as low as possible so you can view the instruments and a reasonable distance above and in front of the patient.

The patient's open mouth should be level with your waist, and you should be able to reach the patient's mouth while maintaining your arms at waist level. For mandibular instrumentation, the patient will have his or her mouth open in a chin-down position. Position your legs under the chair back, in which case the back of the dental chair should touch the top of your legs, or you may straddle the chair back with your legs. Direct the unit light from above the patient (fig. 4-3).

For maxillary instrumentation, the patient will have his or her mouth in a chin-up position. It may be necessary to lower the entire chair when working on the maxillary arch to obtain the proper relationship of your arms to the maxillary teeth. In most cases, you'll need to straddle the headrest of the chair when working on the maxillary teeth. If you try to maneuver your legs under the chair back while working on the maxillary arch, your arms will become fatigued because the patient is too high in relation to your arms. Direct the unit light from the front of the patient (fig. 4-3).

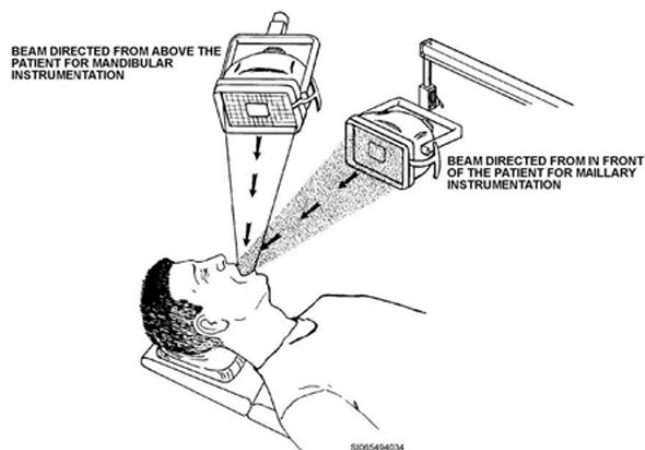


Figure 4-3. Unit light placement.

Now you are ready to learn how to position yourself around your patient in relation to the treatment areas of the mouth. Operating positions for right-handed and left-handed technicians are usually identified in relation to a 12-hour clock (figs. 4-4 and 4-5).

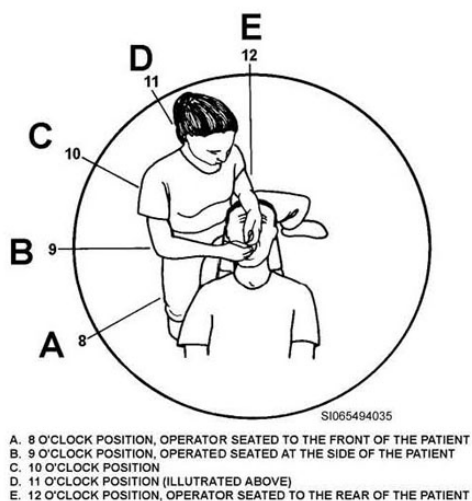


Figure 4-4. Operating positions—right-handed operator.

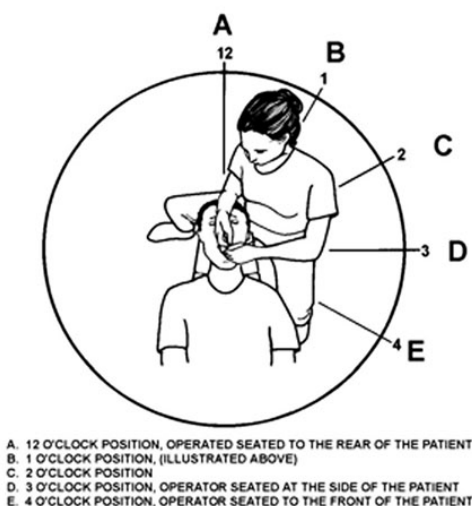


Figure 4-5. Operating positions—left-handed operator.

You'll not be able to obtain a clear view of all tooth surfaces in the mouth through operator and patient positioning alone. Later in this unit you'll learn to use a mouth mirror to obtain complete vision. Keep in mind that you'll more than likely encounter a tooth surface that may be too difficult to reach from your favorite position. Some degree of flexibility is necessary to adapt to a less than ideal situation (for instance, partially erupted, rotated, or tipped teeth). You may be required to vary your operator positioning slightly to accommodate your circumstance. Now you're ready to examine the patient's mouth.

### Screening examination

Before you begin any prophylaxis procedures, make a thorough appraisal of the condition of the patient's mouth. This assessment serves three purposes:

1. Determines the needs of the patient.
2. Determines the sequence in which these needs must be met.
3. Provides you with useful information for conducting the dental health counseling.

Be sure that the dental light is properly adjusted for adequate viewing. Direct the beam as you move the patient's head.

The screening examination has two phases: observation of the entire oral mucosa and examination of the teeth and gingival sulci.

The Screening Examination	
Phase	Procedures
ONE - Observation of entire oral mucosa	<ol style="list-style-type: none"> <li>1. Use the mouth mirror to retract the lips and look for any open lesions.</li> <li>2. Inspect the lips and move intra-orally to the labial, buccal, and vestibular mucosa.</li> <li>3. Examine the oral pharynx, retromolar area, maxillary tuberosity, soft palate, and hard palate. Pay particular attention to the tongue and sublingual mucosa.</li> </ol>
TWO - Examination of teeth and gingival sulci	<ol style="list-style-type: none"> <li>1. Examine the gingival sulci to determine their depth (the use of the calibrated periodontal probe is covered later in this unit).</li> <li>2. With a mouth mirror and explorer, examine the teeth below the gingiva for the presence of subgingival calculus.</li> <li>3. Direct a gentle blast of air into the gingival sulcus to aid in the detection of subgingival calculus.</li> <li>4. Examine the teeth for stains, soft and hard deposits, defects, and dental caries.</li> </ol> <p><b>NOTE:</b> Disclosing tablets or liquid greatly help to detect the soft deposits on the teeth, and are a valuable aid when you conduct your dental health counseling. Disclosing agents and dental health counseling is covered in other parts of this unit.</p>

Try to recognize deviations from the normal anatomy you are familiar with. The first phase of your examination may reveal conditions that prohibit the continuation of the appointment. These conditions include lesions and manifestations of viral infection. Be alert for all of the types of oral pathology. Bring any condition that might be a contraindication to prophylaxis to the attention of the dentist. As you surely are aware, wear gloves, face mask, and glasses while maintaining strict asepsis of all objects that come in contact with the patient during the screening examination and throughout the prophylaxis procedure.

### Disclosing

Apply disclosing agents to the teeth *before* prophylaxis procedures to reveal the presence of plaque. Plaque, which is nearly transparent, is difficult to see without these agents. Also use disclosing agents to assist in patient education techniques. These agents color the plaque, but they do not color clean tooth surfaces. The disclosing tablets or liquid are an indispensable part of the recommended method of cleaning (covered later in this unit). The coloring agent used in disclosing is a harmless red food

coloring. Ask the patient to chew a tablet or place three drops of liquid in the floor of the mouth. Another method to apply the liquid disclosant is to mix 10 drops in 2 tablespoons of water and have the patient swish the agent around in the mouth, then expectorate. Inspect the teeth with a mouth mirror using compressed air to move the papilla for a better view of the sulcus area. Give the patient a hand mirror to observe his or her own mouth while you are performing the examination. The red-colored areas on the teeth indicate plaque, which must be removed. Any pale, film-like areas on the teeth indicate the acquired pellicle. Now that you have finished your preparations, you are ready to begin the prophylactic procedure.

### **623. Locating and removing calculus**

The actual scaling process begins after you have located the deposits of calculus. First, always review current radiographs. Most heavy subgingival calculus can be seen radiographically. These deposits are seen as radiopaque spicules (spurs) or chunks of calculus. Drying the teeth with a stream of warm air helps to expose supragingival calculus. You can see some subgingival deposits if you direct the air stream into the gingival sulcus. Pay particular attention to areas of gingival inflammation. Deposits in the periodontal pocket cannot usually be seen. To locate these deposits, depend on your sense of touch. First, insert an explorer or a fine curette into the pocket area; you can usually feel the characteristically rough texture of the calculus deposits. The concave grooves leading into the furcation areas of multirooted teeth are the most difficult to locate and remove calculus deposits. These areas are located on the root surface just below the cervix. Second, use a very light, relaxed grasp when exploring for calculus. Your stroke should be overlapping so that the entire root surface is explored.

Scaling the teeth removes calculus from the tooth surfaces. Basically, scaling mechanically fractures the calculus deposits on the tooth's surface. It is relatively simple to remove large deposits of supragingival calculus, but removing small pieces of subgingival calculus in deep periodontal pockets is exceedingly difficult. Subgingival calculus can extend down the root of the tooth to the depth of the sulcus or pocket, and reliable removal of these deposits requires advanced training. You must remove all that you can to eliminate this source of irritation to the periodontium and refer the patient for follow-up care. When you remove the source of the irritation, the inflammatory response subsides. In the case of simple gingivitis, the gingiva usually heals completely and needs no further treatment. Advanced treatments such as subgingival scaling and root planing and surgical treatment may be indicated. The first step in removing calculus is to choose your instruments. Your choice of instruments is determined primarily by the amount of calculus present in the patient's mouth. Next, start your gross calculus removal by scaling. If the patient has a large amount of calculus or heavy stain, start your scaling procedure with the ultrasonic instrument. After you have removed the gross calculus or heavy stain, then use the various hand instruments to remove the remaining calculus and stain. If the patient has light to moderate deposits of supragingival calculus, you may choose to complete the entire procedure with hand instruments.

### **624. Using periodontal equipment**

The ultrasonic scaler and sonic scaler were designed for use primarily in oral prophylaxis and minor periodontal procedures. It's not uncommon, however, to find them used in other areas of dentistry. An important fact is that ultrasonic scalers do not eliminate the need for hand scalers.

#### **Ultrasonic scaler**

The ultrasonic scaler converts electrical energy into approximately 30,000 microscopically small mechanical strokes per second. These strokes are transmitted to an insert tip. Combined with a water spray and a light touch, the activated tip rapidly and gently dislodges moderate to heavy calculus, stain, and other accretions from teeth.

### Components

As the technician, you must understand the four major components of the ultrasonic scalers. These components work together; an electronic generator, a handpiece assembly, a set of interchangeable inserts, and a foot control (fig. 4-6).

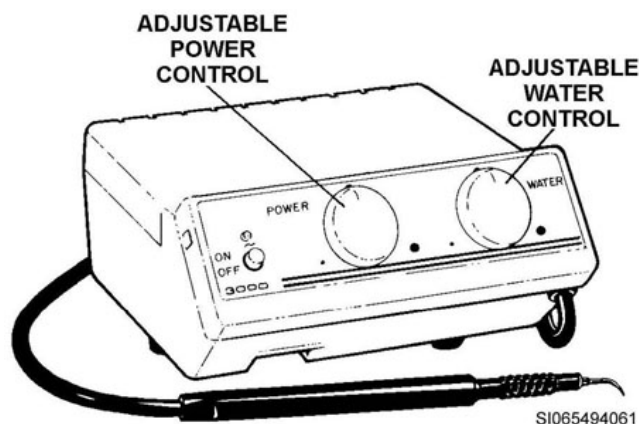


Figure 4-6. Ultrasonic scaler generator and handpiece assembly with insert.

The first component is the *electronic generator*. This produces the power required to activate the handpiece. The three controls located on the front panel are the on/off indicator, power adjustment knob, and water flow adjustment.

The *water flow adjustment knob* adjusts the volume of water permitted to flow from the handpiece. Because the water is heated in the handpiece, adjustment of the water flow rate controls the water temperature also. The greater the water flow, the lower the water temperature; the lesser the water flow, the higher the water temperature. Turn the knob clockwise to increase the water flow, and counterclockwise to decrease until the desired rate of flow is reached. At least 35 cubic centimeters (cc) of water per minute is needed to keep the handpiece cool depending on the power level setting. It's important to know that the power level affects the water temperature, too. An increase in the power level causes the water in the handpiece to heat faster, while a reduction heats the water at a slower rate. In general, adjust the water and power levels to the maximum setting that is tolerated comfortably by the patient (usually a low setting unless anesthesia is used).

The second component is the *handpiece and cable assembly*. This consists of a handpiece, which houses the interchangeable inserts and a cable. When operating ensure you place an insert by lubricating the O-ring on the insert with water and push the insert into the open end of the handpiece with a twisting motion (fig. 4-7). Next, check to see if the insert is fully seated. Then, if the insert is in place, hold the handpiece in an upright position. Next, activate the insert to bleed any air trapped from the handpiece when the insert was placed. From there allow the water to run from the handpiece for a few seconds until it flows without spurting. Repeat this procedure each time an insert is placed into the handpiece. Although the trapped air does not interfere with the handpiece operation, it could cause excessive heating.

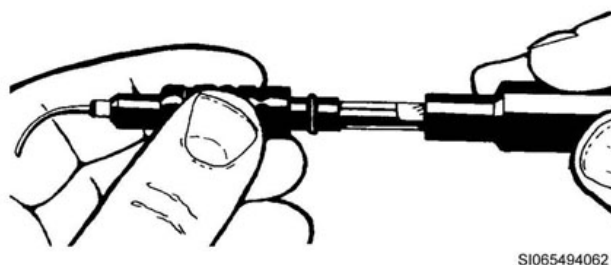


Figure 4-7. Placement of the insert into the handpiece.

The third component is a set of *interchangeable inserts*. They provide access to all areas of the mouth. The components of the inserts include the insert tip, water outlet, plastic grip, O-ring, connecting body, and magnetostrictive stack (fig. 4-8). The water outlet delivers preheated water along the entire working length of the tip. The O-ring acts as a water seal when the insert is placed into the open end of the handpiece. A connecting body transmits motion from the stack to the insert tip. The magnetostrictive stack converts electrical power supplied to the handpiece into mechanical vibrations to activate the insert tip.

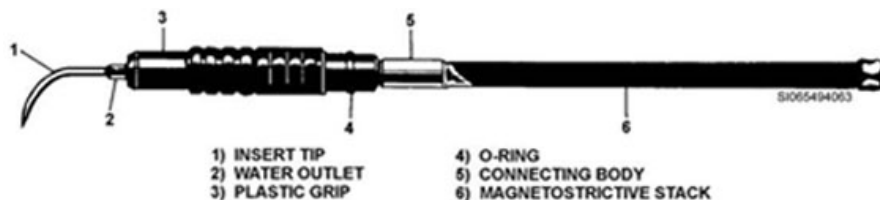


Figure 4-8. Components of the interchangeable inserts.

The handpiece is activated by an on-off contact of the fourth component, the *foot control* switch. When the foot control pedal is held down, the handpiece is activated and water flows. Both the handpiece and water flow are shut off when the pedal is released.

### **Water supply**

The ultrasonic scaling unit comes with an attached water supply hose. The other end attaches to a water connection on the dental unit. The water supply should range from a minimum of 25 pounds per square inch (psi) to a maximum of 60 psi. Water pressure outside of this range can cause the equipment to malfunction. Refer to the manufacturer's instructions for specific information. Flush the water line daily and before each patient use according to local infection control guidelines.

### **Interchangeable inserts and technique**

A wide variety of inserts are available for use with the ultrasonic scaler. Each insert has a different tip designed for a specific use and area of the mouth. The manufacturer for each insert recommends a specific power level. The 30K-10, 30K-1000, and 30KFSI-SLI-10S are among the more commonly used inserts.

The 30K-10, also known as the P-10 insert, is designed for supra- and subgingival calculus removal in all areas. The universal insert is ideally suited for finishing after heavier scaling. Use the sides of the insert with only light pressure, and push or pull strokes. Set the power level no higher than the patient can comfortably tolerate, usually low to medium. The 30K-1000 is a similar tip that is shorter and slightly thinner. Power settings and usage for this tip are similar to the 30K-10.

The slimline tips, such as the 30KFSI-SLI-10S, are used for the more delicate work of calculus and plaque removal, especially subgingivally. It is recommended that advanced training is provided before using this tip. Use slimline tips only at low power settings, and take care to prevent premature breakage.

Just like hand instruments, ultrasonic tips wear with normal use and lose up to 90 percent cleaning efficiency. Periodically check your inserts for wear. Replace inserts after one year's use in order to maximize cleaning efficiency and avoid breakage. Discard bent, scratched, or dropped insert tips to avoid breakage. After each use, thoroughly clean and sterilize the insert. Inserts may be safely autoclaved; however, do *not* use dry heat and do *not* clean in an ultrasonic cleaner.

### **Patient sensitivity**

If patient sensitivity is noted, several possibilities exist. First, be certain that the power setting is in a lower range. Then check to see if the insert tip is at a 15-degree angle to the tooth surface. You can increase the speed of movement of the insert in hypersensitive areas to alleviate discomfort. Also, a change in the motion of the insert tip from vertical to horizontal, or vice versa, helps diminish

sensitivity. Lighten your finger pressure on the handpiece, especially on exposed dentin. Last, if sensitivity persists, decrease the power setting.

### **Maintenance**

No special maintenance is required on the ultrasonic scaler; however, follow these precautions:

1. Do *not* place the unit on or next to a heat source since it could damage the electronic components.
2. Do *not* keep the unit in a tightly confined space or corner. Keep it where a normal amount of air will circulate freely on all sides of the unit.
3. Past precautions about using the unit around cardiac pacemakers should not apply to currently used pacemakers because they are electronically shielded to prevent problems. If in doubt, consult the patient's physician and follow the professional recommendations.

You may experience some common problems or difficulties with the ultrasonic scaler which may require minor adjustments. For example if the handpiece heats up, the cause is insufficient water or air trapped in the handpiece. If the water spray from the insert does not properly cover the area of the activated insert tip, the water flow adjustment is improperly set. Water leaks from the handpiece when in operation generally indicate that the O-ring on the insert is worn and requires replacement. Consult the manufacturer's instructions for causes and corrective measures of additional problems.

### **Sonic scaler**

The sonic scaler is an air-powered, mechanical scaler that runs at sonic frequency (6,000 cycles per second) and uses a controlled water spray. It removes large calculus deposits and stains from teeth. It does *not* eliminate the use of hand scalers. You must finish the scaling with hand instruments. It is used similar to the ultrasonic scaler, but the resulting tooth surface is usually left rougher.

### **Handpiece assembly and types of tips**

The sonic scaler consists of the scaler handpiece assembly and three types of tips (fig. 4-9). The handpiece assembly attaches to the hoses on the dental unit with a swivel handpiece attachment coupling. Using the air and water control valves on the dental unit controls air and water pressure. The three types of tips are the universal, sickle, and perio. The *universal* tip is used for all surfaces to remove medium and heavy calculus deposits. The *sickle* tip is recommended for patients with sensitive areas and to remove light to medium deposits of calculus. The *perio* tip breaks up heavy calculus and is recommended for supragingival scaling of the lingual mandibular incisors. Both the tips and handpiece assembly can be sterilized in the autoclave. Read and follow the manufacturer's instructions when sterilizing and for additional maintenance requirements.



**Figure 4-9.** Sonic scaler tips and handpiece. Left to right: Universal tip, Perio tip, and Sickle tip.

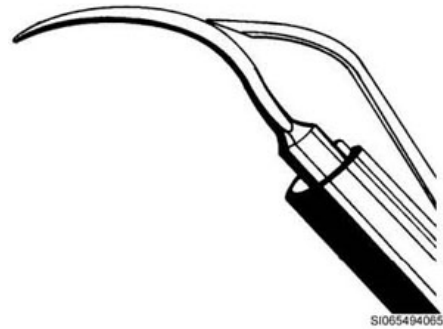
### ***Technique for ultrasonic/sonic scalers***

The techniques for both scalers are basically the same and are covered together. First, lightly apply the vibrating tip to the tooth's surface using a back-and-forth brush stroke to dislodge the calculus deposits. Second, use a continuous water spray to keep the tip cool and prevent the overheating of both the tip and tooth structures. The water spray also flushes the working site. Avoid placing the scaler tip directly on the enamel since this will cause pitting. Use the side of the instrument, not the tip.

*Cavitation* is the term used to describe the vibratory motion of the tip and the continuous stream of water that causes tremendous pressure and creates powerful bursts of collapsing bubbles. Cavitation allows for the removal of calculus.

Follow the manufacturer's instructions on setup, adjusting water temperature and flow, and ultrasonic operation. Nearly all units are tuned automatically, and a few specialized units require manual tuning.

