BASIC LIFE SUPPORT: CPR AND FIRST AID

STUDENT HANDBOOK

DAN® SOUTHERN AFRICA

BASIC LIFE SUPPORT: CPR AND FIRST AID STUDENT HANDBOOK

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DAN SOUTHERN AFRICA

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1 Basic Life Support: CPR and First Aid Course Overview

According to the World Health Organisation, cardiovascular diseases are the most common cause of death worldwide and account for about one-third of deaths.[2] As our population ages, the prevalence of these diseases is expected to increase. This programme will help prepare participants to handle these events and other life-threatening incidents.

The Basic Life Support (BLS): CPR and First Aid provider programme is designed to provide course participants with foundational knowledge and to teach skills needed to perform cardiopulmonary resuscitation (CPR) and other lifesaving skills.

During this course, participants will become familiar with the signs and symptoms associated with cardiovascular diseases such as heart attack as well as with other diseases and conditions that may also pose an immediate threat to life. These conditions — such as shock, choking and external bleeding — are included in this course.

The first aid component of this course addresses additional circumstances and diseases that may require intervention and assistance from emergency medical services (EMS).

Successful completion of the BLS: CPR and First Aid course includes demonstration of skill competency and passing a knowledge assessment. Upon completion, you will receive a provider card indicating that you have been trained in basic life support (including CPR) and first aid measures.

Reading this handbook without instruction and skill practice will not make someone competent to provide CPR or first aid assistance.

First Responder Roles and Responsibilities

First aid is providing initial care for an injury or illness. The three key aims of first aid are to (1) preserve life, (2) prevent the condition from worsening and (3) promote recovery.

Since emergency-response skills deteriorate with time, retraining is required every two years to maintain BLS: CPR and First Aid provider certification. In addition, regular practice is encouraged, when possible, to retain skill proficiency. All skills performed in an emergency should be within the scope of one's training.

Course Prerequisites
There are no course prerequisites for participation in the BLS: CPR and First Aid course.

Continuing Education
Continuing education is encouraged in the form of additional training courses, supervised practice sessions, reading current literature and refresher training. Your BLS Instructor can provide information about these programmes.

How to Use this Handbook
Each chapter in this student handbook contains two distinct features.
- The beginning of each chapter has a list of questions to assist with learning. This is the information you should look for as you read the material, complete the knowledge development sections and participate in class discussions.
- Boxes labelled "Note" provide explanations that are important for understanding the material just presented.

Terminology
The BLS: CPR and First Aid student handbook introduces medical terms that may be unfamiliar to some readers. Familiarity with basic medical terminology will enhance the quality of communication with emergency and health-care workers. A glossary of terms is provided in the back of this handbook.

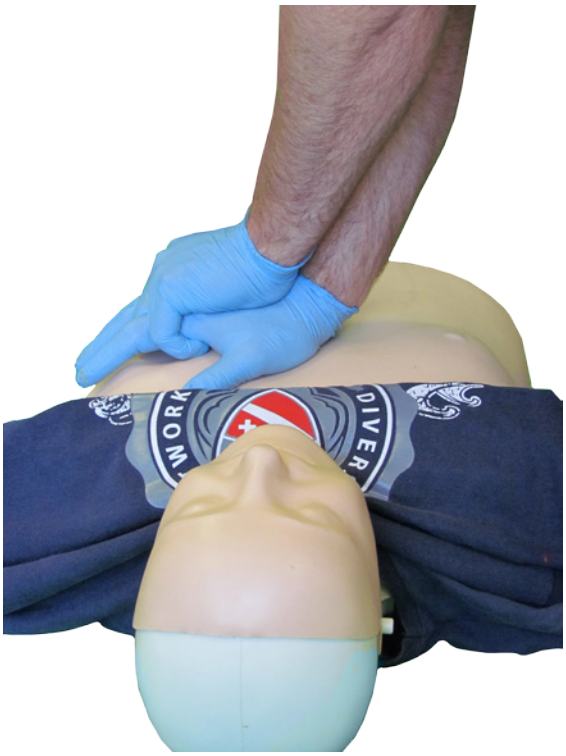
2 Basic Life Support (BLS)

CHAPTER 2 OBJECTIVES

1. What is the goal of CPR?
2. Why is asking permission necessary before rendering care?
3. What are the five links in the chain of survival in their proper sequence?
4. What is the first step for a single rescuer once unresponsiveness has been established?
5. What is the first step for a rescuer if the injured person is a child or the victim of a drowning incident?
6. What can a rescuer do to deal with emotional stress?

Maintenance of tissue oxygen supply is vital for life, and establishing and keeping an open airway is a critical first step when caring for an unconscious or non-breathing person. Airway obstruction impedes or prevents oxygen delivery to our lungs, which then prevents delivery to our blood and subsequently to tissues.

When oxygen supplies are interrupted, our organs will suffer and eventually die. Without oxygen, particularly vulnerable tissues, such as the brain, may start dying after 4-6 minutes. The need for immediate action is therefore crucial.



During BLS, rescuers provide and maintain oxygen supplies to victims by using chest compressions to maintain blood circulation and ventilations to maintain oxygen levels.

Key steps in BLS include:

1. Check for responsiveness and activate emergency medical services (EMS).
2. Quickly check for normal breathing.
3. If the patient is not breathing normally, provide chest compressions to temporarily take over the function of the heart and circulate blood.
4. Open the airway and provide ventilations to deliver air to the lungs.

C irculation

A irway

B reathing

The goal of CPR is not to restart the heart but to provide critical blood flow to the heart and brain, and to keep oxygenated blood circulating. CPR delays damage to vital organs such as the brain and improves the chances of successful defibrillation.

NOTE

The exhaled air used during rescue breathing contains about 16% oxygen compared to the 21% in the normal air we breathe. Despite this reduction in oxygen concentration, ventilations still provide adequate oxygen supplies to sustain vital organs.

Also worth noting is the difference between sudden cardiac arrest (SCA) and myocardial infarction (MI), or heart attack. Sudden cardiac arrest, as its name implies, is sudden and can happen without warning or may be preceded by brief generalised seizures. In this circumstance, the heart has either completely stopped or is in a dysrhythmia such as ventricular fibrillation that cannot support life. Check for normal breathing once seizure activity has stopped and activate EMS. Initiation of CPR and implementation of an AED, if available, is critical.

Heart attacks are serious cardiac events as well but may not result in unresponsiveness or the need for CPR. For an individual experiencing a heart attack, activate EMS and monitor the person continuously. Be prepared to initiate CPR if the victim loses consciousness.

Duty of Care