Tip selection is based on the type, location, and amount of calculus deposit present. Larger tips are effective in removing heavy supragingival calculus deposits and stains; where smaller tips, similar in design to a scaler, are generally used for lighter deposits. The tips should be dull so as not to damage the tooth or root surface. The *universal* tip (fig. 4-10) is the most commonly used tip for moderately heavy deposits. Vertical strokes are used on proximal surfaces, and horizontal or oblique strokes are used on facial and lingual surfaces.



**Figure 4-10. Universal ultrasonic tip.**

Before starting the ultrasonic/sonic scaling procedure, first take some time to explain the procedure to your patient. The noise, excessive water spray, and vibratory sensations produced by the ultrasonic/sonic scaler may be a shock to the patient if he or she is not warned. Second, place a plastic drape on your patient in addition to the patient drape to prevent the patient's clothing from becoming wet. Third, have your patient rinse with an antimicrobial mouthwash for 30 seconds before treatment to reduce aerosol pathogens. Use the same operator and patient positions as discussed for maxillary and mandibular instrumentation. The amount of water that will accumulate in the patient's mouth will necessitate the use of a saliva ejector. Ask your patient to hold the evacuation tip, if necessary.

Fourth, hold the handpiece in a modified pen grasp with the end of the hose tucked in the palm of your hand. This prevents the hose from weighing down the handpiece. Then establish a fulcrum on a tooth surface as close as possible to the tooth on which you are working. The working end of the instrument should be adapted at a 10 to 15 degree tip to tooth angulation. You know that cavitation rather than sharp cutting edges accomplish calculus removal. This allows you to use the lateral surfaces, face, and back of the instrument tip for scaling. *Never use the toe or tip of the working end to scale.* Incorrect adaptation of the instrument to the tooth will cause pain to the patient and damage to the tooth. It's very important to understand that the working end of the instrument must be kept in direct contact with the calculus deposit. Remember to use light, rapid strokes keeping the working end moving at all times to avoid heat buildup.

### **625. Using periodontal instruments**

Hand scaling instruments are used after you are completed with the ultrasonic and sonic scalers. There are many types of hand scaling instruments that help ensure your patient receives the best treatment possible. Consider hand scaling instruments as the "fine tuning" of the treatment. Below discusses the common hand scaling instruments used along with the proper instrumentation.



## Hand scaling instruments

Curettes are recommended instruments for removing moderate to fine deposits of subgingival calculus. Past investigations have shown that hand scaling with curettes is superior to scaling with other instruments, but this philosophy is changing as ultrasonic instrumentation is becoming more refined. These instruments have proven to be less traumatic to hard structures, cementum, and supporting structures of the teeth. All the curettes discussed in this lesson can be placed subgingival to the base of the sulcus or pocket. With them subgingival scaling can be accomplished with minimal discomfort to the patient and, and if the instruments are handled correctly, with minimal damage to their soft tissues and teeth. Bear in mind that thorough subgingival instrumentation is an advanced skill that requires additional training and time to develop. However, knowledge of the instruments used for supra- and subgingival instrumentation is necessary for all technicians because they are commonly used instruments in all clinics.

Each instrument has a working end or blade, a shank, and a handle. The shank connects the blade to the handle. The shank of each posterior instrument is angled making it easier to reach the surfaces of the posterior teeth.

### *Gracey curettes*

The Gracey curettes are specifically designed to remove light calculus deposits on root surfaces within the periodontal pocket. Gracey curettes have flexible shanks that allow the ability to feel the calculus deposits that cannot be seen below the gingiva. The working ends on the Gracey curettes are tilted so that one cutting edge will be at the correct angle to the root surface while the opposite cutting edge is angled away from the soft tissue of the pocket. These curettes are designed to adapt to specific surfaces of the teeth, and they are also known as area specific curettes. An example of this would be the Gracey 11. It will adapt to mesial surfaces of the posterior teeth whereas the Gracey 14 will adapt to distal surfaces of posterior teeth. The following double-ended instruments make an ideal set:

- Gracey 1–2.
- Gracey 7–8.
- Gracey 11–12.
- Gracey 13–14.

Both the *Gracey #1/2* and *#3/4* are designed for use on anterior teeth. The *Gracey #1/2* has a medium length shank and mild angulation which adapts primarily to the facial root surfaces of incisors and cuspids. The *Gracey #3/4* has a short shank and sharper angulation which adapts best to the lingual surfaces of anterior teeth. It is important to note that the cutting edge of the *#3/4* is the outer edge along the convex curvature of the working end.

The *Gracey #5/6* has a long shank with slight angulation. It is used on all surfaces of anterior teeth and some bicuspid.

The *Gracey #7/8* and *#9/10* are designed primarily for use on the facial and lingual surfaces of posterior teeth. The severe angulation of the longer shank makes both these instruments useful in deep depressions and furcations.

The *Gracey #11/12* has a longer shank with several shallow angulations. Its sharp convex cutting edge is used on the mesial surfaces of posterior teeth. One end of the instrument is designed to scale the mesial surfaces from the facial aspect, and the other end from the lingual aspect. This instrument is also well suited for use in furcations and depressions.

The *Gracey #13/14* is designed with a triple-bend shank for use on the distal surfaces of posterior teeth. Distal surfaces are instrumented from the facial and lingual aspects.

**McCalls curettes**

Instrument manufacturers also market curettes with strong, rigid shanks to remove moderate calculus deposits. In such cases, use a curette with a rigid shank. The *McCalls 13–14* is used for scaling bicuspsids; the *McCalls 17–18* and *Younger-Good 7/8* are used for scaling molars and providing the strength needed to remove moderate deposits.

The U-15-33 is a sickle-type rather than a curette-type scaler and is particularly effective for scaling anterior teeth. This scaler is primarily used supragingival to remove moderate to heavy calculus, but with great skill, can be used up to two millimeters (mm) subgingivally. Two hazards of the sickle scaler are the sharp pointed tip and the edge on the bottom of the instrument, which can gouge tooth surfaces or traumatize the gingival tissues. The solid design of the instrument makes it strong enough to remove heavy calculus deposits as long as the cutting edges are sharp and used with adequate pressure against the tooth during the working stroke. Sickle scalers are limited to removing supragingival calculus or subgingival calculus, which is usually only 1 to 2 mm beneath the gingival margin. The cutting edge is inserted under the ledge of calculus and used with a pull stroke. Sickle scalers are *not* effective for deep deposits and will cause tissue trauma if an attempt is made to use it in deep pockets.

Remember that rigid instruments should *not* be used for definitive scaling or root planing. The rigid shank design results in limited tactile transfer to the operator's fingers. Use of rigid curettes for root planing could result in excessive removal of root structure.

**Columbia curette**

The *Columbia 13–14* serves as a *universal curette* to remove moderate or light calculus located supra or subgingivally. The design of a universal curette differs from that of an area specific curette such as the Graceys in that the universal curette has two parallel, straight cutting edges. These cutting edges meet to form a rounded toe. The working end has a rounded back and is semicircular in shape. These design features make the universal curette with the midline and parallel it with the long axis of the incisors.

**Periodontal diagnostic instruments**

As a dental assistant, you may be tasked with performing periodontal examinations and documentation prior to cleaning a patient's teeth. The primary instruments and their use are as follows:

- *Dental mirrors* are used by the dentist, or dental prophyl technician, to view a mirror image of the teeth in locations of the mouth where visibility is difficult or impossible. The mouth mirror can also be used to reflect light onto desired surfaces, and with retraction of soft tissue improve access or vision.
- A *dental explorer*, also known as a *sickle probe*, is an instrument used in the basic dental setup. The sharp point at the end of the explorer is used to enhance tactile sensation. The primary purpose for this instrument is to detect caries, cracks in the tooth structure, and locate foreign objects. Consequently, you will use explorers to inspect every aspect of the clinical crown of each tooth and document your findings.
- There are different types of explorers; the most common one used in Air Force clinics is referred to as the Number 23 explorer. It is also called the *shepherd's hook*. Other types of explorers are the 3CH, also known as a *cowhorn*, and the Number 17. The 3CH and Number 17 are particularly useful when inspecting the interproximal surfaces of the teeth.
- A *periodontal probe* is a slender instrument which has indentations that are spaced in millimeters. These probes are designed to measure the depth of the sulcus of the tooth. When using this instrument, place the probe between the tooth and the gingival, using enough pressure to drop the probe to the bottom of the sulcus. You will do this task for each tooth, being sure to examine the six areas to be measured. Three are located on the facial aspect of

the tooth; the other three are located on the lingual side of the tooth. Document probing depths for all six areas on the patient's AF Form 935, Periodontal Diagnosis and Treatment Plan.

- A *furcation probe* is a blunt tipped instrument used to measure bone loss in teeth that have multiple roots. This instrument is mainly used in the molar regions of the patient's mouth. As the examiner, if you can visualize gingival recession to the point of seeing the top of the roots, it is time to use this instrument. Place the probe into the sulcus, measuring from the bottom of the sulcus to where the roots visually separate. Document the depth on the AF Form 935.

### **Other periodontal instruments**

In addition to the scaling instruments already mentioned, three other instruments are needed to give you a complete instrument setup for each patient.

#### ***Periodontal probe***

The *periodontal probe* is used to evaluate the periodontium. The shank of the probe forms an angle between the working end and the handle. The probe is very thin and can be inserted easily to the depth of the gingival sulcus or pocket. The working end is scored at mm intervals for pocket measurement. There are many probe designs, but all have millimeter scales for measurements. Some probes have mm marks for every mm from 1 through 10 or 1 through 15. Others have marks for every mm from 1 through 3, marks for every 2 mm from 3 through 7, and marks for every mm from 7 through 10.

Hold the calibrated probe in a modified pen grasp and a finger rest close to the area to be probed. Your grasp must be very light for maximum tactile sensitivity. With the probe parallel to the long axis of the tooth, place the side of the instrument tip against the enamel or cemental surface above the gingival margin. Using very light pressure, gently insert the tip beneath the gingival margin and slide the tip to the base of the sulcus. The base of the sulcus will feel soft and resilient.

There will be many times when a calculus deposit or a defective margin of a restoration will inhibit your path of insertion. The calculus deposit will feel hard in comparison to the soft, elastic feel of the floor of the sulcus.

Healthy gingiva has an average depth of 1 to 2 mm but may range from 0.5 to 3.0 mm in depth. A depth greater than 3.0 mm is termed a *periodontal pocket*. **NOTE:** Pocket depth is measured for the gingival margin to the junctional epithelium, *not* from the normal level of the gingival tissue.

#### ***Explorer***

The explorer is used for oral inspection during oral prophylaxis procedures. The Orban-type explorer is recommended for this purpose. This type of explorer can be a single-ended instrument or one of two unpaired double-ended instruments. The opposite working end is usually a calibrated periodontal probe or some other type of explorer. It's excellent for use in detection of subgingival calculus. Keep in mind that when all calculus deposits have been removed with the curette, make a definitive evaluation with an explorer. Since the explorer provides tremendous tactile information, it's likely you'll find some calculus deposits that went undetected with the curette.

#### ***Mouth mirror***

The mouth mirror provides visibility of tooth surfaces in areas of the mouth that are beyond the range of direct vision. The mouth mirror has four purposes: (1) indirect vision, (2) indirect illumination, (3) trans-illumination, and (4) retraction.

Avoid causing discomfort to the patient when you are using the mouth mirror. Do not use excessive pressure on the handle or shank against the patient's lips or corner of the mouth. Do not press the edge of the mirror into the gingiva. Since some teeth are sensitive to metal, do not touch the teeth with the mirror when you are inserting it into or removing it from the mouth.

You can prevent fogging of the mirror by (1) requesting the patient breathe through the nose rather than the mouth, (2) warming the mirror by holding it against the patient's buccal mucosa, or (3) heating the mirror under warm running water.

### **Instrument grasps**

A correct instrument grasp is an important part of instrumentation. It has a direct bearing on your ability to manipulate instruments. There are three instrument grasps to use during oral prophylaxis procedures—(1) pen, (2) modified pen, and (3) palm.

#### ***Pen grasp***

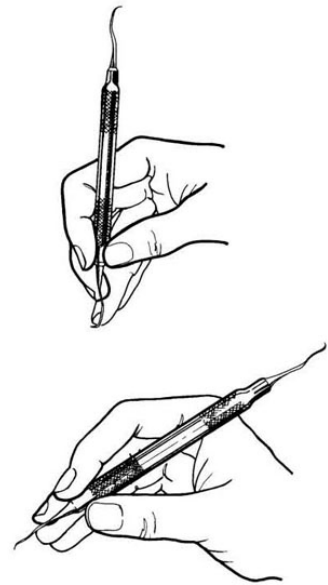
With the pen grasp, hold the instrument the way you would hold a pen when writing. Your thumb and first finger grasp the handle while your middle finger supports the instrument from underneath. This is a favorite grasp when using the mouth mirror.

#### ***Modified pen grasp***

With the modified pen grasp, hold the instrument in basically the same way as in the pen grasp, except that the pad of your middle finger rests lightly on the shank of the instrument (fig. 4-11). This finger is used to feel the shank vibrate when the instrument's working end rubs over a rough surface. The middle finger also helps to guide the instrument. The ring finger is used to stabilize the hand in the patient's mouth. Balance your hand and the instrument on this finger. The little finger serves no real function and should remain relaxed.

#### ***Palm grasp***

When using the palm grasp, the index finger, middle finger, ring finger, and little finger hold the instrument so that it rests in the palm of the hand. Your thumb remains free to stabilize your hand in the patient's mouth, or can be used to support an instrument when sharpening (fig. 4-12). This grasp is rarely used in the mouth and only when exceptional force is needed.



**Figure 4-11. Modified pen grasp.**



**Figure 4-12. Palm grasp.**

## Finger rest

Use a finger rest (or fulcrum) to maintain control of the instrument. It's a stabilizing point for your hand while you are working in the mouth. Use a finger rest in the same arch as the working area and as close to the working area as possible. In the modified pen grasp, the third or ring finger is always used as a finger rest. This finger can rest on the teeth, gingiva, another finger, or a combination of these. Do not use soft movable tissue for a finger rest. When you are holding the instrument in the pen grasp, use your third finger as the finger rest. When you are using the palm grasp, use your thumb for the finger rest. The same finger used as a finger rest also acts as a fulcrum, the pivot point around which the necessary force to remove the calculus can be exerted.

## Instrumentation

After you have located the calculus deposits, you are ready to perform the instrumentation necessary to remove them. There are three basic scaling strokes; the vertical, the horizontal, and the oblique. The first is the vertical stroke, which parallels the long axis of the tooth. Use the vertical stroke to remove calculus from the proximal surfaces of the teeth. The second stroke is the horizontal stroke, which parallels the cervical line. Use this stroke cautiously to remove deposits from the facial and lingual surfaces of the teeth. The vertical stroke is considered the safest scaling stroke because the instrument's cutting edge does not come in contact with the epithelial attachment. *Do not* use the horizontal stroke where probe measurements show that the sulcus depth is uneven, because the curette will be dragged into the epithelial attachment at the higher areas. Even where the sulcus depth is uniform, be extremely careful when using the horizontal stroke. The last stroke is the *oblique or diagonal stroke*, which is made at a 45-degree angle to the long axis of the tooth. Use this stroke to scale the majority of the tooth's surfaces (fig. 4-13). Often vertical or oblique strokes are used for scaling. They are efficient and easy to control. However, the direction of the stroke will depend on the type of instrument, area, and tooth surface involved.

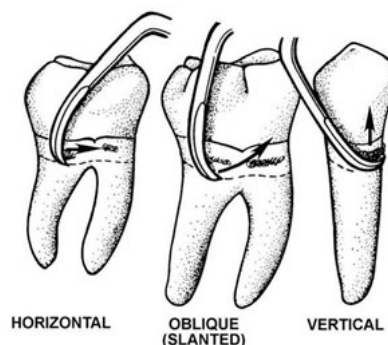


Figure 4-13. Scaling strokes.

There are three distinct phases in each scaling stroke—(1) exploratory phase, (2) positioning phase, and (3) working phase. Refer to figure 4-14 as you cover these phases. Figure 4-14, view A, shows the exploratory phase of the stroke. Before beginning this stroke, establish your finger rest on a dry, firm tooth structure as close as possible to the tooth being scaled. Gently insert the curette under the gingival margin at zero degrees. Grasp the curette lightly and move it down toward the base of the gingival sulcus. Keep the curette's tip in light contact with the calculus or tooth surface and continue the downward movement, until you feel the tension of the soft tissue attachment.

When you reach the base of the apical extent of the stroke, you are ready for the positioning phase. This phase is illustrated in figure 4-14, view B. Position the blade at the apical aspect of the deposit so that it forms a 45 to 90 degree angle with the tooth. If the angle is less than 45 degrees, your working stroke will probably slip over the deposits or your blade will not engage the deposit and will slip over the calculus or burnish it down. If it is more than 90 degrees, you are in danger of gouging the root surface. After you have positioned the instrument properly, you are ready to begin the working phase of the stroke.

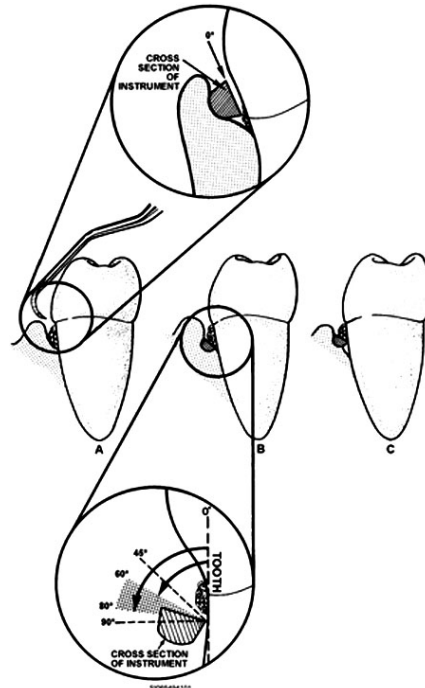


Figure 4-14. Phases of the scaling stroke.

Before starting the working phase of the stroke, tighten your grip on the instrument. Use your hand, wrist, and arm to activate the instrument (fig. 4-15). Avoid scaling with independent finger movements as this technique is extremely fatiguing. Your working stroke should be short, controlled, decisive, and directed in a manner to protect the tissues from trauma. With the short stroke, you can maintain control of the instrument and adapt the cutting edge to variations in the tooth's surface. Always keep as much of the working blade (the terminal one-third of the blade, not just the point) on the tooth as possible. The exact length of the stroke depends on the height of the deposits. During the working stroke, slightly increase the pressure on the fulcrum to balance the pressure of the instrument on the tooth. The working stroke is shown in figure 4-14, view C.

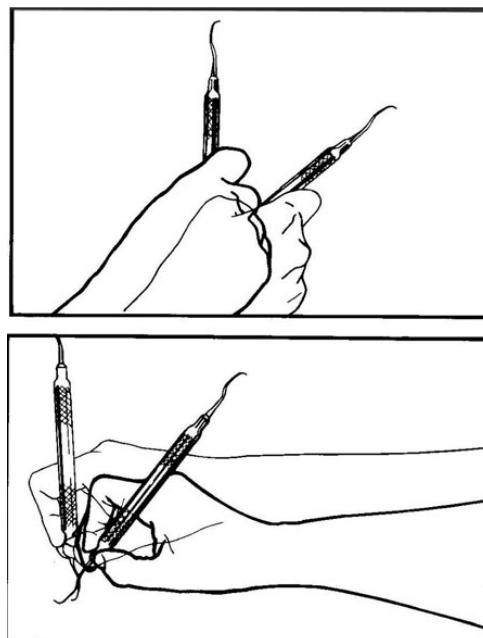


Figure 4-15. Instrument activation.

Try to work within the boundaries of the pocket or sulcus to eliminate the need for the repeated withdrawal and reinsertion of the curette. This practice not only saves time but also reduces the number of times that the instrument must pass over the tooth's highly sensitive neck and gingival margin, where the enamel and cementum is thinnest. Whenever possible, remove the whole thickness of calculus in one piece. Never remove calculus by shaving it in layers. Shaving often leaves a thin layer of calculus, which is difficult to distinguish from the tooth's surface. This thin layer can serve as a nucleus for new plaque and calculus formations. Frequently irrigate the pocket and sulcus areas to prevent the implantation of calculus deposits into the underlying tissues. After you have completed the scaling procedure, you are ready to polish the teeth.

## 626. Polishing teeth

Polishing is meant only to remove plaque and extrinsic stains from natural teeth; it does not remove calculus. To polish teeth correctly, the technician should be familiar with all instruments, materials, procedure, and technique for an effective polishing.

*Prophylaxis polishing instruments* are used in conjunction with an abrasive to remove stains and polish teeth. They come in cup, brush, or air polishing form. The polishing cup is made of rubber and polishes teeth and restorations. These cups are designed to screw into a slow-speed, right-angle (prophylaxis) handpiece or into a contra-angle mandrel (fig. 4-16). Abrasive pumice is used with the polishing cup to polish natural teeth. The polishing brush is designed to screw into the right-angle handpiece like the polishing cup. It is made of natural bristles (swine hair) mounted on a screw stem. The polishing brush removes stains from tooth fissures and other areas, which the polishing cup cannot reach. The air polishing unit is described in a separate section below.



Figure 4-16. Threaded prophylaxis polishing cup and brushes.

Have the necessary rotary instruments available for use in your dental treatment room. Also, properly clean, disinfect, sterilize, and store all dental instruments. Discard paper and plastic-backed abrasive disks after one use. Other disks and wheels have to be disinfected in a chemical solution rather than sterilized because sterilizing temperatures affect the abrasive bond (glue).

After you have completed the scaling procedures, evaluate the teeth to determine if any extrinsic stains remain that need to be removed using an abrasive agent. The prophy polisher and abrasive agents can have harmful effects on the teeth, and indiscriminate use of the polisher is not recommended. Harmful effects could include loss of tooth structure, removal of fluoride-rich surface enamel, possible trauma to gingival tissue, and patient reliance on professional plaque control.

Be selective, not negligent! Don't jump right in with the attitude that all patients are going to need every tooth in their mouth polished. Light stains may be localized in anatomic grooves where polishing with an abrasive agent may be indicated for that specific area. On the other hand, you may find heavy and/or generalized stains that indicate a full mouth polishing. Always remember when you are scaling or polishing, look and think before you leap.

Now that you have determined that polishing is necessary, you're ready to begin using the polishing handpiece. The first step is to prepare the *prophylaxis angle*. The prophylaxis angle is attached to the threaded head of the handpiece that holds a rubber polishing cup or bristle brushes used in the polishing procedure. The handpiece is right-angled to provide access to the posterior teeth.

Next, hold the handpiece in a modified pen grasp. Use your middle finger to help support the handpiece. Establish a finger rest as close as possible to the tooth you are polishing.

Then, using the rheostat foot pedal to control the speed of the polishing handpiece, you want to achieve a slow, even speed. Higher speed results in excessive frictional heat and pain to the patient. Use firm pressure when applying the rubber cup to tooth surfaces that need polishing. You'll know that you have applied sufficient pressure when you see the cup edge flare. Don't bounce the cup on and off the tooth. Keep the cup in constant motion, staying in constant contact with the tooth. Remember to bring the cup almost in contact with the tooth before you begin to polish.

As you start polishing, begin at the gingival margin of the tooth and work toward the occlusal or incisal edge, using vertical or oblique *pulling* strokes.

**CAUTION:** The cup is always kept in contact with the tooth, not the gingiva.

Remember, the rotating cup can sling polishing material out of the patient's mouth, so always wear protective gloves, glasses, and mask. Drape the patient to protect his or her clothing.

You may not be able to reach all of the interproximal areas with the polishing cup. To polish these hard to reach areas, place the polishing agent in the facial and lingual embrasures and carry it into the interproximal space with dental floss or dental tape.

If you discover an overhanging restoration, call it to the attention of a dentist or make a note of this finding in the remarks section of the patient's dental record. Overhanging restorations are a prime source of gingival irritation, and they should be promptly corrected.

### **627. Applying fluoride**

Fluoride can be administered by three different methods. The first method involves the application of fluoride solution. This type of fluoride must be painted onto the individual tooth surfaces with a cotton tip applicator, which is rarely done. The second method is the tray technique, which is used to apply fluoride gels or foams to the teeth. The use of fluoride gels and foams for fluoride applications has greatly increased the simplicity of applying fluoride. You'll be focusing your attention on tray application. The third method is application of fluoride varnishes to caries susceptible teeth. This method is growing in popularity and use.

A variety of trays are available for fluoride application, most of which are made of disposable materials that reduce the chances of cross-contamination and eliminates additional time required to sterilize reusable ones. Disposable trays come in a selection of arch sizes to ensure optimal fit for each patient. The tray should provide complete coverage of all erupted teeth without going beyond the most distal tooth surface. A custom-fitted tray requires less gel to cover all surfaces of the teeth and promotes concentration of the gel against the teeth onto proximal surfaces. Use a technique that minimizes the amount of gel needed. Refer to the manufacturer's instructions on the amount of gel to place in the trays, but a narrow strip of fluoride gel along the bottom of the tray is normally adequate. A technique that minimizes the amount of gel needed reduces the chance that the patient will swallow excess gel. Apply fluoride as follows:



1. Select a tray size and try it in your patient's mouth to make sure the gel will contact all teeth.
2. Dry the patient's teeth; keep them as dry as possible until trays are inserted. Dry each arch separately before placing the tray into the patient's mouth.
3. Insert one end of the mandibular tray at a time from the side of the patient's mouth rather than directly from the front.
4. Insert the saliva ejector before placing the maxillary tray. Place the maxillary tray and ask your patient to close his or her teeth together gently.
5. Apply fluoride gels for four minutes. This is the current guideline from the ADA, regardless of manufacturer instructions. Allow your patient to expectorate any remaining fluoride from the mouth.
6. Instruct your patient not to rinse, drink, eat, or smoke for at least 30 minutes.

## **628. Performing dental implant hygiene**

Although patients should always practice proper dental hygiene, this is especially true once a dental implant has been put into place. Whenever artificial items are placed in the human body, there is always a potential for risks to be involved. Plaque (biofilm) develops more rapidly around implants, which leads to more bone resorption around fixtures in patients with poor oral hygiene. Dental plaque is the etiologic agent for peri-implant diseases; fortunately, plaque can be eliminated by proper oral hygiene.

### **Routine assessments**

Before beginning any treatment, an examination and assessment of the soft tissues surrounding the dental implant abutment and prosthesis provide the dentist and technician with valuable information that may influence treatment planning. For example, the presence of hard and soft deposits and the condition of the peri-implant tissues will influence the kind and type of treatment and individualized home care instructions given. There are three routine assessment of implant maintenance: tissue and probing, mobility, and radiographs. Let's discuss each of these in more detail.

### ***Tissues and probing***

The first step in a routine assessment begins with the clinical assessment of peri-implants soft tissues visual examination. Characteristics of the soft tissue should be noted and compared with baseline records. The plaque index (PLI) is an important factor in peri-implant inflammation, but is not a clear contribution to fixture loss. Color, contour, and consistency of keratinized tissue and lining mucosa must also be considered when discussing the peri-implant tissue health. Probing is not recommended if the soft tissue has the appearance of clinical health. This is because the seal is weak between the implant and gingiva, if necessary probing should be done gently. Probing depths alone do not indicate the loss of an implant; increased depths, however, may indicate a failing implant. It is important to use only plastic probes to avoid scratching the surface, which may create plaque-retentive areas. The pocket depth may represent potential for future disease activity.

### ***Mobility***

Second, the presence or absence of mobility of the implants should be evaluated. To check for mobility of the prosthesis, two instrument handles or the thumb and index finger of one hand can be used to attempt to physically move the prosthesis. Accurate assessment of the abutment can be performed only if the prosthesis is removed. Whenever there is movement that is more than normal, inform the dentist. Mobility is the key sign of a failure.

### ***Radiographs***

The last routine assessment step is to take radiographs of body changes around the implants, such as crestal bone levels and radiolucency. They are useful in assessing bone height and density and in showing the functional relationship between the implant, abutment, and the prosthesis. They assist in

determining the distance between the threads of the implant. This distance may be measured from the standardized radiographs over time to assess attachment levels. Although it is a late sign, radiographic evidence of bone loss is the most reliable for evaluating implants. Radiographs are also used to determine if there is radiolucency around a failing and mobile implant.

A significant part of the implant maintenance appointment is occupied by the cleaning and polishing of implants, prosthesis, and remaining natural teeth. It is also necessary to instruct implant-prosthetic patients about home care measures, which should be targeted specifically for their implants.

### **Professional implant maintenance**

Titanium surfaces are very susceptible to abrasion, and to avoid contamination the usual metal instruments *should not be used*. Special scalers made of plastic are designed for the assessment and cleaning of dental implants. The special material enables optimum cleaning without damaging the soft metal titanium surface. A major goal of abutment instrumentation is to avoid roughening the surface. Implants must be highly polished and kept scratch and gouge free. Scratches, pits, fissures, and gouges can offer a possible environment for plaque and calculus accumulation. Incorrect dental care by the technician can lead to scratches and gouges in the titanium. The optimal peri-implant health depends largely on the inhibition of plaque formation, the prevention of early plaque attachment, and the elimination of existing plaque. The success of an implant can hinge on implant maintenance being performed at regular intervals. It is recommended that the same dental technician follow the patient's hygiene status throughout the maintenance period when possible. To achieve that health, there are several things to remember when performing implant maintenance:

- When handscaling, use plastic instruments only.
- Rubber cup polishing is the least abrasive if not overdone.
- Ultrasonic and air powder instruments severely abrade titanium implants – do not use.
- If you use ultrasonics, use plastic inserts only.

### **Home care maintenance**

Numerous items play an important role in dental maintenance. Home care instructions should be reviewed and reinforced at each and every appointment. Written instructions are often helpful. They help the patient remember the important information you instruct him or her on, after the appointment. A variety of cleaning methods may be recommended, depending on the type of design of the prosthesis.

#### ***Home care aids***

The selection of hygiene aids will depend upon the type of prosthesis as well as the manual dexterity of the patient. Different aids for cleaning the implants are commercially available. However, effective cleaning can usually be achieved with a conventional toothbrush, interdental brushes and Superfloss. An assortment of brushes may be used to effectively remove soft deposits. A standard toothbrush is usually recommended for the facial, lingual, and occlusal surfaces of the prosthesis. It is recommended that only toothbrushes with soft, rounded bristles are used, because the surfaces of the implants are easily damaged. The lingual surfaces of bars and bridgework are especially critical zones for implant hygiene. A nylon-coated interdental brush is effective for plaque removal on the gingival side of the suprastructure and proximal surfaces of the abutments. A flat end-tuft brush is used on the facial surfaces of the abutment cylinders. The tapered end-tuft brush is preferred for the plaque removal on the lingual abutment surfaces. For unusually large spaces, there are interdental brushes that have a Teflon or nylon coating and core. They are also useful for cleaning the interproximal areas and should be inspected for exposed wires that can scratch abutments and replaced frequently.

Items such as Superfloss or yarn threaded in between abutments with floss threaders are effective for cleaning interproximally. Prosthetic bridge design and patient dexterity dictate selection of the type of floss or floss cord. A flossing cord specifically designed for dental implants polish the abutments and the gingival side of the prosthesis. The hooked end of the cord is used as a threading device, making

insertion between adjacent abutment cylinders relatively easy. Once inserted, the cord is criss-crossed and moved from side to side and up and down to reach the entire circumference of the abutment. A thinner cord for light embrasure may be used; the cord is durable enough to be used several times by simply rinsing and drying after each use.

Patients can be instructed to soak their overdenture in one part water to one part white household vinegar and antibacterial denture tablet before thorough brushing on a daily basis. The abutments may be brushed with either a standard soft toothbrush or a flat end-tuft brush. Careful, individualized instruction is usually required with any dental implant patient.

### ***Patient education***

Education is the most important step in delivering implant care to a patient. Through explanation, education and visual demonstration you stress the importance for a successful implant maintenance program. Involve the patient in the process and have him or her demonstrate his or her routine to you. Be sure to document the aids prescribed and instructions given.

The long-term success of the dental implant lies in the ability of the patient to control daily plaque accumulation. The dental technician plays an important role in assisting and influencing the dental patient to maintain an adequate oral hygiene level. Implant maintenance is not only the responsibility of the technician, but the patient as well. The whole team plays a part in long term successful implant maintenance procedures. Communication between the technician and patient is essential for long-term implant success.

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## **Self-Test Questions**

**After you complete these questions, you may check your answers at the end of the unit.**

### **622. Preparing for oral prophylaxis**

1. What must you do before the patient enters your DTR?
2. What can an evaluation of your patient's radiographs reveal?
3. What form is used to find out whether there are any problems that can affect your patient's dental treatment?
4. Describe the benefits of correct operator and patient positioning.
5. Who is responsible for the physical and psychological safety of your patient?
6. To maintain good working posture, briefly explain how your feet, thighs, back, head, and arms would be positioned as a seated operator.

7. How far above or in front of the patient is the unit light kept?
8. What three purposes do screening examinations serve?
9. How many phases make up the screening examination? Name them.
10. When should disclosing agents be applied to the teeth?
11. What does the use of a disclosing agent reveal?

**623. Locating and removing calculus**

1. Into what area should you direct a stream of air to locate subgingival calculus?
2. What must you depend on to locate calculus deposits in the periodontal pocket?
3. What is the chief characteristic of the calculus deposits in periodontal pockets?
4. In what area is it most difficult to locate and remove calculus deposits?
5. What is the purpose of scaling the teeth?
6. Why must all calculus be removed from the teeth?
7. What is the primary factor in instrument selection?
8. What instrument can be used to remove large amounts of calculus or heavy stain?
9. Which instruments are effective in removing light to moderate deposits of supragingival calculus?

**624. Using periodontal equipment**

1. Explain how the ultrasonic scaler operates and how it is used?
2. What are the four major components of the ultrasonic scaling unit?
3. What component produces the power required to activate the handpiece?
4. Explain what the waterflow adjustment knob controls.
5. How much water is needed to keep the handpiece cool?
6. How does the power level affect the water temperature?
7. Explain how to properly place an interchangeable insert into the handpiece of the ultrasonic scaling unit.
8. How does trapped air affect the unit?
9. Name each of the components of the interchangeable inserts and give their function, if any.
10. Explain how the ultrasonic scaling handpiece is activated.
11. How is the water line cared for daily?
12. Name and describe the use and technique for each of the three commonly used inserts.
13. Why should inserts be checked? When should they be replaced or discarded? How are inserts cared for after each use?

14. How can patient sensitivity be reduced when using the ultrasonic scaling unit?
15. List the precaution measures to be followed when using the ultrasonic scaling unit.
16. What is wrong if the water spray from the insert does not properly cover the area of the activated insert tip?
17. Describe the sonic scaler. What are its uses?
18. How can air and water pressure be controlled with the sonic scaler?
19. Name and describe the uses of each of the three types of sonic tips.
20. How is the sonic scaler sterilized?
21. Describe cavitation.
22. Name the most commonly used tip for moderately heavy deposits.
23. Why would it be a good idea to explain the ultrasonic/sonic scaling procedure to your patient?
24. When should the toe or tip of the working end of the ultrasonic instrument be used to scale?

**625. Using periodontal instruments**

1. What instruments are recommended for removing fine deposits of subgingival calculus?
2. Name the curettes that are specifically designed to remove light calculus deposits on root surfaces within the periodontal pocket.

3. The *Gracey 1-2* is used to scale which teeth?
4. Which teeth would you scale with the *Gracey 13-14*?
5. What three instruments provide the strength needed to remove moderate calculus? On what teeth would they be used to scale?
6. What is a U-15-33?
7. What is the dental explorer used to detect and inspect?
8. Explain how to use the periodontal probe.
9. What is the furcation probe used to measure?
10. What is the purpose of the periodontal probe?
11. What are the three instrument grasps?
12. When using the modified pen grasp, why is it important that your middle finger rest lightly on the shank of the instrument?
13. What instrument grasp is useful when you need exceptional force?
14. Which finger is used as a finger rest when using the modified pen grasp?
15. Name the three basic scaling strokes.

16. Which stroke is considered the safest scaling stroke and why?
17. What are the three distinct phases in each scaling stroke?
18. Before beginning the working phase of the stroke, at what angle should the blade be positioned?

#### **626. Polishing teeth**

1. What are prophylaxis polishing instruments usually used with and why?
2. How are the polishing cups and brushes used for prophylaxis secured in the handpiece?
3. What are the harmful effects of indiscriminate use of polisher or abrasive agents?
4. Why is the prophylaxis handpiece right-angled?
5. What is a rheostat?
6. Name one way to reduce heat generated during the polishing procedure.
7. How will you know when sufficient pressure is being applied to the rubber cup?
8. What is used to carry the polishing agent into the interproximal space?

#### **627. Applying fluoride**

1. Which type of fluoride application is used to apply gels or foams to the teeth?
2. What makes the use of disposable trays so desirable?



3. What are the advantages of a custom-fitted tray?
4. Why would you use a technique that minimizes the amount of gel needed?
5. Why take time to try the tray in your patient's mouth?
6. Briefly describe the insertion of the fluoride trays.
7. How long should your patient be instructed not to rinse, drink, eat, or smoke following fluoride application?

#### **628. Performing dental implant hygiene**

1. What are the routine assessments of implant maintenance?
2. What is the major goal of abutment instrumentation?

## **4-2. Dental Health Education**

It is the goal of preventive dentistry to help people have the best oral health throughout their lives. To achieve this goal, we must work together with our patients to prevent new and recurring disease. Proper education and counseling are two ways for you to motivate patients to improve their oral hygiene. Many patients have misconceptions concerning their oral health due to the lack of good, sound professional advice. You are responsible for correcting those misconceptions and educating your patients with an adequate oral health program.

#### **629. Classifications of micro-organisms and oral cavity bacteria**

There are many ways to classify micro-organisms. Your study will divide them into six areas: (1) bacteria, (2) spores, (3) viruses, (4) rickettsiae, (5) protozoa, and (6) fungi. In this lesson, you will study their main facets and differentiation between each are to give a general overview of each organism.

##### **Bacteria**

Bacteria are one-celled micro-organisms. Unlike the typical cell, a bacterial cell does not have an organized nucleus. The nucleus is diffused throughout the cell. Bacterial cells occur in a number of shapes: spherical, called *cocci*; rod-shaped, called *bacilla*; and corkscrew shaped, called *spirochetes*. The shape of a particular bacterium is one of the criteria used in its identification.

Another factor in the identification of bacteria is the way the cells are arranged or grouped together. An arrangement grouped in clusters like grapes is called staphylococci. Some cocci arrange themselves into pairs. Paired organisms are called *diplo* and are termed *diplococci*. Still another group of cocci, the streptococci, form in long chains. The bacilla organisms, or rod-shaped bacteria, align

themselves into chains or pairs, called *streptobacilli* or *diplobacilli*, but these terms are not used often. The spirochetes vary from a loose spiral to a tightly coiled spring. They can be short or very long. They always appear as individual cells and do not form clusters or chains.

The pairing, chaining, or clustering of bacterial cells is a result of the organism's method of reproduction. The cells multiply by a process called *binary fission* (binary means two; fission means to split), the splitting of one organism into two organisms just like the parent cell. If fission is complete, the cells will be found individually or in clusters, but if the fission is incomplete, the cells remain in pairs or in long chains.

The polymorphic bacteria are just what the name implies—many shapes. They appear as modular filaments; short, clumpy rods; or possibly even Y-shaped organisms.

In addition to different shapes and groupings, some bacteria have special structures that aid them in motility or survival in nature. All bacteria possess an outer coating known as a *capsule*. Some may have a capsule so thin that it is undetectable. Others have a very thick, sticky capsule composed of a complex sugar-fatty-protein substance. Research indicates that this capsule aids in the organism's survival against the white blood cells in the body. To enable them to move about, some of the bacilli have special structures called flagella. A *flagellum* is a hair-like appendage that whips back and forth, and either pulls or pushes the organism about. Some cells have only a single flagellum, while others may have several or may even be completely covered with flagella. The sole purpose of the flagella is movement.

### Spores

Another special structure that develops in some of the bacteria is the *spore*. Any time certain organisms find themselves in an unfavorable environment they concentrate their protoplasm into a little round ball and become extremely resistant to the unfavorable condition. When the spore is formed, you can clearly see the rigid cell wall containing the little ball. This dormant form enables the organism to survive adverse conditions that normally destroy bacteria. One species, *bacillus anthracis* (anthrax), has been known to live as long as 40 years outside the animal's body. Some organisms can withstand boiling as long as two hours.

Here is something else to remember. In order for bacteria to cause disease, they must have the proper environment to survive. Bacteria have no mouths; therefore, they absorb food directly through their cell membranes. Their food or nutrients must be part of their environment, and there must be sufficient moisture to sustain life. Temperature is a critical requirement for bacteria growth. Most disease-producing bacteria can survive only at body temperature. Therefore, when this temperature is lowered or elevated, they will cease to grow and could die. Basically in order to reproduce or grow, particular bacteria must have the proper temperature, nutritional requirements, and moisture environment.

As the bacteria grow, they produce waste products and sometimes excrete other substances used in their digestion. These products, called bacterial toxins, can be toxic or poisonous to us. Exotoxins are toxins that diffuse out of the bacterial cell into the surrounding media. Normally endotoxins do not diffuse out but are liberated by physical disintegration (autolysis) when the cell dies. In either case, these are the substances that make bacteria harmful. So as you can see, bacteria, in their simple one-celled form, are actually very complex organisms.

Their reaction to the Gram stain is another method of classifying bacteria. In this classification, bacteria are divided into two broad groups—the Gram-positive and Gram-negative.

### Viruses

*Virus* is a Latin word meaning poison. Viral organisms infect not only humans, but animals and plants as well. Viruses are a group of ultramicroscopic, disease-causing agents. In the past few years we've learned a lot about viruses, but they are still a mystery to people outside the field of virology. Viruses are so different from other disease causing agents that they cannot be compared with any of them.

They belong to neither the plant nor animal kingdom, and only a few can be seen without the aid of an electron microscope. They do not fit our present biological definition of “living” organisms. Yet they do not die. They merely inactivate or disassociate themselves. They do not reproduce themselves but cause a living cell to replicate or reproduce them. They do, however, cause a wide variety of diseases in plants and animals. Examples of virus caused diseases are smallpox, measles, poliomyelitis, acquired immunodeficiency syndrome (AIDS), herpes simplex, influenza, yellow fever, and the common cold.

### **Rickettsiae**

Rickettsiae are a group of organisms intermediate in many characteristics between the bacteria and viruses. Rickettsiae will not reproduce outside a host cell. In other words, they require the presence of a living cell for growth. Primarily rickettsiae are parasites of insects and are transmitted to humans by fleas, lice, mites, or ticks. The most common rickettsiae diseases are Rocky Mountain spotted fever and typhus.

### **Protozoa**

Protozoa is the lowest division of the micro-organisms of animal life and is composed of one-celled organisms. There are many species of protozoa; the majority of the species are harmless to humans. Protozoa differs from the typical cell in that it is a true member of the animal kingdom and does not have a cell wall. Its outer covering is the cell membrane, which is flexible like a plastic bag. It does not possess all the other parts of a typical cell, including an organized nucleus and cytoplasm. Some of these one-celled animals have parts not included in the typical cell. Some have flagella or cilia, which are organs of locomotion, and others have a cytostome, which is a kind of primitive mouth. There are four classes of protozoa. Note that the first two are the causes of familiar diseases.

1. Sarcodina (amoeba), the type that causes amebic dysentery.
2. Sporozoa, the type that causes malaria.
3. Mastigophora (flagellates).
4. Infusoria (ciliates).

### **Fungi**

The fungi are small members of the plant kingdom, commonly referred to as yeasts and molds. They have no roots, stems, or leaves, and possess no chlorophyll. Members of the plant kingdom use chlorophyll to convert carbon dioxide, water, and sunlight into sugar. Therefore, the fungi lacking chlorophyll must depend on some other source for their livelihood. This other source is what concerns us; it's the living organism. We usually refer to an infection caused by the fungi as a fungus infection. Most of the pathogenic fungi produce superficial infections and grow on the skin. Thrush (oral candidosis), angular cheilosis, and ringworm are examples of this type of infection. Other pathogenic fungi are responsible for more serious infections where the fungus invades the lungs and other tissues of the body.

Fungi do not look at all like typical cells. They are round, oval, or filamentous and much larger than the bacteria cell. They have a large vacuole (clear space in the cell) taking up a good portion of the cell and usually a few large granules between the vacuole and cell wall. Identification is based almost entirely on the type of colony the fungi produce. Like bacteria, fungi are ever present in our environment. Some are harmful to us, while others are beneficial. Fungi have many industrial uses. Penicillin and several other fungi are used in the production of antibiotics. The undesirable fungi are pathogenic to plants and animals and are difficult to control. Spores are found on everything. They blow around in the air and can grow on anything that hints at being a nutrient. Because of their prevalence in nature and their association with disease, they are of prime concern to the field of medicine.

**Common oral bacteria**

There are over a hundred types of bacteria found in the mouth alone. This discussion includes five of the most common types. Bacteria are micro-organisms and are called many names—microbes, micro-organisms, microflora, germs, and possibly, bugs. The term *oral flora* best describes the micro-organisms found in the mouth. Each *bacterium* (bacteria) is much like a tiny bit of living jelly surrounded by a clear, thin covering called a membrane. Are these bacteria animals or plants? The answer is that some bacteria are branched and sheathed like plants, but some have locomotive (movement) organs like animals. Thus in the scheme of life, they occupy an intermediary position between animals and plants, with the properties of both. Early bacteriologists agreed to classify bacteria as plants.

Bacteria abound everywhere; you name a place—any place—and you can correctly say that bacteria are found there. Bacteria are usually thought of as something that makes us ill. Very often they do; however, many kinds of bacteria are so useful that you could not live without them. As result of scientific experiments, killing harmful bacteria can cure many diseases; at the same time, many other types of bacteria are beneficial to humans.

**Categories of bacteria**

There are several different ways to categorize bacteria. Some, termed *saprophytes*, derive their nourishment from dead or decaying matter. These organisms, for the most part, do not cause disease. Other bacteria are categorized as *parasites*. These organisms live on or in other organisms, deriving their nourishment at the expense of the host.

Parasitic bacteria that live in or on a host, but do not cause serious damage, are termed *nonpathogens*. Those that severely damage their host by destroying the host's tissues or causing serious infections are called *pathogens*. A pathogen that causes infection so severe that the host is permanently damaged or results in death of the host is called a *virulent pathogen*. Nonvirulent pathogens damage the host, but damage is usually not permanent and rarely results in death, unless other underlying debilitating (weakening) conditions are present.

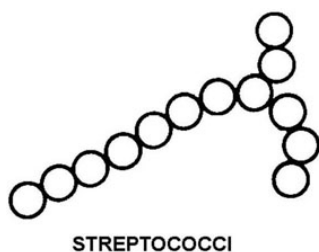
Bacteria are further categorized into three groups based on their need for oxygen. *Anaerobic* bacteria grow only in the absence of oxygen and, in the human mouth, are usually deep in the sulcus. *Aerobic* bacteria grow only in the presence of oxygen; that is, they must have oxygen to live. Facultative bacteria are the micro-organisms that can live under either aerobic or anaerobic conditions. These can be found deep in the sulcus or on the tongue. Each of these types of bacteria is found in infectious areas. Most bacteria cannot live in direct sunshine.

**Forms of bacteria**

Bacteria have many different shapes and forms, (figs. 4-17 through 4-22). However, oral bacteria (normal flora) are reduced to four forms for discussion here. This discussion is a superficial explanation of bacteria found in the oral cavity—it presents only information that may be useful in motivating your patients toward better oral health.

**Cocci**

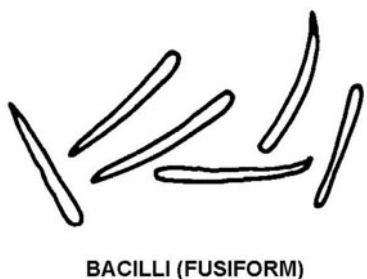
The cocci (kock'-sigh) forms are usually nonmotile and facultative. They are spherical or oval-shaped and about 1/1000 mm in diameter. The cocci forms exist singly or in aggregate (in chains or in colonies with clusters of varied shapes).



**STREPTOCOCCI**  
Figure 4-17. Streptococci.

cause boils, abscesses, and ulcers. Some food poisoning is caused by staphylococci. However, they produce various enzymes that are necessary for some normal body functions.

#### Bacilli



**BACILLI (FUSIFORM)**  
Figure 4-19. Bacilli.

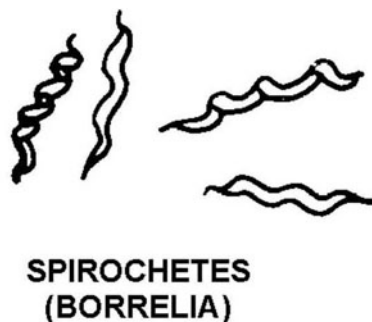
#### Filamentous branching organisms

Filamentous (fil-ah-ment-tus) branching organisms are anaerobic, nonmotile, branching organisms. They are found around the teeth, in plaque, and in calculus. An illustration of filamentous branching organisms is shown in figure 4-20.

The actinomyces are a nonmotile, anaerobic form of filamentous, and classified between fungus and bacteria. Actinomyces israelii (one of three pathogenic species of Actinomyces) is the one found in the human mouth.

#### Spirochetes

Spirochetes (spi'-ro-kets) are anaerobic organisms. Their name, which means coiled hair, is descriptive of their form, (fig. 4-21). They are extremely motile and move in a corkscrew fashion. There are two types—*Borrelia* (bo-re'-le-ah) *vincentii* and *Treponema* (trep'-o-ne'-mah). *Borrelia vincentii* are found in NUG with the fusiform bacillus. They are comparatively small. *Treponema* are larger spirochetes and rather rare. The invasion by the *Treponema pallidum* spirochete causes syphilis (fig. 4-22).

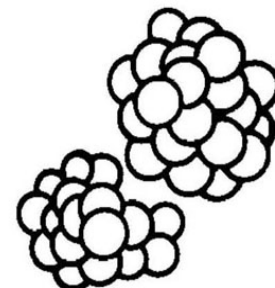


**SPIROCHETES  
(BORRELIA)**

Figure 4-21. *Borrelia vincentii*.

*Streptococci* (strep''-to-kok'-i), the most common of all oral bacteria, are facultative. Figure 4-17 shows that they grow in chains, resembling a string of beads. Examples of diseases caused by streptococci are bacterial pneumonia, scarlet fever, strep throat, and tooth decay. The *streptococcus mutans* bacteria are considered to be major causes of tooth decay.

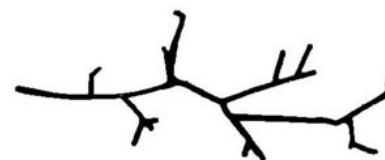
*Staphylococci* (staf''-i-lo-kok'-i) are also facultative and grow in clusters (fig. 4-18). They are nonmotile and often found on the epidermal surfaces of human beings. They



**STAPHYLOCOCCI**

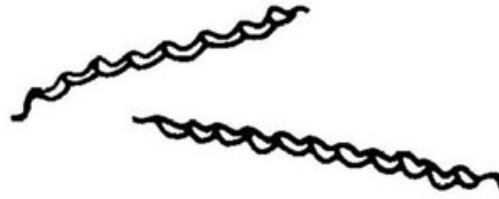
Figure 4-18. Staphylococci.

Bacilli (bah-sil'-i) are rod-shaped, and vary in length and diameter. Some are motile, some nonmotile. They are aerobic, anaerobic, or facultative. There are several types of bacilli, but the types of most importance are fusiform (fig. 4-19). Fusiforms are anaerobic bacilli that inhabit the gingival sulcus and increase to large numbers when necrotizing ulcerative gingivitis (NUG) is present. They are susceptible to antibiotics. Bacilli are also responsible for such diseases as botulism and tetanus. The bacteria in the genus *Lactobacillus* are considered to be major causes of tooth decay.



**FILAMENTOUS  
BRANCHING ORGANISMS**

Figure 4-20. Filamentous branching.



**SPIROCHETES  
(TREPONEMA PALLIDUM)**

Figure 4-22. Treponema.

### ***Prevalence of oral bacteria***

Only once during your lifetime is your mouth without oral flora. The oral cavity of a fetus is sterile—but not for long. Shortly after birth, the oral cavity of a baby shows signs of a developing flora. Soon the bacteria are flourishing. How?

Oral bacteria are initially inoculated into the baby's mouth by sources such as the primary caregiver. Many different bacteria make up this initial set of flora. If *Streptococcus mutans* is inoculated early in the baby's life, the risk of developing caries is greatly increased. Delaying this event as long as possible decreases caries development once teeth begin to erupt.

After inoculation, each bacterium increases rapidly by dividing into two bacteria. Under proper conditions, some bacteria divide every 15 minutes. This means that, theoretically, in less than one day, one single bacterium can become more than 100 million bacteria! Actually there are 40 million to 5½ billion organisms per cc of saliva—and you have about 10 cc of saliva in your mouths during your waking hours. In addition, there are many, many more organisms in contact with the teeth and soft tissues. The saliva is both an aid and a deterrent to the growth of bacteria. It aids in providing a warm, moist environment, but some secretions in saliva provide a mechanical means of removing bacteria from the mouth, either by expectorating or swallowing.

The bacteria in an infant's mouth before tooth eruption are predominantly aerobic, cocci, and short-rod forms. With the eruption of teeth, the bacteria are able to work deep down into the sulcus. During this stage, the oral flora are predominantly anaerobic cocci and short-rod forms. When a person's teeth are lost (becomes edentulous), the deep crevices of the sulcus are lost, and once more the bacteria are predominantly aerobic cocci and short-rod forms.

Aerobic bacteria are prevalent with good oral hygiene and aerobic bacteria are prevalent in areas of poor oral hygiene. The greatest number of oral flora is present just before the morning and evening meals. Rapid eating and drinking, expectorating, and using a mouthwash *temporarily* reduce oral flora, but remember how quickly they reproduce!

### **630. Patient motivation**

Unlike early beliefs that tooth loss was part of the aging process, it is now an accepted fact that teeth were designed to last. Prevention of any problems is a key to fulfilling that goal. To avoid destruction of the teeth and supporting structures, the patient must understand how to maintain the best possible oral health. This is where you, the technician come in. You must have the knowledge and know how to relay this information to your patient.

### **Counseling atmosphere**

The atmosphere you create for your counseling session will determine the success of the counseling. Position yourself in front of the patient so that you can look directly into his or her eyes and observe the patient's response to your counseling. You may want to repeat or clarify points if the patient's response shows that he or she doesn't understand or questions what you have said. In most cases, sitting on the dental stool and facing the patient from the front is a good counseling position. This

position allows you to view the patient's facial expression. Being at the same eye level as the patient helps you to establish rapport with him or her, since you are not talking "down" to him or her. Talk directly to your patients. Smile occasionally. If you stare at the wall or some other inanimate object during your counseling, the patient will get the impression that you are not sincere or interested. Use simple words, and explain any scientific or technical terms with which the patient may not be familiar. Your patient probably does not know that "gingiva" is the technical term for "gums," and he or she probably thinks "calculus" is a form of mathematics. You cannot motivate a person to improve his or her oral health if you speak in terms he or she doesn't understand.

Another important way to establish the proper counseling atmosphere is by explaining, or better yet, showing and explaining why good oral health care is needed. Charts and literature that show the progression of caries and periodontal diseases are also fine motivational tools. Do not forget the disclosing agent. It can have the greatest impact on the patient. By using this agent before your counseling session, you can actually show the patient the areas his or her cleansing techniques are missing. Again, your job is not to chastise the patient for past neglect, but to educate and encourage him or her to improve oral health.

### **Home care**

Remember that home care is not limited to the home. Several times in this course, the proper method of cleaning teeth has been mentioned, but no details have been given. One of your most important duties is to tell your patients, or your audience during a dental health talk, how to *clean their mouths properly, not just how to brush their teeth*. The difference between dental health and dental disease is not toothbrushing but mouth cleansing. Everybody brushes their teeth, but few thoroughly clean their mouths. Give your patients a step-by-step procedure.

One of the major causes of tooth decay and periodontal disease is *bacterial plaque*. Bacterial plaque is an almost invisible film of water containing cells and millions of living bacteria. To prevent dental diseases, you must effectively remove this destructive film at least once during a 24-hour period. By keeping your teeth and gums clean and in good health, you'll have better health, retain your natural appearance, enjoy chewing and talking, and prevent bad breath.

### **631. Instruct oral hygiene techniques**

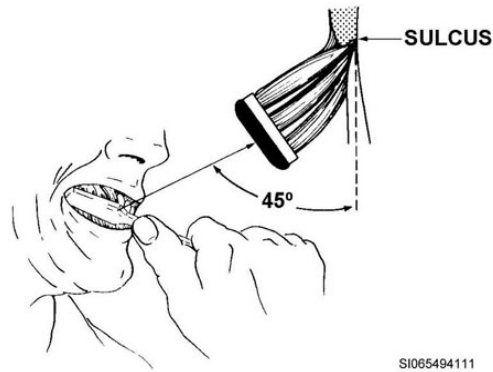
The toothbrush can remove the bacterial film from the facial, lingual, and occlusal surfaces of the teeth. Brush gently, but with enough pressure to feel the bristles on the gum. Do not use so much pressure that you feel discomfort. The method described here is effective and relatively easy for most patients. Sometimes other methods are recommended in special situations such as malocclusion.

Toothpaste foams and prevents you from seeing if you are placing the brush properly. While a person is initially learning to brush properly, it's best to omit toothpaste or to use it in a second brushing.

#### **Using the toothbrush properly**

Your toothbrush should have soft, multitufted nylon bristles. It should have a comfortable, rigid plastic handle, and the head should be small enough to fit the smallest areas of the mouth to be cleaned.

For all facial surfaces and posterior lingual surfaces, point the bristles at the teeth at a 45-degree angle. Lay the bristles in the sulcus area and use a gentle circular, vibrating motion (fig. 4-23).



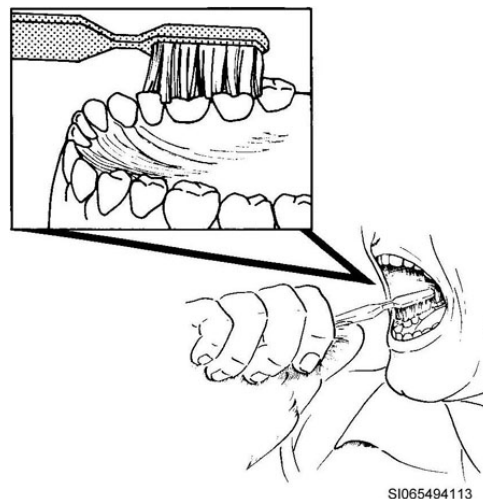
**Figure 4-23. Brushing the sulcus area.**

For the lingual surfaces of the anterior teeth, place the brush as shown in figure 4-24 and use small circular scrubbing strokes.

When brushing the occlusal surfaces, place the bristles flat on the surface and use the same scrubbing strokes as for the other surfaces (fig. 4-25). Move the bristles around the mouth in a regular pattern so as not to skip any areas. Also include brushing the dorsum or backside of the tongue in your cleaning routine in order to remove food and bacteria from this area.



**Figure 4-24. Brushing the lingual surfaces of anterior teeth.**



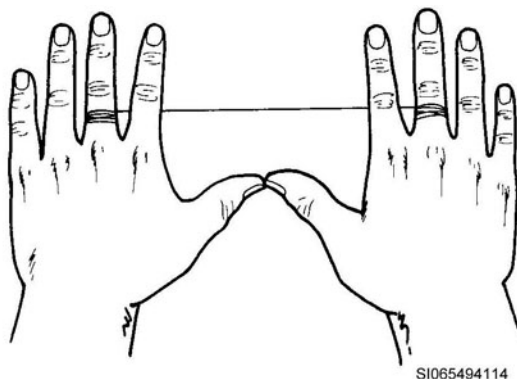
**Figure 4-25. Brushing the occlusal surfaces.**



### Using dental floss

For most people, dental decay and periodontal (gum) disease most often occur between or on the proximal surfaces of the teeth. The toothbrush cannot clean these areas effectively or clean behind the last tooth in each arch. Dental floss is best for cleaning these areas.

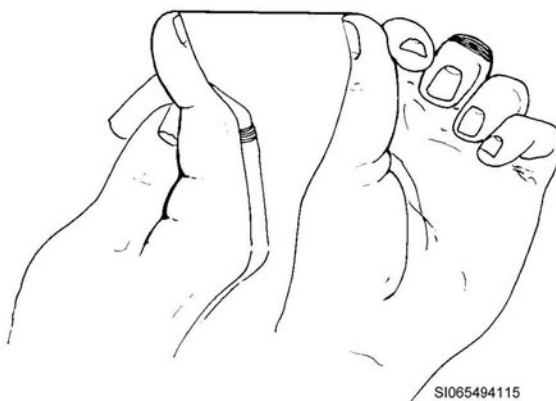
To properly floss, cut a piece of floss about 18 inches long and lightly wrap the ends of the floss around your middle fingers, as shown in fig. 4-26. The fingers controlling the floss should not be more than one half inch apart. Do not force the floss between the teeth. Insert it gently by sawing it back and forth at the point where the teeth touch each other. Let it slide gently into place. With both fingers, move the floss up and down on the side of one tooth, and then repeat on the side of the other tooth until the surfaces are audibly “squeaky” clean. Use your fingers to curve or bend the floss around the tooth. Go carefully under the gum line with the floss since this is a sulcus where plaque collects, but do not go far enough into the gum to cause discomfort, soreness, or bleeding. When the floss becomes frayed or soiled, a turn from one middle finger to the other brings up a fresh section. At first flossing may be awkward and slow, but continued practice will increase your skill and effectiveness.



**Figure 4-26. Floss wrapped around middle fingers.**

Rinse vigorously with water after flossing to remove food particles and plaque. Also rinse with water after eating if you are unable to floss or brush. Rinsing alone or water-spraying devices will not remove the bacterial plaque because of the glue-like material in the plaque.

To clean between the upper left back teeth, pass the floss over your left thumb and the forefinger of your right hand (fig. 4-27).



**Figure 4-27. Floss position for maxillary posterior teeth.**

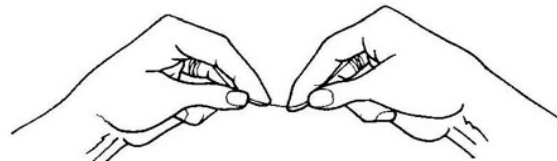
To see the proper position of the hands, look at figure 4-28. The thumb is placed on the outside of the teeth and helps to hold the cheek back.

To clean between the upper right teeth, pass the floss over your right thumb and the forefinger of your left hand. Now the right thumb is outside the teeth and the left forefinger is on the inside.



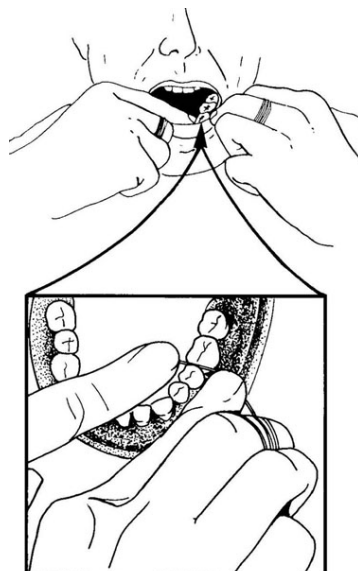
**Figure 4-28. Hand position for flossing maxillary posterior teeth.**

To clean between all lower teeth, hold the floss with the forefingers of both hands (fig. 4-29). You can insert the floss gently between all lower teeth with the floss over your forefingers in this position.



**Figure 4-29. Floss position on hands for mandibular teeth.**

Figure 4-30 shows the correct method for flossing between the lower back teeth, using the two forefingers to guide the floss.



**Figure 4-30. Flossing position of mandibular posterior teeth.**

### Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

#### **629. Classifications of micro-organisms and oral cavity bacteria**

1. List the six categories of micro-organisms.
2. By what process do cells multiply?
3. What is the outer coating of bacteria called?
4. When certain organisms find themselves in an unfavorable environment, they concentrate their protoplasm into a little round, protective ball. What is an organism in this state called?
5. What do pathogenic bacteria require in order to cause disease?
6. What are viruses?
7. What are the two most common rickettsiae diseases?
8. What is the lowest division of the micro-organisms of animal life and composed of one-celled organisms?
9. What types of conditions may be produced by pathogenic fungi?
10. Why must fungi depend on other living organisms for their livelihood?
11. Briefly describe a bacterium.
12. How can bacteria be compared with animals and plants?

13. What type of bacteria derives their nourishment from dead or decaying matter?
14. What type of bacteria lives on or in other organisms, deriving their nourishment at the expense of the living host?
15. What pathogen causes infection so severe that the host is permanently damaged?
16. What category of bacteria grows only in the absence of oxygen and, in the human mouth is usually deep in the sulcus?
17. Match the bacterium listed in column B with the correct description listed in column A. Use each bacterium only once.

*Column A*

- \_\_\_ (1) Are large spirochetes and rather rare.
- \_\_\_ (2) Are comparatively small spirochetes and are found in NUG.
- \_\_\_ (3) These are anaerobic organisms and their name means coiled hair.
- \_\_\_ (4) Form of filamentous, and classified between fungus and bacteria.
- \_\_\_ (5) These are anaerobic, nonmotile, branching organisms. Found around the teeth in plaque and in calculus.
- \_\_\_ (6) They are rod-shaped, and vary in length and diameter.
- \_\_\_ (7) Are facultative and grow in clusters.
- \_\_\_ (8) The most common of all the oral bacteria, facultative, and grow in chains.
- \_\_\_ (9) They are spherical or oval-shaped. They exist singly or in aggregate.

*Column B*

- a. Cocci.
- b. Streptococci.
- c. Staphylococci.
- d. Bacilli.
- e. Filamentous branching organisms.
- f. Spirochetes.
- g. *Borrelia vincentii*.
- h. *Treponema*.
- i. *Actinomyces*.

18. How do bacteria increase?
19. How does saliva aid in the growth of bacteria?
20. How does saliva act as a deterrent to the growth of bacteria?
21. Which type of bacteria is prevalent with good oral hygiene?

**630. Patient motivation**

1. Why should you position yourself so that you can look your patient in the eye when you are counseling him or her?
2. Which item that you use for counseling will probably have the greatest impact on the patient?
3. What should you never do when counseling a patient about his or her oral hygiene program?
4. What is the most important thing that you can tell your patients during a dental health talk?
5. What is bacterial plaque?
6. How often must bacterial plaque be effectively removed to prevent dental diseases?
7. List four ways you will benefit by keeping your teeth and gums clean.

**631. Instruct oral hygiene techniques**

1. What is the disadvantage of using toothpaste while you are learning to brush properly?
2. Briefly describe the design of a good toothbrush.
3. What is the most effective item for cleaning the proximal surfaces of the teeth?
4. Briefly state how to safely insert the floss between the teeth.
5. Why should you rinse vigorously with water after flossing?
6. Which fingers should you use for guiding the floss when you are flossing between the lower teeth?

### Answers to Self-Test Questions

**622**

1. Evaluate his or her record for completeness.
2. Subgingival calculus and overhanging margins of restorations.
3. AF Form 696.
4. Prevents operator and patient fatigue and discomfort, permits the operator to gain a clear view of the tooth being worked on, allows easy access of instruments to the teeth, and is time-efficient.
5. You, the healthcare provider.
6. Feet flat on the floor, thighs parallel to the floor, back and head straight, arms at waist level.
7. An arm's length.
8. (1) Determine the needs of the patient.  
(2) Sequence in which these needs must be met.  
(3) Provide you with useful information for conducting dental health counseling.
9. Two; observation of the entire oral mucosa and examination of the teeth and gingival sulci.
10. Before the prophylaxis procedure begins.
11. Plaque, which is nearly transparent and difficult to see without these agents.

**623**

1. Into the gingival sulcus.
2. Your sense of touch.
3. A rough texture.
4. The concave grooves leading into the furcation areas of multirrooted teeth.
5. To remove calculus from the tooth surfaces.
6. To eliminate the source of irritation to the periodontium.
7. The amount of calculus present in the patient's mouth.
8. The ultrasonic instrument.
9. Hand instruments.

**624**

1. It converts electrical energy into 30,000 microscopically small mechanical strokes per second, which is transmitted to an insert tip. Combined with a water spray and a light touch, the activated tip rapidly and gently dislodges moderate to heavy calculus and stain from teeth.
2. (1) Electronic generator.  
(2) Handpiece assembly.  
(3) Set of interchangeable inserts.  
(4) Foot control.
3. Electronic generator.
4. The volume of water permitted to flow from the handpiece and water temperature. The lesser the water flow, the higher the water temperature.
5. At least 35 cc of water per minute.
6. An increase in the power level causes the water in the handpiece to heat faster, while a reduction heats the water at a slower rate.
7. To place an insert, lubricate the O-ring on the insert with water and push the insert into the open end of the handpiece with a twisting motion. Check to see if the insert is fully seated. With the insert in place, hold the handpiece in an upright position and activate the insert to bleed any air trapped from the handpiece when the insert was placed. Allow the water to run from the handpiece for a few seconds until it flows without spurting. Repeat this procedure each time an insert is placed into the handpiece.
8. Trapped air does not interfere with the handpiece operation, but could cause excessive heating.

9. Components include the insert tip, water outlet, plastic grip, O-ring, connecting body, and magnetostrictive stack. The water outlet delivers preheated water along the entire working length of the tip. The O-ring acts as a water seal when the insert is placed into the open end of the handpiece. The connecting body transmits motion from the stack to the insert tip. The magnetostrictive stack converts electrical power supplied to the handpiece into mechanical vibrations to activate the insert tip.
10. By an on/off contact of the foot control switch. When the foot control pedal is held down, the handpiece is activated and water flows. Both the handpiece and waterflow are shut off when the pedal is released.
11. By flushing the water line daily and before each use, according to local infection control procedures.
12. (1) The 30K-10 or P-10 is designed for supra- and subgingival calculus in all areas, ideally suited for finishing after heavier scaling. Use sides with only light pressure and push or pull strokes. Set power level no higher than patient can comfortably tolerate.
- (2) The 30K-1000 has a smaller tip that is shorter and slightly thinner than the 30K-10. Power settings and usage for this tip are similar to the 30K-10.
- (3) The 30KFSI-SLI-10S has a slimline tip and designed to use for more delicate work of calculus and plaque removal.
13. Tips wear with normal use and lose up to 90 percent cleaning efficiency. Inserts should be replaced after one year's use or sooner if bent, scratched, or dropped. Thoroughly clean and sterilize inserts. Inserts may be safely autoclaved, however, do not use dry heat.
14. By being certain the insert tip is at a 15 degree angle to the tooth surface, increasing the speed of movement of the insert in hypersensitive areas to alleviate discomfort, changing the motion of the insert tip from vertical to horizontal or vice versa, and lightening your finger pressure on the handpiece especially on exposed dentin. If sensitivity persists, decrease the power setting.
15. (1) Do not place the unit on or next to a heat source.
- (2) Do not keep the unit in a tightly confined space or corner. Keep it where a normal amount of air will circulate freely on all sides.
- (3) Past precautions about using the unit around cardiac pacemakers should not apply to currently used pacemakers because they are electronically shielded to prevent problems. If in doubt, consult the patient's physician and follow the professional recommendations.
16. Water flow adjustment is improperly set.
17. It is an air-powered, mechanical scaler that runs at sonic frequency and uses a controlled water spray. It's used to remove large calculus deposits and stains from teeth.
18. By using the air and water control valves on the dental unit.
19. (1) Universal tip is used for all surfaces to remove medium to heavy calculus deposit.
- (2) The perio tip breaks up heavy calculus and is recommended for subgingival scaling of lingual mandibular incisors.
- (3) The sickle tip is recommended for sensitive patients, and to remove light medium deposits of calculus.
20. Both the tips and handpiece assembly can be sterilized in the autoclave.
21. It is the vibratory motion of the tip and the continuous stream of water that causes tremendous pressure and creates powerful bursts of collapsing bubbles. Cavitation allows for the removal of calculus.
22. The universal tip.
23. Because the noise, excessive water spray, and vibratory sensations produced by the ultrasonic/sonic scaler may be a shock to the patient if he or she is not forewarned.
24. Never.

## 625

1. Curettes.
2. Graceys.
3. Anterior teeth.
4. The distal surfaces of the posterior teeth.
5. (1) McCalls 13-14, bicuspid.
- (2) McCalls 17-18, molars.

- (3) Younger-Good 7–8, molars.
- 6. A sickle-type scaler.
- 7. Used to detect caries, cracks in the tooth structure, and locate foreign objects.
- 8. To use this instrument you will place it between the tooth and the gingival. Use enough pressure to drop the probe to the bottom of the sulcus. You will do this task for each tooth. For every tooth there are six areas to be measured. Three are located on the facial aspect of the tooth and the other three are located on the lingual side of the tooth.
- 9. Used to measure bone loss in teeth.
- 10. To evaluate the periodontium.
- 11. (1) Pen.  
(2) Modified pen.  
(3) Palm grasp.
- 12. Because this finger is used to feel the shank vibrate when the instrument's working end rubs over a rough surface.
- 13. The palm grasp.
- 14. The third or ring finger.
- 15. (1) Vertical.  
(2) Horizontal.  
(3) Oblique.
- 16. Vertical, because the instrument's cutting edge does not come in contact with the epithelial attachment.
- 17. (1) Exploratory.  
(2) Positioning.  
(3) Working.
- 18. At a 45 to 90 degree angle with the tooth.

**626**

- 1. With abrasives to remove stains or to polish teeth.
- 2. They are screwed into the slow-speed, right-angle handpiece, or into a contra-angle mandrel.
- 3. Loss of tooth structure, removal of fluoride-rich surface enamel, possible trauma to gingival tissue, and a reliance on professional plaque control.
- 4. To provide access to the posterior teeth.
- 5. The foot pedal used to control the speed of the polishing handpiece.
- 6. Use a slow, even speed when polishing.
- 7. The edge of the cup will flare.
- 8. Dental floss or dental tape.

**627**

- 1. The tray technique.
- 2. It reduces the chances of cross contamination and eliminates additional time required to sterilize reusable ones.
- 3. They require less gel to cover all surfaces of the teeth, and the amount of contact between the teeth and fluoride gel promotes concentration of the gel against the teeth onto proximal surfaces.
- 4. Reduces the chance that excess gel will be swallowed by the patient.
- 5. To make sure all teeth will be in contact with the gel.
- 6. Insert one end of the mandibular tray at a time from one side of the patient's mouth rather than directly from the front. Insert the saliva ejector before placing the maxillary tray. Place the maxillary tray and ask your patient to close the teeth together gently.
- 7. At least 30 minutes.



**628**

1. (1) Tissues and probing.  
(2) Mobility.  
(3) Radiographs.
2. To avoid roughening the surface.

**629**

1. (1) Bacteria.  
(2) Viruses.  
(3) Rickettsiae.  
(4) Spores.  
(5) Protozoa.  
(6) Fungi.
2. Binary fission.
3. A capsule.
4. A spore.
5. The proper environment to survive.
6. A group of ultramicroscopic disease causing agents.
7. Rocky Mountain spotted fever and typhus.
8. Protozoa.
9. Superficial infections that grow on the skin and more serious infections where pathogenic fungi invades the lungs and other tissues of the body.
10. Because they lack chlorophyll and, therefore, the ability to convert carbon dioxide, water, and sunlight into sugars.
11. Much like a tiny bit of living jelly surrounded by a clear, thin covering called a membrane.
12. They occupy an intermediary position between animals and plants with some properties of both.
13. Saprophytes.
14. Parasites.
15. Virulent.
16. Anaerobic.
17. (1) h.  
(2) g.  
(3) f.  
(4) i.  
(5) e.  
(6) d.  
(7) c.  
(8) b.  
(9) a.
18. Each bacterium increases rapidly by dividing into two bacteria.
19. By providing a warm, moist environment.
20. By providing a mechanical means of removing bacteria from the mouth, either by expectorating or by swallowing.
21. Aerobic bacteria.

**630**

1. So that you can look directly into his or her eyes and observe the patient's response to your counseling.
2. The disclosing agent.

3. Never chastise patients for their past neglect. Your job is to educate and encourage them to improve their oral hygiene.
4. How to clean their mouths properly.
5. An almost invisible film of water containing cells and millions of living bacteria.
6. At least once in every 24-hour period.
7.
  - (1) Have better health.
  - (2) Retain your natural appearance.
  - (3) Enjoy chewing and talking.
  - (4) Prevent bad breath.

**631**

1. It foams and prevents you from seeing if the brush is placed properly.
2. It should have soft, multitufted nylon bristles; a comfortable, rigid plastic handle; and a small, head.
3. Dental floss.
4. Saw it back and forth at the point where the teeth touch each other. Let it slide gently into place.
5. To remove the food particles and plaque that you have loosened.
6. Your two forefingers.

**Do the unit review exercises before going to the next unit.**

## Unit Review Exercises

**Note to Student:** Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

64. (622) If your patient has had radiographs taken since the previous oral prophylaxis, evaluate them for
- a. periodontal abscesses.
  - b. inflammation of the gingiva.
  - c. bleeding in the periodontal space.
  - d. subgingival calculus and overhanging margins.
65. (622) What must be performed *before* you seat your patient?
- a. Pull patients record and perform infection control.
  - b. Evaluate record and perform infection control.
  - c. Perform infection control only.
  - d. Pull and evaluate record.
66. (622) How far do you keep the dental unit light above or in front of the patient?
- a. At arms' length.
  - b. As close to the operator as possible.
  - c. As close to the patient's head as possible.
  - d. As far away from the patient as possible.
67. (622) During the screening exam, what phase and step are the lips and labial inspected?
- a. Phase 1, step 1.
  - b. Phase 1, step 2.
  - c. Phase 2, step 1.
  - d. Phase 2, step 2.
68. (623) As a general rule, which method is *most* practical for locating calculus in the periodontal pocket?
- a. Use disclosing chemicals.
  - b. Dry teeth with a stream of air.
  - c. Pay special attention to those areas where gingival inflammation is apparent.
  - d. Locate deposits by inserting an explorer or fine curette into the pocket area and feel the rough texture.
69. (623) After you locate calculus, your *next step* is to
- a. review radiographs for confirmation.
  - b. insert explorer or curette into pocket.
  - c. perform gross debridement.
  - d. choose your instrument.
70. (623) If a patient has gross supragingival calculus deposits, what instrument is particularly useful for performing the gross scaling?
- a. Curettes.
  - b. Scalers.
  - c. Ultrasonic instrument.
  - d. Finishing bur on a slow-speed handpiece.

71. (624) When do you bleed trapped air from the ultrasonic handpiece assembly?
- a. Before seating insert.
  - b. At the beginning of the day.
  - c. After seating the insert.
  - d. At the end of the day.
72. (624) Which ultrasonic insert tip is designed for supragingival and subgingival calculus removal in *all* areas?
- a. P-3.
  - b. 30K-3.
  - c. 30K-10.
  - d. 30K-EWPP.
73. (624) Which procedure is *not* the proper maintenance of an ultrasonic insert?
- a. Sterilize an insert by autoclave and dry heat.
  - b. Thoroughly clean and sterilize an insert after each use.
  - c. Discard bent, scratched, or dropped insert tips to avoid breakage.
  - d. Replace an insert after one year's use to maximize cleaning efficiency and avoid breakage.
74. (624) When using the ultrasonic scaler or sonic scaler, which step ensures you have your patient rinse with antimicrobial mouthwash?
- a. First.
  - b. Second.
  - c. Third.
  - d. Fourth.
75. (624) If you note patient sensitivity when using the ultrasonic scaler, which one of the following is *not* used to alleviate the discomfort?
- a. Increase the power setting.
  - b. Hold the insert tip at a 15-degree angle to the tooth surface.
  - c. Increase the speed of movement of the insert in hypersensitive areas.
  - d. Change the motion of the insert tip from vertical to horizontal, or vice versa.
76. (624) The working end of the ultrasonic instrument should be adapted at what tip-to-tooth angulation?
- a. 5 to 10 degrees.
  - b. 10 to 15 degrees.
  - c. 20 to 30 degrees.
  - d. 30 to 40 degrees.
77. (625) Which curette is used to scale anterior teeth?
- a. Gracey 1/2.
  - b. Gracey 7/8.
  - c. Gracey 11/12.
  - d. Gracey 13/14.
78. (625) Which curette is specially designed to scale distal surfaces of the posterior teeth?
- a. Gracey 1/2.
  - b. Gracey 7/8.
  - c. Gracey 11/12.
  - d. Gracey 13/14.

79. (625) Which is *not* a use for the dental mouth mirror?
- a. Reflect light onto desired surfaces.
  - b. View a mirror image of the teeth.
  - c. Retract soft tissue.
  - d. Detect caries.
80. (625) You should avoid individual finger movements during scaling because this
- a. may be ineffective.
  - b. is extremely fatiguing.
  - c. could injure patients.
  - d. slows down the scaling procedure.
81. (626) The polishing cup and brush are used for prophylaxis work in conjunction with a
- a. latch angle.
  - b. friction grip attachment.
  - c. high-speed handpiece.
  - d. right-angle handpiece.
82. (627) The *last thing* you do when applying fluoride is to tell your patient to avoid eating, drinking, rinsing, or smoking for
- a. 10 minutes.
  - b. 15 minutes.
  - c. 30 minutes.
  - d. 45 minutes.
83. (628) What is the *last routine assessment step* in implant maintenance?
- a. Check for presence or absence of mobility.
  - b. Perform visual examination.
  - c. Take radiographs.
  - d. Probe soft tissue.
84. (629) If an ultramicroscopic, disease-causing agents does *not* belong to neither the plant nor animal kingdom it is called
- a. rickettsiae.
  - b. protozoa.
  - c. viruses.
  - d. spores.
85. (630) When showing and explaining why good oral hygiene care is needed, what can have the greatest impact on the patient?
- a. Charts.
  - b. Pictures.
  - c. Literature.
  - d. Disclosing agent.
86. (630) What is the *most* important thing that you can tell your patients during a dental health talk?
- a. How to brush their teeth.
  - b. How to floss their teeth.
  - c. The causes of dental disease.
  - d. How to clean their mouths properly.

87. (630) How often must bacterial plaque be effectively removed to prevent dental disease?
- a. Twice a day.
  - b. Three times daily.
  - c. At least once in a 24-hour period.
  - d. At least once every two or three days.
88. (631) When do you rinse vigorously with water?
- a. After brushing.
  - b. Before flossing.
  - c. Before brushing.
  - d. After flossing.

**Please read the unit menu for unit 5 and continue ➔**

## Unit 5. Diet and Nutrition

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**D**O YOU REALIZE that one-third of all the people in the world are properly nourished? To be adequately nourished, humans require proper foods for growth in childhood, good health during adulthood, and the building and repair of body tissues throughout life. Nutrition is the process by which humans take in and use food substances.

Before you can adequately understand nutrition, you must understand the human body functions involved in digestion. Although you have already studied the digestive system in a previous volume of this course, you'll first review and then go on to study the processes of digestion, absorption, and metabolism. You'll see how the body breaks down food, such as whole milk, into various simpler nutrient products before the body can use it as nourishment.

To nourish the body properly, the diet must include certain nutrients. (Any substance useful in nutrition can be termed a nutrient.) In this unit, you will learn the seven nutrient classes that are essential in providing normal nutrition—(1) carbohydrates, (2) proteins, (3) fats, (4) vitamins, (5) minerals, (6) water, and (7) fiber.

A nutritionally sound diet can limit the amount of acid produced by decay-causing micro-organisms in your patients' mouths and help maintain healthy periodontal tissues. Studies show that there is much truth in the saying, "You are what you eat." In a year's time the body replaces 98 percent of its cells. This constant rebuilding means that adults as well as children need the nutrients in a diet containing foods from the My Plate guide. The My Plate guide is comprised of common foods that can supply all of the essential nutrients. They are covered later in this unit. Using the My Plate guide will enable you to meet the recommended standards required for normal nutrition.

### 632. Digestive system

The primary purpose of the digestive system is to convert food (nutrients) into simpler substances that can enter the blood and nourish the body tissues. Other functions of the digestive system include transporting ingested foods and waste products; secreting acid, enzymes, and bile; and storing waste products.

The digestive system extends from the mouth to the external opening of the rectum, called the anus. Next, you'll review the processes of digestion, absorption, and metabolism.

#### Digestion

Food changes, both physically and chemically, during the process of digestion. *Physical* changes are produced by grinding, crushing, and mixing food with digestive juices and propelling the food mass through the digestive tract. Reactions between food and enzyme secretions in the digestive system cause *chemical* changes to the food.

#### Absorption

Absorption is the process by which the end products of digestion pass through the lining of the small intestine into the blood and lymphatic systems. Usually over 90 percent of a mixed diet is digested and absorbed. Foodstuffs of animal origin are used more completely than vegetable and fruit foodstuffs. Water and simple sugars are absorbed in their original form. Before complex carbohydrates are absorbed, they must be broken into simple sugars. Proteins must be broken down into amino acids. Fats must be broken down into fatty acids and glycerol.

No absorption takes place in the mouth, and there is very little foodstuff absorbed in the stomach. Alcohol, an exception, is absorbed directly from the stomach, but most nutrient absorption takes place in the small intestine.

Food normally remains in the small intestine from three to eight hours. In addition to the digestive juices, the small intestine is also filled with bacteria, which usually are not harmful and perform certain important functions. One function of intestinal bacteria is to attack plant fiber (bulk) in the chyme (kime). This action brings about further breakdown of this indigestible matter. Also these bacteria are important in synthesizing (forming) some of the vitamins essential to the body. Absorption continues in the small intestine until most of the nutrients are absorbed. The water and food particles that are not absorbed pass into the first segment of the large intestine.

To repeat, most of the available nutrients have already been absorbed from the small intestine. In the large intestine, the food mass changes from a liquid to a semisolid state. Considerable amounts of water, including digestive juices, are absorbed from the large intestine during this change. The remaining matter contains only indigestible carbohydrates (fiber) and decomposed food particles. The mass becomes more solid as it moves along the large intestine and is finally excreted as feces.

### **Metabolism**

Generally absorbed nutrients are carried in the blood to the muscles, liver, and other organs for immediate use or storage. The use of food nutrients by body cells is known as cell metabolism. Cell metabolism is the chemical process of either changing (building) the absorbed foods into complex tissue elements or transforming (breaking down) complex body elements into simple ones. This process also produces heat and energy.

The building of body tissues from foods is obvious during childhood, when growth is most rapid. Actually it never stops. An adult's old cells must be repaired or replaced by new cells. The breakdown of tissue into simpler elements always yields energy. Cell metabolism means change and this buildup and breakdown both occur simultaneously throughout life.

### ***Fuel measurement***

Each food has a specific caloric value. A given amount of food will yield a certain amount of heat or calories when it is metabolized. The calorie is a standard unit for measuring heat. Since heat results from the body's energy expenditure, the calorie measures energy metabolism. Of the seven nutrient classes, proteins, fats, and carbohydrates are the only ones the body can use as fuel sources. A food's yield in calories depends on its composition in terms of these three nutrients. The following values have been established:

- 1 gram of protein yields 4 calories.
- 1 gram of carbohydrate yields 4 calories.
- 1 gram of fat yields 9 calories.

You can use these figures to estimate the caloric values of foods in the diet. For example, if 240 milliliter (ml) (8 oz) of whole milk contains 8 grams of protein, 12 grams of carbohydrate, and 10 grams of fat, the caloric value can be determined as follows:

8 grams of protein × 4 calories	=	32	calories
12 grams of carbohydrate × 4 calories	=	48	calories
10 grams of fat × 9 calories	=	<u>90</u>	calories
		170	calories in 240 ml (8oz) whole milk



### ***Caloric requirements***

Many factors control the body's need for calories. Among the most obvious factors are age and growth, climate, and physical activity.

#### ***Age and growth***

The need for calories and various nutrients is increased greatly during growth periods. Energy needs are the greatest during the first two years of life. Another increase occurs during adolescence, but as an adult the body's energy needs decline steadily.

#### ***Climate***

Since energy metabolism produces heat, which regulates body temperature, caloric requirements are increased in cold climates or environments. In hot climates, the caloric requirements are decreased.

#### ***Physical activity***

Muscular work (physical activity) is the most important factor influencing caloric needs. A warehouse worker, whose job requires constant physical exertion, needs about 5,000 calories a day; while a clerk typist with the same body build and age, in a similar climate, requires only about 2,000 calories a day. Generally *food intake* should meet the *energy output*. For people who want to lose weight, food energy intake must be less than energy output. For people who want to gain weight, food energy intake must be greater than energy output.

## **633. Chemical composition of food**

You have probably heard the expression, "You are what you eat." This is true because food is used to build and repair the body. Food choices must therefore be based on solid information and knowledge. Let us start by breaking down the composition of food.

### ***Carbohydrates***

Carbohydrates (CHO) are by far the most abundant of natural foods and constitute the body's most economical source of energy. CHOs provide 45 to 50 percent of the calories in the American diet and a higher percentage in the diets of many other people in the world. CHOs are composed of carbon, hydrogen, and oxygen.

The term *carbohydrate* includes both sugars and starches. There are three main classes of carbohydrates. They are monosaccharides (simple sugars), disaccharides (double sugars), and polysaccharides (complex starch, glycogen, and cellulose). Glycogen is a small temporary storage of sugar in live tissues. And, since you cannot digest cellulose, you ordinarily think of only sugars and starches when you hear carbohydrates.

### ***Composition***

The simple sugars are called monosaccharides. This group includes glucose (dextrose), fructose (fruit sugar), and galactose.

<b>Simple Sugars</b>	<b>Explanation</b>
Glucose	Type of sugar found in the blood, muscles, and liver.
Fructose	Is the sweetest sugar and is found in fruits and honey.
Galactose	Is formed in the body through digestion of milk sugar (lactose).

Disaccharides are double sugars which include the sucrose found in cane sugar and beet sugar, the maltose in malted drinks, and the lactose in milk. These sugars must be broken down to simple sugars (monosaccharides) before they can be absorbed. A polysaccharide is a CHO where hydrolysis yields more than 10 monosaccharides. Starches are chemically more complex and larger than sugars, and they are usually the cheaper source of energy. Grains (wheat, corn, rice) and vegetables (potatoes, dried peas, and beans) are chief sources of starches. One polysaccharide *glycogen* is important

because it's the storage form for carbohydrate in our body. Another polysaccharide, *cellulose*, plays an important role by providing undigested fiber (bulk) in the digestive tract.

### **Functions**

The chief function of carbohydrates is to furnish a direct and immediate source of energy to the tissues of the body. They can be temporarily stored in the liver as glycogen or converted into fatty tissue and stored as a reserve form of energy.

If a sufficient amount of carbohydrates is present, the body will not use available protein as a source of energy. This, of course, is an important function of carbohydrates—to leave protein available for its primary functions of growth and maintenance of body tissues. Therefore, carbohydrates are protein sparing.

Also a certain amount of carbohydrates is necessary to prevent excessive oxidation of fat. In the absence of carbohydrates, fats are oxidized too fast. This results in an accumulation of incompletely oxidized fatty acid products in the blood, which can result in acidosis or ketosis.

The milk-sugar lactose helps promote the growth of bacteria in the small intestine. These bacteria are responsible for the synthesis of certain B-complex vitamins.

### **Sources**

Some sources of sugars are granulated table or confectioners' sugar, honey, corn and maple syrups, molasses, jellies, jams, preserves, marmalade, candies, sweet chocolate, and cocoa. Examples of starchy foods are cooked cereals, ready-to-serve cereals, flours, macaroni, spaghetti, noodles, breads, pastry, puddings, cakes, dried peas and beans, potatoes, and other root vegetables.

The daily CHO allowance has not been established. Carbohydrates are desirable in the diet for a number of reasons:

1. Easily digested and almost completely absorbed.
2. Are an economical energy source.
3. Can be stored in the liver as glycogen.
4. Spare protein for its more important functions.
5. Enhance the palatability of the diet.

However, there are several problems associated with diets high in refined carbohydrates. Highly refined breads and cereals have largely replaced whole grain products. In the refining process, most of the fiber, vitamins, minerals, and proteins are lost when the outer bran layer and germ are removed. These cereals primarily contain carbohydrates; therefore, a diet containing only refined cereals could provide adequate energy levels without providing the other required nutrients. Most, but not all, refined cereal products are now being enriched with vitamins and minerals—some even with certain amino acids. This enrichment is very important, especially where diets consist largely of less expensive, refined bread and cereal products.

Another problem with high carbohydrate diets occurs when an excessive amount of concentrated sweets is eaten. Sweets lack essential fiber, vitamins, and minerals; impair appetite for nutritionally important foods; and promote tooth decay. Be cautious that sweets not be substituted for or take the place of needed food nutrients. Refined sugar supplies calories but is not a source for vitamins or minerals; therefore, refined sugar is an "empty calorie" food.

### **Protein**

Every living cell, animal or vegetable, contains proteins. All proteins are composed of chemicals called carbon, hydrogen, oxygen, and nitrogen. Certain mineral elements, such as sulfur, iron, phosphorus, or iodine, may or may not be present. Nitrogen is the most important of these elements because it is contained in protein but not in carbohydrates and fat. Nitrogen is essential for the repair and maintenance of every living body cell.

A single protein broken down into smaller parts can be pictured as a pyramid made of building blocks, each block representing an *amino acid*. There are 22 amino acid building blocks commonly found in protein—all contain nitrogen. Many of the amino acids needed for repair and maintenance of every living body cell can be synthesized (made) by the body. They are called *nonessential amino acids*. However, nine amino acids cannot be synthesized by the body and must be supplied by the diet. These nine amino acids that cannot be synthesized by the body are called *essential amino acids*. One of these, histidine, is essential for children during growth but is not required by an adult.

### Sources

Food sources of proteins are classified in three ways—(1) complete proteins, (2) partially complete proteins, and (3) incomplete proteins. *Complete proteins* contain all essential amino acids in sufficient quantities for sustaining life and normal rate of growth. Eggs, meat, and milk products are examples of complete proteins. *Partially complete proteins* can maintain life but lack sufficient amounts of some amino acids to promote growth. Wheat, cereals, and legumes (peas and beans) are examples of partially complete proteins. *Incomplete proteins* are incapable of replacing or building tissue and cannot support life, let alone promote growth. Corn, rice products, dried beans and peas, and gelatin, are examples of incomplete proteins.

Proteins that are partially complete or incomplete can be made adequate to promote growth and maintenance of body tissue by supplementation with either a complete protein, such as milk, cheese, and eggs, or another incomplete protein that supplies the limiting (missing) amino acid. This assists individuals who for some reason don't consume meat products (vegetarians) to fulfill their protein requirements. The following table lists the amount of protein found in each serving size.

#### Breads, Cereals, Rice and Pasta Group

Food	Serving	Protein gm
Breakfast cereals	½ cup cooked ¾ cup dry	2–3
Bread, Macaroni, noodles, rice, spaghetti	1 slice, ½ cup cooked	2–3

#### Vegetables Group

Food	Serving	Protein gm
Vegetables	½ cup	1–3

#### Fruit Group

Food	Serving	Protein gm
Fruit juice	½ cup	Trace
Fruits	1 serving	Trace–1

#### Meat Group

Food	Serving	Protein gm
Meat, fish, poultry	3 oz fatty, 3 oz lean	15–20 20–25
Egg	1 whole	6
Dried beans and peas	½ cup	7–8
Peanut butter	1 tablespoon	4

Milk Group

Food	Serving	Protein gm
Milk, whole, skim, buttermilk	1 cup	9
Cheese, American, Process	1 oz	7
Cheese, cottage	1/4 cup	8
Cheese, cream	2 tablespoons	2
Ice cream	1/8 qt	3

### Functions

Muscles and glandular tissues are primarily composed of protein. The cells of these body tissues are in a state of constant and rapid breakdown, which must be balanced by an equally constant and rapid buildup of new cells. Therefore, amino acids must be present in sufficient amounts to rebuild cell proteins throughout life. During growth, there is an additional requirement to form new cells. Therefore, the chief use of protein is the building and repairing of body tissues. The production of new cells demands a high intake of foods containing the essential amino acids. In addition to childhood and teenage growth periods, new cell production occurs during pregnancy when a mother must maintain her own body tissues and also provide for the demands of the developing baby. Other adults may have increased needs for building new tissues, such as after illness or injury.

Proteins have many functions in regulating body processes. *Hemoglobin*, a chief part of red blood cells, is a protein that contains iron. The iron in hemoglobin functions in respiration by carrying oxygen to the tissues. Blood also has plasma proteins that help regulate the body's water balance. Digestive enzymes, such as trypsin and pepsin, are also made of protein. The formation of certain proteins called hormones depends on the availability of amino acid building blocks. Also the body's resistance to disease is maintained, in part, by proteins called antibodies.

If the body's fuel energy need is not met by a sufficient amount of carbohydrates and fats, the body can use proteins as a source of fuel. As you remember, 1 gram of protein supplies 4 calories. However, protein is not an economical source of energy. First of all, foods containing proteins (such as meats) are usually more expensive than foods containing carbohydrates (such as bread and potatoes). Second, protein is harder to break down in the body. For these reasons, you normally do not depend on proteins as an energy source.

### Fat

Like carbohydrates, fats are made up of carbon, hydrogen, and oxygen. The term *lipid* is used to identify any fat, oil, or fat-like substance. Lipids that are liquid at room temperature are usually called oils, while those that are solid are called fats. Fats are made up of fatty acids in complex chemical structures. They are insoluble in water and greasy to touch.

Fats are classified according to the types of fatty acids they contain. Different types of fatty acids have different flavors, textures, and melting points, but all fatty acids are either saturated or unsaturated. Generally fats from the animal sources, such as egg yolks and lard, contain saturated fatty acids, and fats from the vegetable sources, such as corn oil and soybean oil, contain unsaturated fatty acids.

*Saturated* fatty acids contain all the hydrogen atoms possible. Fats formed primarily by saturated fatty acids are usually solid at room temperature. For instance, butter and lard are fats containing high percentages of saturated fatty acids. On the other hand, unsaturated fatty acids do not carry all possible hydrogen atoms and are referred to as monounsaturated or polyunsaturated.

*Monounsaturated* fatty acids have one missing hydrogen atom; *polyunsaturates* have more than one missing hydrogen atom. A monounsaturated fatty acid is oleic acid found in various animal and plant sources. Lineoleic acid, a polyunsaturated fatty acid, is found in corn, safflower, and soybean oils. In

fat-controlled diets, foods containing polyunsaturated fatty acids are added, and foods containing saturated fatty acids are limited. In other words, animal fats are limited, and vegetable fats are substituted.

### **Functions**

Every gram of fat used as fuel in the body will yield 9 calories, and each gram of protein or carbohydrate will yield only 4 calories. For this reason, fats are known as the most concentrated source of energy, and they supply a large percentage of calories in the average American diet. Diets restricted in fat may contain large quantities of the allowed foods to provide sufficient energy from carbohydrate and protein sources.

Other functions of fats are that they serve as padding around vital organs. Fats also help conserve body heat and are needed for brain and nerve tissue structures and functions and spare the use of protein as a source of energy. In addition to these functions, fats also aid in the passage of other fatty substances into and out of cells, and spare the use of certain vitamins—especially thiamin and niacin. Fats are carriers of the fat-soluble vitamins A, D, E, and K. They also delay the emptying of the stomach by slowing its secretion of gastric acids. Odors and flavors of fats add considerably to the palatability of a diet.

### **Allowance**

Fats in the diet are easily recognized as two main types: visible and invisible. Visible fats include butter, margarine, lard, cream, oil, and shortening. Invisible fats include meat, poultry, fish, dairy products, eggs, pastries, and cheese.

There is a very limited nutritional requirement for fat aside from meeting the requirement of the essential fatty acids. The average American diet contains 34 to 36 percent of its calories in the form of fat. This is excessive. Although fats perform the important functions that were discussed, diets containing too much fat can contribute to malnutrition and disease (examples include obesity and heart disease).

As you have seen, 1 gram of fat contains two and one-fourth times as many calories as 1 gram of protein or carbohydrate. When an individual's caloric intake exceeds his or her energy needs, deposits of body fat occur. This not only causes obesity, but the excess fatty tissue around the heart, kidneys, and liver impairs their functions. For these reasons, a diet containing not more than 25 to 30 percent of the total calories from fat is recommended by nutritional and medical authorities.

### **Cholesterol**

Cholesterol is another type of lipid (fat). The typical American diet contains approximately 600 to 900 milligrams of cholesterol. It is widely distributed in body tissues and fluids. Cholesterol is important in the body because it is a precursor for vitamin D, related to several hormones, and an important part of the bile. Some cholesterol is provided by the diet and the rest is synthesized by the body. Egg yolk, organ meats (liver, kidney, sweetbreads), dairy products (whole milk, cheese, cream, ice cream), and meat are dietary sources of cholesterol.

## **634. Essential nutrients**

To nourish the body properly, the diet must include certain nutrients. (Any substance useful in nutrition can be termed a *nutrient*.) In this lesson you'll study the other nutrients essential in providing normal nutrition—vitamins, minerals, water, and fiber.

### **Vitamins and minerals**

Interest in vitamins was aroused early in medical history when it was discovered that some elements in food played important roles in deficiency diseases, such as scurvy, pellagra, and beriberi. It was not known what these elements were, but physicians did know that certain foods had to be included in the diet or individuals would develop the disease.

Vitamins are defined as a group of unrelated organic compounds needed only in minute quantities in the diet but essential for some specific metabolic reactions within the cells, and necessary for normal growth and maintenance of health.

Vitamins are often called “accessory food factors” because they neither supply calories nor contribute to body mass. Although the body can synthesize a few vitamins, most must be supplied by the diet.

### ***Vitamins***

Vitamins are divided into two classes, fat-soluble and water-soluble vitamins. Vitamins A, D, E, and K are fat-soluble vitamins. They are absorbed along with dietary fats. The body stores excessive amounts of these vitamins in the diet. Excesses of vitamins A, D, E, and K can be detrimental to health.

All vitamins, except A, D, E, and K, are water-soluble. The B-complex vitamins and vitamin C (ascorbic acid) fall into this category. The main vitamins in the B-complex group with which you are concerned are riboflavin (B<sub>2</sub>), thiamine (B<sub>1</sub>), and niacin. These vitamins are soluble in water. The body does not normally store appreciable amounts of these vitamins. Excesses are excreted in the urine. Therefore, adequate amounts of these vitamins must be included daily in the diet. The sources and deficiencies related in the following table is not complete, but they represent the best sources and the major effects of deficiencies.

<b>Vitamin</b>	<b>Food Source</b>	<b>Deficiency</b>
A	Liver, kidney, milk fat fortified margarine, egg yolk, yellow and dark green leafy vegetables, apricots, cantaloupe, peaches.	Night blindness. Increased susceptibility to infection. Changes in skin and mucous membranes.
D	Fortified milk, irradiated foods, milk fat, liver, egg yolk, salmon, tuna fish, and sardines. Sunlight is a nonfood source.	Rickets in children Osteomalacia in adults Poor tooth development.
E	Wheat germ, green leafy vegetables, legumes, nuts, egg yolk, vegetable oils, milk fat.	Undetermined.
K	Green leafy vegetables, wheat bran, soybean oil, other vegetable oils, liver. Also synthesized in the intestinal tract.	Hemorrhages.
Ascorbic acid (vitamin C)	Citrus fruits, tomatoes strawberries, guava, raw cabbage, broccoli, melons, pineapple, potatoes, peppers, greens.	Scurvy. Stunted growth. Tendency to bruise easily. Lack of development of the dentin in teeth.
Thiamin (vitamin B <sub>1</sub> )	Pork, liver, whole grain cereals and bread, legumes, organ meats, wheat germ, potatoes. Also synthesized in the intestinal tract.	Impaired nerve function. Retarded growth. Lowered resistance to fatigue.
Riboflavin (vitamin B <sub>2</sub> )	Eggs, green leafy vegetables, milk and dairy products, organ meats, enriched breads and cereals.	Cheilosism (cracks at corner of mouth). Retarded growth.
Niacin	Lean meat, fish, poultry many grains, liver, eggs, peanuts, milk, legumes, enriched grains.	Glossitis. Digestive disorders. Nervous, mental disorders.

### ***Minerals***

Minerals are inorganic—they are not composed of plant or animal material. Minerals are usually referred to as *mineral elements* or *inorganic nutrients*. They are widely distributed in nature and play important roles in metabolism. One example is iron’s oxygen-carrying function in hemoglobin. Most

of a human's mineral weight (about 4 percent of total weight) is in the bones. Minerals found in large amounts (*macronutrients*) include calcium, phosphorus, potassium, sulfur, sodium, chlorine, and magnesium. Minerals found in small amounts that have known functions are called *micronutrients* (such as iron, zinc, manganese, copper, and iodine). Some minerals are found in small amounts but have unknown functions (such as aluminum and nickel). More than 20 minerals have been identified as existing in the body. All minerals required by the body must be provided by the diet. Of these, the ones most frequently deficient are calcium, iron, and iodine. Usually when the diet supplies these adequately, there is an adequate amount of other minerals. Metabolic disturbances may frequently involve zinc, iron, copper, magnesium, and potassium. A diet that follows the My Plate guide with a variety of foods from animal and vegetable products provides adequate mineral intake. On the other hand, you'll recall that empty calorie foods, such as sugar, fats, and cornstarch, contain few or no minerals (or vitamins).

The chief functions, best food sources, and the major effects of deficiency are provided in the following table:

Mineral	Function	Food Source	Deficiency
Calcium	Builds bones and teeth; blood clotting; nerve function.	Milk, cheese, greens.	Rickets; poorly developed bones and teeth.
Phosphorus	Bone and tooth formation; acid base balance.	Milk, cheese, egg yolk.	Porous bone; loss of calcium. Poor tooth formation.
Potassium	Intracellular fluid balance; acid-base balance; nerve function.	Meats, milk, many fruits, cereals, vegetables, legumes.	Muscular weakness; paralysis.
Sulfur	Metabolism; part of tissues.	Eggs, cheese, milk, meat, fish, poultry, legumes, nuts.	Related to deficiency of sulfur amino acids.
Sodium	Regulates body fluid, nerve function; acid-base balance.	Table salt, most foods (except fruits).	Excess fluid retention. Can lead to high blood pressure.
Chlorine	Acid-base balance; gastric juice formation.	Table salt, seafood, meat, milk, eggs.	Muscle cramps; mental apathy; reduced appetite.
Magnesium	Metabolism; assists protein synthesis.	Whole grains, nuts, green leafy vegetables.	Growth failure; weakness; spasms.
Iron	Part of hemoglobin (oxygen carrying).	Liver, meat, egg yolk, legumes, green leafy vegetables, whole or enriched grains.	Anemia
Manganese	Metabolism	Cereal, bran, soybeans, legumes, nuts, tea, coffee.	None established.
Copper	Metabolism	Liver, shellfish, meats, whole grains.	Rare; anemia; bone changes.
Iodine	Part of thyroid hormone	Iodized salt, seafood.	Goiter (enlarged thyroid).
Zinc	Growth, part of enzymes involved in digestion.	Milk, liver, shellfish.	Growth and sexual development slows.

### Body's water requirements

Water is the most important item in the diet. An individual can live for weeks without food but will die in a few days without water. Blood is about 90 percent water. Water enables the blood to carry nutrients and oxygen to the cells.

The body obtains water in three different ways. The first and most obvious way is by drinking water or beverages. The body also obtains water from various foods. All foods, even those considered to be dry, contain significant amounts of water. An egg, for example, contains approximately 75 percent water, and meats can also contain as much as 75 percent water. The third way the body obtains water is from the oxidation (burning) of foodstuffs in the body. The end products (waste products) of energy metabolism are carbon dioxide and water. Metabolism of an average diet creates approximately 300 to 500 ml of water daily.

Normally the recommended daily intake of water is 1,440 to 1,920 mls (6 to 8 cups) per day. This can be in the form of drinking water or beverages.

Maintaining proper water balance is important. Dehydration (excessive loss of water) could be fatal. The importance of keeping the body in fluid balance cannot be overemphasized. The body is said to be in a state of water balance when the amount of water taken in equals the amount of water excreted from the body.

Excess loss of water can occur from prolonged vomiting, hemorrhage, prolonged diarrhea, fevers, excessive perspiration, burns, and uncontrolled diabetes. Less than fatal losses of water could lead to poor food absorption, vomiting, diarrhea, fever, circulatory failure, kidney failure, and intestinal obstruction. For this reason, it's of primary importance to make water readily available to people exercising, particularly in hot climates.

### **Function and source of fiber**

The term *fiber* is used to identify all indigestible complex carbohydrates, such as cellulose, which is found in plant foods. Frequently they are referred to as residue, roughage, or bulk. Since fiber consists of indigestible carbohydrates, these carbohydrates cannot be used as a source of energy. Unlike vitamins and minerals, they do not enter into or cause essential chemical changes or reactions to occur. Often, they are not even considered as a nutrient or foodstuff. However, they do have an important function in the body—stimulating normal movement in the large intestine.

### ***Function***

Peristaltic action refers to the automatic, rhythmic waves in the intestine, which force food through the gastrointestinal tract. A chief function of the fiber component of food is to provide bulk, which will stimulate peristaltic action (rhythmic waves) that causes waste products to pass down the intestinal tract at a normal rate of speed. Therefore, fiber is important for good elimination and helps prevent constipation. Fiber absorbs moisture and increases stool size. This water absorption prevents the fecal mass from becoming hard, dry, and difficult to eliminate.

An excess of fiber delays the emptying time of the stomach and can interfere with absorption of some nutrients. Some fiber of foods is softened and partially broken down by cooking; thus, it's more easily digested with less fiber residue in the intestine.

### ***Types of fiber***

The major groups of fiber are soluble and insoluble. Some foods contain both soluble and insoluble fibers. Soluble fibers are the fibers that can be broken down by bacteria. They are usually broken down into acids, resulting in gas production. Not all fiber foods cause gas. Soluble fibers, by definition, can be dissolved in water and may become gummy (oat bran is an example). Insoluble fibers do not absorb water well. They may soften and be broken down by heat—as in a prolonged cooking process—but uncooked, they are insoluble and the body cannot do much with them.

### ***Sources***

Foods that contain any indigestible parts have fiber. All high-fiber foods contain carbohydrate, but some high carbohydrate foods (such as sugars, syrups, honey, molasses, and refined flour) have all fiber portion removed. Foods lose some or all of their fiber when they are processed, milled or refined, cooked, hulled, peeled, or seeded. There are four major groups of foods that contain natural



fiber—(1) whole grains and grain products, (2) vegetables, (3) fruits, and (4) nuts, seeds, and legumes.

### **Requirements**

A diet that includes sufficient amounts of vegetables, fruits, and whole grain breads and cereals will contain the necessary amount of fiber. How much fiber a person actually consumes varies greatly, depending on how he or she eats. Vegetarians may consume 12 to 24 grams per day. The highly refined American diets tend to be deficient in fiber, with a fiber intake of 8 to 11 grams per day. A person who eats highly processed and cooked foods may consume much less fiber.

From what is known about fiber, it's better for the healthy person to eat high-fiber carbohydrates' foods than to eat low-fiber foods. Diets deficient in fiber could contribute to constipation and disease of the gastrointestinal tract.

### **635. The My Plate guide**

Everyone should want to know what they should eat and how much. The new 2011 My Plate guide is produced by the United States Department of Agriculture (USDA). This guidance, referred to as My Plate (fig. 5-1), will give you all the information you need. You may find more information at [www.choosemyplate.gov](http://www.choosemyplate.gov). The new My Plate symbolizes a personalized approach to healthy eating and physical activity. The My Plate guide calls for eating a variety of foods to get the nutrients you need and, at the same time, the right amount of calories to maintain a healthy weight while considering your physical activity level. The My Plate guide also focuses on fat and sweets because most American diets are too high in fat, especially saturated fat, or they eat too many sweets.

The My Plate guide is a graphic representation of the Dietary Guidelines for Americans and illustrates the concepts of activity, moderation, personalization, proportionality, variety and gradual improvement. It is a guide that allows you to choose a healthy diet that meets your needs.

My Plate emphasizes food from five major food groups. Each of these food groups provides some, but not all, of the nutrients you need. Foods in one group cannot replace foods in another. No one food group is more important than another for good health—you need them all.

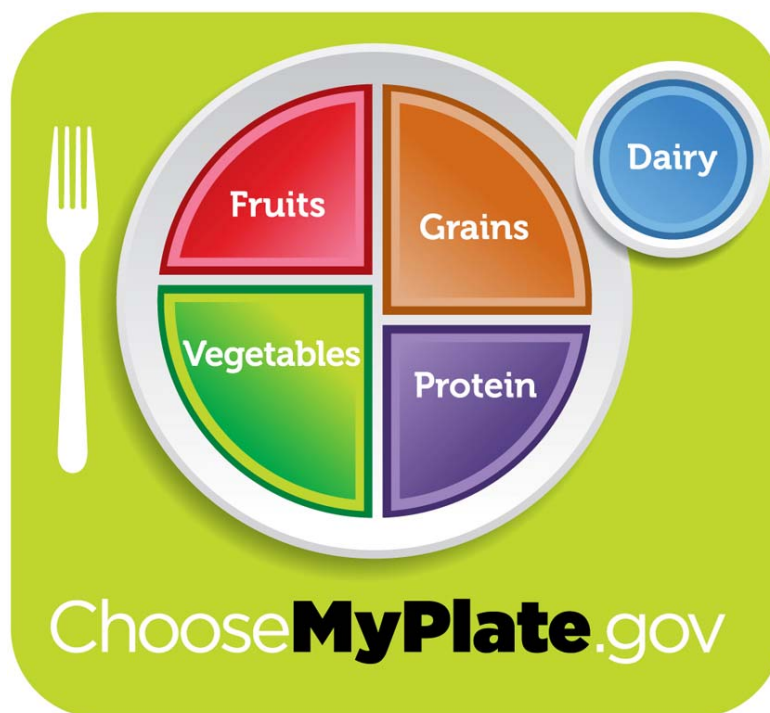


Figure 5-1. My Plate guide. (USDA Center for Nutrition Policy and Promotion)

All foods made from meat, poultry, fish, dry beans or peas, eggs, nuts, and seeds are considered part of this group. Dry beans and peas are part of this group as well as the vegetable group. Most meat and poultry choices should be lean or low-fat. Fish, nuts, and seeds contain healthy oils, so choose these foods frequently instead of meat or poultry.

The amount of food from meat and beans you need to eat depends on age, sex, and level of physical activity. Most Americans eat enough meat and beans, but need to make leaner and more varied selections of these foods. Meat, poultry, fish, eggs, nuts, and seeds provide nutrients that are vital for health and maintenance of your body. However, choosing foods that are high in saturated fat and cholesterol may have health implications. The following table includes some commonly eaten choices in the meat and beans category, with selection tips:

<b>Meats*</b>	<b>Dry beans and peas:</b>	<b>Fish*</b>
<i>Lean cuts of:</i> beef ham lamb pork veal	black beans black-eyed peas chickpeas (garbanzo beans) falafel kidney beans lentils lima beans (mature)	<i>Finfish such as:</i> catfish cod flounder haddock halibut herring mackerel pollock porgy salmon sea bass snapper swordfish trout tuna
<i>Game meats:</i> bison rabbit venison	navy beans pinto beans soy beans split peas tofu (bean curd made from soy beans) white beans	
<i>Lean ground meats:</i> beef pork lamb	<i>bean burgers:</i> garden burgers veggie burgers	
<i>Lean luncheon meats</i>		<i>Shellfish such as:</i> clams crab crayfish lobster mussels octopus oysters scallop squid (calamari) shrimp
<i>Organ meats:</i> liver giblets	tempeh texturized vegetable protein (TVP)	
<b>Poultry*</b> chicken duck goose turkey ground chicken and turkey	<b>Nuts &amp; seeds*</b> almonds cashews hazelnuts (filberts) mixed nuts peanuts peanut butter pecans pistachios pumpkin seeds sesame seeds sunflower seeds walnuts	<i>Canned fish such as:</i> anchovies clams tuna sardines
<b>Eggs*</b> chicken eggs duck eggs		

**\*Selection Tips**

1. Choose lean or low-fat meat and poultry. If higher fat choices are made, such as regular ground beef (75 to 80% lean) or chicken with skin, the fat in the product counts as part of the discretionary calorie allowance.
2. If solid fat is added in cooking, such as frying chicken in shortening or frying eggs in butter or stick margarine, this also counts as part of the discretionary calorie allowance.
3. Select fish rich in omega-3 fatty acids, such as salmon, trout, and herring more often.

4. Liver and other organ meats are high in cholesterol. Egg yolks are also high in cholesterol, but egg whites are cholesterol-free.
5. Processed meats such as ham, sausage, frankfurters, and luncheon or deli meats have added sodium. Check the ingredient and Nutrition Facts label to help limit sodium intake. Fresh chicken, turkey, and pork that have been enhanced with a salt-containing solution also have added sodium. Check the product label for statements such as “self-basting” or “contains up to \_\_\_% of \_\_\_”, which mean that a sodium-containing solution has been added to the product.
6. Sunflower seeds, almonds, and hazelnuts (filberts) are the richest sources of vitamin E in this food group. To help meet vitamin E recommendations, make these your nut and seed choices more often.

### Grain group

Any food made from wheat, rice, oats, cornmeal, barley or another cereal grain is a grain product. Bread, pasta, oatmeal, breakfast cereals, tortillas, and grits are examples of grain products. Grains are divided into two subgroups, *whole grains* and *refined grains*.

Whole grains contain the entire grain kernel—the bran, germ, and endosperm. Examples include the following:

- Whole-wheat flour.
- Bulgur (cracked wheat).
- Oatmeal.
- Whole cornmeal.
- Brown rice.

Refined grains have been milled, a process that removes the bran and germ. This is done to give grains a finer texture and improve their shelf life, but it also removes dietary fiber, iron, and many B vitamins. Listed are some examples of refined grain products:

- White flour.
- Degermed cornmeal.
- White bread.
- White rice.

Most refined grains are *enriched*. This means certain B vitamins (thiamin, riboflavin, niacin, folic acid) and iron are added back after processing. Fiber is not added back to enriched grains. Check the ingredient list on refined grain products to make sure that the word “enriched” is included in the grain name. Some food products are made from mixtures of whole grains and refined grains. The table includes some commonly eaten grain products:

Whole grains:	Refined grains:
brown rice	cornbread*
buckwheat	corn tortillas*
bulgur (cracked wheat)	couscous*
oatmeal	crackers*
popcorn	flour tortillas*
	grits
	noodles*
<i>Ready-to-eat breakfast cereals:</i>	
whole wheat cereal flakes	
muesli	
whole grain barley	<i>Pasta:*</i>
whole grain cornmeal	spaghetti
whole rye	macaroni
whole wheat bread	
whole wheat crackers	
whole wheat pasta	
	pitas*
	pretzels

whole wheat sandwich buns and rolls whole wheat tortillas wild rice  <i>Less common whole grains:</i> amaranth millet quinoa sorghum triticale	<i>Ready-to-eat breakfast cereals:</i> corn flakes white bread white sandwich buns and rolls white rice
* Most of these products are made from refined grains. Some are made from whole grains. Check the ingredient list for the words “whole grain” or “whole wheat” to decide if they are made from a whole grain.	

The amount of grains you need to eat depends on your age, sex, and level of physical activity. Most Americans consume enough grains, but few are whole grains. At least one-half of all the grains eaten should be whole grains.

### Vegetable group

Any vegetable or 100 percent vegetable juice counts as a member of the vegetable group. Vegetables may be raw or cooked; fresh, frozen, canned, or dried/dehydrated; and may be whole, cut-up, or mashed. Vegetables are organized into five subgroups, based on their nutrient content. Some commonly eaten vegetables in each subgroup are listed in the table:

<b>Dark green vegetables</b> bok choy broccoli collard greens dark green leafy lettuce kale mustard greens romaine lettuce spinach turnip greens watercress  <b>Orange vegetables</b> acorn squash butternut squash carrots hubbard squash pumpkin sweet potatoes  <b>Dry beans and peas</b> black beans black-eyed peas garbanzo beans (chickpeas) kidney beans lentils lima beans (mature) navy beans pinto beans soy beans split peas tofu (bean curd made from soybeans) white beans	<b>Starchy vegetables</b> corn green peas lima beans (green) potatoes  <b>Other vegetables</b> artichokes asparagus bean sprouts beets Brussels sprouts cabbage cauliflower celery cucumbers eggplant green beans green or red peppers iceberg (head) lettuce mushrooms okra onions parsnips tomatoes tomato juice vegetable juice turnips wax beans zucchini
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### Fruit group

Any fruit or 100 percent fruit juice counts as part of the fruit group. Fruits may be fresh, canned, frozen, or dried, and may be whole, cut-up, or pureed. Listed in the table are some commonly eaten fruits:

apples apricots avocado bananas  <i>Berries:</i> strawberries blueberries raspberries cherries  grapefruit grapes kiwi fruit lemons limes mangoes  <i>Melons:</i> cantaloupe honeydew watermelon	<i>Mixed fruits:</i> fruit cocktail nectarines oranges peaches pears papaya pineapple plums prunes raisins tangerines  <i>100% fruit juice:</i> orange apple grape grapefruit
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### Milk, yogurt, and cheese group

All fluid milk products and many foods made from milk are considered part of this food group. Foods made from milk that retain their calcium content are part of the group, while foods made from milk that have little to no calcium, such as cream cheese, cream, and butter, are not. Most milk group choices should be fat-free or low-fat. Listed in the table are some commonly eaten choices in the milk, yogurt, and cheese group:

<b>Milk*</b> All fluid milk: fat-free (skim) low fat (1%) reduced fat (2%) whole milk  flavored milks: chocolate strawberry  lactose reduced milks lactose free milks  <b>Milk-based desserts*</b> puddings made with milk ice milk frozen yogurt ice cream	<b>Cheese*</b> hard natural cheeses: cheddar mozzarella Swiss parmesan  soft cheeses: ricotta cottage cheese processed cheeses American  <b>Yogurt*</b> all yogurt fat-free low fat reduced fat whole milk yogurt
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**\*Selection Tips**

1. Choose fat-free or low-fat milk, yogurt, and cheese. If you choose milk or yogurt that is not fat-free, or cheese that is not low-fat; the fat in the product counts as part of the discretionary calorie allowance.
2. If sweetened milk products are chosen (flavored milk, yogurt, drinkable yogurt, desserts), the added sugars also count as part of the discretionary calorie allowance.
3. For those who are lactose intolerant, lactose-free and lower-lactose products are available. These include hard cheeses and yogurt.

The basic five food group—grains, vegetables, fruits, meats, milk—do not include the oils or discretionary calories or “extras” which go with meals. There is the butter on bread, the dressings on the salads, the sugar in coffee, and other additional foods that are part of normal diets and make a major contribution to the total caloric value of the meal. In addition to their caloric contribution, these “extra” foods help make our meals more satisfying and enjoyable. However, excessive intake of these “extra” foods may cause a decrease in the intake of the basic foods, creating a diet low in essential nutrients and/or excessively high in calories.

**Oils**

Oils are fats that are liquid at room temperature, like the vegetable oils used in cooking. Oils come from many different plants and from fish. Listed are some common oils:

1. Canola oil.
2. Corn oil.
3. Cottonseed oil.
4. Olive oil.
5. Safflower oil.
6. Soybean oil.
7. Sunflower oil.

Some oils are used mainly as flavorings, such as walnut oil and sesame oil. A number of foods are naturally high in oils, like the following:

- Nuts.
- Olives.
- Some fish.
- Avocados.

Foods that are mainly oil include mayonnaise, certain salad dressings, and soft (tub or squeeze) margarine with no trans fats. Check the Nutrition Facts label to find margarines with zero grams of trans fat. Most oils are high in monounsaturated or polyunsaturated fats, and low in saturated fats. Oils from plant sources (vegetable and nut oils) do not contain any cholesterol. In fact, no foods from plants sources contain cholesterol. A few plant oils, however, including coconut oil and palm kernel oil, are high in saturated fats and for nutritional purposes should be considered to be solid fats.

Solid fats are fats that are solid at room temperature, like butter and shortening. Solid fats come from many animal foods and can be made from vegetable oils through a process called hydrogenation. Listed are some common solid fats:

1. Butter.
2. Beef fat (tallow, suet).
3. Chicken fat.
4. Pork fat (lard).

5. Stick margarine.
6. Shortening.

While consuming some oil is needed for health, oils still contain calories. In fact, oils and solid fats both contain about 120 calories per tablespoon. Therefore, the amount of oil consumed needs to be limited to balance total calorie intake.

### **Discretionary calories**

You need a certain number of calories to keep your body functioning and provide energy for physical activities. Think of the calories you need for energy like money you have to spend. Each person has a total calorie “budget.” This budget can be divided into “essentials” and “extras.”

With a financial budget, the essentials are items like rent and food. The extras are things like movies and vacations. In a calorie budget, the “essentials” are the minimum calories required to meet your nutrient needs. By selecting the lowest fat and no-sugar-added forms of foods in each food group you would make the best nutrient “buys.” Depending on the foods you choose, you may be able to spend more calories than the amount required to meet your nutrient needs. These calories are the “extras” that can be used on luxuries like solid fats, added sugars, and alcohol, or on more food from any food group. They are your “discretionary calories.”

Each person has an allowance for some discretionary calories. But many people have used up this allowance before lunch time! Most discretionary calorie allowances are very small, between 100 and 300 calories, especially for those who are not physically active. For many people, the discretionary calorie allowance is totally used by the foods they choose in each food group, such as higher fat meats, cheeses, whole milk, or sweetened bakery products. You can use your discretionary calorie allowance in the following ways:

1. Eat more foods from any food group than the food guide recommends.
2. Eat higher calorie forms of foods—those that contain solid fats or added sugars. Examples are whole milk, cheese, sausage, biscuits, sweetened cereal, and sweetened yogurt.
3. Add fats or sweeteners to foods. Examples are sauces, salad dressings, sugar, syrup, and butter.
4. Eat or drink items that are mostly fats, caloric sweeteners, and/or alcohol, such as candy, soda, wine, and beer.

For example, assume your calorie budget is 2,000 calories per day. Of these calories, you need to spend at least 1,735 calories for essential nutrients, if you choose foods without added fat and sugar. Then you have 265 discretionary calories left. You may use these on “luxury” versions of the foods in each group, such as higher fat meat or sweetened cereal. Or, you can spend them on sweets, sauces, or beverages. Many people overspend their discretionary calorie allowance, choosing more added fats, sugars, and alcohol than their budget allows.

### **Physical activity**

Last and certainly not least—the My Plate guide now recommends that we engage in regular physical activity and reduce sedentary activities to promote health, psychological well-being, and a healthy body weight. Physical activity simply means movement of the body that uses energy. Being physically active is a key element to living a longer, healthier, happier life. Physical activity can help relieve stress and provide an overall feeling of well-being. Physical activity can also help you achieve and maintain a healthy weight and lower risk for chronic disease. The benefits of physical activity may include the following:

- Improves self-esteem and feelings of well-being.
- Increases fitness level.
- Helps build and maintain bones, muscles, and joints.

- Builds endurance and muscle strength.
- Enhances flexibility and posture.
- Helps manage weight.
- Lowers risk of heart disease, colon cancer, and type 2 diabetes.
- Helps control blood pressure.
- Reduces feelings of depression and anxiety.

Physical activity and nutrition work together for better health. Being active increases the amount of calories burned. As people age their metabolism slows, so maintaining energy balance requires moving more and eating less. Some types of physical activity are especially beneficial:

1. *Aerobic activities* – speeds heart rate and breathing and improves heart and lung fitness. Examples are brisk walking, jogging, and swimming.
2. *Resistance, strength building, and weight-bearing activities* – helps build and maintain bones and muscles by working them against gravity. Examples are carrying a child, lifting weights, and walking. They help to build and maintain muscles and bones.
3. *Balance and stretching activities* – enhances physical stability and flexibility, which reduces risk of injuries. Examples are gentle stretching, dancing, yoga, martial arts, and t'ai chi.

Your food and physical activity choices each day affect your health—how you feel today, tomorrow, and in the future. As you can see, a thorough knowledge of the My Plate guide helps you incorporate the principles of a healthy life style into every patient's counseling.

These tips and ideas are a starting point. For more information log on to:

<http://www.choosemyplate.gov>. You will find a wealth of suggestions here that can help you and your patients get started toward a healthy diet.

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### Self-Test Questions

**After you complete these questions, you may check your answers at the end of the unit.**

#### **632. Digestive system**

1. How is food changed in the process of digestion?
2. Define the absorption process in digestion.
3. What substances must complex carbohydrates be broken into before they can be absorbed?
4. What organ absorbs alcohol directly into the bloodstream?
5. What organ is primarily responsible for nutrient absorption?
6. What are the functions of intestinal bacteria?



7. What change occurs in the food mass when it is in the large intestine?
8. Define metabolism.
9. What are the three nutrient classes the body can use as fuel?
10. How many calories does 1 gram of carbohydrate yield?
11. When are the energy needs of the body the greatest?
12. Do caloric requirements increase or decrease in cold climates?
13. With the exception of people who need to lose weight, the food intake should correlate with what?

**633. Chemical composition of food**

1. Name the three classes of carbohydrates.
2. Fructose is categorized under which main kind of carbohydrate?
3. Which kind of carbohydrate provides the fiber required in the diet?
4. What is the chief function of carbohydrate?
5. What will happen to fat in the absence of carbohydrate?
6. Explain the function of milk-sugar lactose.

7. List the five reasons for including carbohydrates in the diet.
8. What problems arise when a diet contains an excess of carbohydrates in the form of concentrated sweets?
9. Why must nitrogen be present in our diet?
10. What is an amino acid?
11. How many of the 22 known amino acids are essential amino acids?
12. Complete proteins are usually found in what food sources?
13. What is hemoglobin?
14. What type of protein helps to regulate the body's water balance?
15. What can the body use for fuel if fats or carbohydrates do not meet the body's energy needs?
16. How are fats classified?
17. What type of fatty acids will you find in egg yolk or lard?
18. What type of fatty acids will you find in vegetable sources such as corn and soybean oils?
19. State the difference between a monounsaturated fatty acid and a polyunsaturated fatty acid.
20. Fats are carriers of which fat-soluble vitamins?

21. What happens when an individual's caloric intake exceeds his or her energy needs, causing deposits of fat to occur?
22. Specify the recommended percentage of fat in the diet.

**634. Essential nutrients**

1. What are the two classes of vitamins?
2. Excess of what vitamins can be detrimental to your health?
3. What vitamin deficiency causes changes in the skin and mucous membranes?
4. To what does a lack of vitamin D in children lend itself?
5. How does a vitamin K deficiency affect the blood?
6. What specific part of the tooth is dependent on ascorbic acid?
7. Describe the effects of riboflavin deficiency.
8. Define minerals.
9. What are minerals found in large amounts called? What are they?
10. What are minerals found in small amounts called? What are they?
11. What is the effect of a deficiency of calcium?

12. Name some food sources that contain phosphorus.
13. What are the food sources of iron?
14. What percent of the blood is water?
15. What does water enable the blood to carry?
16. Name the three different ways the body obtains water.
17. Cite the normal recommended human intake of water per day.
18. When is the body said to be in a “state of water balance?”
19. What is the chief function of fiber?
20. What could happen if there is an excess of fiber?
21. What are the items in a diet that contain the necessary amount of fiber?

**635. The My Plate guide**

1. According to the Anatomy of My Plate, what does the new My Plate symbolize?
2. What are the different parts of the new My Plate?
3. What types of foods are considered part of the meat and beans group?
4. What types of foods are considered part of the grain group?

5. How many subgroups are vegetables organized into and what is it based on?
6. What type of fruit juice is included in the fruit group?
7. What type of milk products should you choose to eat according to My Plate?
8. Match the food groups in column B with the recommended food item in column A.

*Column A*

- \_\_\_\_ (1) Cottage cheese.
- \_\_\_\_ (2) Popcorn.
- \_\_\_\_ (3) Peanut butter.
- \_\_\_\_ (4) Corn.
- \_\_\_\_ (5) Avocado.

*Column B*

- a. Meat and Beans.
- b. Grains.
- c. Vegetables.
- d. Fruits.
- e. Milk.

9. Which foods are naturally high in oils?
10. How many discretionary calories are normally allowed for a person who is *not* physically active?
11. According to My Plate, what does physical activity mean?
12. List three benefits of physical activity.
13. What are three types of beneficial physical activity?

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### Answers to Self-Test Questions

**632**

1. Physically and chemically.
2. It is the process by which the end products of digestion pass through the lining of the small intestine into the blood and lymphatic systems.
3. Simple sugars.
4. The stomach.

5. The small intestine.
6. They attack plant fiber in the chyme, bringing about further breakdown of this indigestible matter. They are also important in synthesizing some of the vitamins essential to the body.
7. It is changed from a liquid to a semisolid state.
8. Metabolism is the chemical process of either changing the absorbed foods into complex tissue elements or transforming complex body elements into simple ones, along with the production of heat and energy.
9. Proteins, fats, and carbohydrates.
10. Four.
11. During the first two years of life.
12. Increase.
13. The energy output.

**633**

1. (1) Monosaccharides (simple sugars).  
(2) Disaccharides (double sugars).  
(3) Polysaccharides (complex starch, glycogen, and cellulose).
2. Monosaccharides – simple sugars.
3. Cellulose.
4. To furnish a direct and immediate source of energy to the tissues for the body.
5. Fats are oxidized too fast.
6. Helps promote the growth of bacteria in the small intestine.
7. (1) Easily digested and almost completely absorbed.  
(2) Are an economical energy source.  
(3) Can be stored as glycogen in the liver.  
(4) Spare protein for its more important functions.  
(5) Enhance the palatability of the diet.
8. An excess of carbohydrates lacks essential fiber, vitamins and minerals; impairs appetites for nutritionally important foods; and promotes tooth decay.
9. Because it's essential for the repair and maintenance of every living body cell.
10. Protein broken down into smaller parts.
11. Nine.
12. Eggs, meat, and milk products.
13. It's a protein that contains iron.
14. Blood plasma.
15. Protein.
16. According to the types of fatty acids they contain.
17. Saturated.
18. Unsaturated.
19. Monounsaturated fatty acids have only one missing hydrogen atom, while polyunsaturated fatty acids have more than one missing hydrogen atom.
20. Vitamins A, D, E, and K.
21. They produce obesity, and the excess fatty tissue around the heart, kidneys, and liver impairs their functions.
22. 25 to 30 percent.

**634**

1. Fat-soluble and water-soluble.
2. Vitamins A, D, E, and K.

3. Vitamin A.
4. Rickets.
5. It will cause hemorrhages.
6. Dentin.
7. Cheilosism (cracks at the corner of the mouth) and retarded growth.
8. Minerals are inorganic. They are not composed of plant or animal material.
9. Macronutrients – calcium, phosphorous, potassium, sulfur, sodium, chlorine, and magnesium.
10. Micronutrients – iron, zinc, iron, copper, magnesium.
11. Rickets and poorly developed bones and teeth.
12. Milk, cheese, and egg yolk.
13. Liver, meat, egg yolk, legumes, green leafy vegetables, and enriched grains.
14. 90 percent.
15. Nutrients and oxygen to the cells.
16. (1) By drinking water.  
(2) From various foods.  
(3) From the oxidation (burning) of foodstuffs in the body.
17. 1,440 to 1,920 ml (6 to 8 cups) per day.
18. When the amount of water taken in equals the amount of water excreted from the body.
19. Provide bulk, which will stimulate peristaltic action (rhythmic waves) that causes waste products to pass down the intestinal tract at a normal rate of speed.
20. It delays the emptying time of the stomach and can interfere with absorption of some nutrients.
21. Sufficient amounts of vegetables, fruits, and whole grain breads and cereals.

### 635

1. It symbolizes a personalized approach to healthy eating and physical activity.
2. (1) Activity.  
(2) Moderation.  
(3) Personalization.  
(4) Proportionality.  
(5) Variety.  
(6) Gradual Improvement.
3. All foods made from meat, poultry, fish, dry beans or peas, eggs, nuts and seeds.
4. Any foods made from wheat, rice, oats, cornmeal, barley or another cereal grain.
5. Five subgroups, based on their nutrient content.
6. 100% fruit juice.
7. Fat-free or low-fat milk, yogurt, and cheese.
8. (1) e.  
(2) b.  
(3) a.  
(4) c.  
(5) d.
9. Nuts, olives, some fish, and avocados.
10. Between 100 and 300 calories.
11. Movement of the body that uses energy.
12. Any three of the following:  
(1) Improves self-esteem and feelings of well-being.  
(2) Increases fitness level.

- (3) Helps builds and maintain bones, muscles, and joints.
  - (4) Builds endurance and muscle strength.
  - (5) Enhances flexibility and posture.
  - (6) Helps manage weight.
  - (7) Lowers risk of heart disease, colon cancer, and type 2 diabetes.
  - (8) Helps control blood pressure.
  - (9) Reduces feelings of depression and anxiety.
13. (1) Aerobic.
- (2) Resistance, strength building, and weight-bearing.
  - (3) Balance and stretching.



## Unit Review Exercises

**Note to Student:** Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field Scoring Answer Sheet.

**Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).**

89. (632) Generally what is the relationship between food intake and energy output in the average person?
- a. Food intake should exceed energy output.
  - b. Energy output should exceed food intake.
  - c. Food intake should meet energy output.
  - d. There is no general relationship between food intake and energy output.
90. (633) The simple sugar formed in the body by the digestion of milk is known as
- a. lactose.
  - b. glucose.
  - c. glycogen.
  - d. galactose.
91. (633) Name a protein substance that contains beneficial amounts of iron that is necessary in regulating body processes.
- a. Urea.
  - b. Amino acid.
  - c. Hemoglobin.
  - d. Blood plasma.
92. (633) Which food group contains a fatty acid with more than one missing hydrogen atom?
- a. Saturated fatty foods.
  - b. Fats from animal sources.
  - c. Oleic acids found in various animal and plant sources.
  - d. Oils such as those extracted from corn, safflower, and soybeans.
93. (633) Fats do *not* carry which fat-soluble vitamins?
- a. A.
  - b. B.
  - c. D.
  - d. E.
94. (633) The average American diet contains what percentage of its calories in the form of fat?
- a. 14 to 16 percent.
  - b. 24 to 26 percent.
  - c. 34 to 36 percent.
  - d. 64 to 66 percent.
95. (633) In an ideal diet, what percentage of the total calorie intake is recommended to be fat?
- a. 10 to 15 percent.
  - b. 20 to 25 percent.
  - c. 25 to 30 percent.
  - d. 40 to 45percent.

96. (634) A deficiency of which vitamin can cause skin changes such as cracks at the corners of the mouth?
- a. Thiamine.
  - b. Niacin.
  - c. Riboflavin.
  - d. Folacin.
97. (634) The chief reason that fiber, as a source of bulk, is included in the diet is to
- a. absorb moisture.
  - b. harden the fecal mass.
  - c. stimulate peristaltic action.
  - d. solidify and dry the fecal mass.
98. (635) What food is *not* part of the milk group of MyPlate?
- a. Swiss cheese.
  - b. Cream cheese.
  - c. Yogurt.
  - d. Pudding.
99. (635) What portion of MyPlate is a key element to living a longer, healthier life?
- a. Variety.
  - b. Moderation.
  - c. Proportionality.
  - d. Physical activity.

## Glossary of Abbreviations and Acronyms

<b>°F</b>	degrees Fahrenheit
<b>ADA</b>	American Dental Association
<b>AFI</b>	Air Force Instruction
<b>AFIND</b>	Air Force Index
<b>AFOSH</b>	Air Force Occupational Safety and Health
<b>AIDS</b>	Acquired Immunodeficiency Syndrome
<b>BCLS</b>	basic cardiac life support
<b>BE</b>	bioenvironmental engineering
<b>BMET</b>	biomedical equipment technician
<b>BX</b>	Base Exchange
<b>cc</b>	cubic centimeters
<b>CE</b>	Civil Engineering
<b>CHO</b>	carbohydrates
<b>CPR</b>	cardiopulmonary resuscitation
<b>CVA</b>	cerebrovascular accident
<b>DDS-W</b>	Dental Data System-Web
<b>DECS</b>	Dental Evaluation and Consultation Service
<b>DRMS</b>	Defense Reutilization and Marketing Service
<b>DSC</b>	dental squadron commander
<b>DTR</b>	dental treatment room
<b>EMS</b>	Emergency Medical System
<b>Hg</b>	Mercury
<b>HQ USAF</b>	Headquarters, United States Air Force
<b>HVE</b>	high volume evacuator
<b>IG</b>	Inspector General
<b>JCAHO</b>	Joint Commission on Accreditation of Healthcare Organizations
<b>MHSS</b>	Military Health Services Systems
<b>ml</b>	milliliter
<b>mm</b>	millimeters
<b>MSDS</b>	material safety data sheets
<b>MTF</b>	medical treatment facility
<b>NCO</b>	noncommissioned officer
<b>NFPA</b>	National Fire Protection Association

<b>NIOSH</b>	National Institute of Occupational Safety and Health
<b>NUG</b>	necrotizing ulcerative gingivitis
<b>OPIM</b>	other potentially infectious material
<b>OSH</b>	Occupational Safety and Health
<b>OSHA</b>	Occupational Safety and Health Administration
<b>PCS</b>	permanent change of station
<b>PDE</b>	periodic dental examination
<b>PLI</b>	plaque index
<b>PPE</b>	personal protective equipment
<b>psi</b>	pounds per square inch
<b>PTA</b>	Parent-Teacher Association
<b>SBE</b>	subacute bacterial endocarditis
<b>SG</b>	Surgeon General
<b>SSN</b>	social security number
<b>TVP</b>	texturized vegetable protein
<b>UHM</b>	unit health monitor
<b>USDA</b>	United States Department of Agriculture

## **Student Notes**

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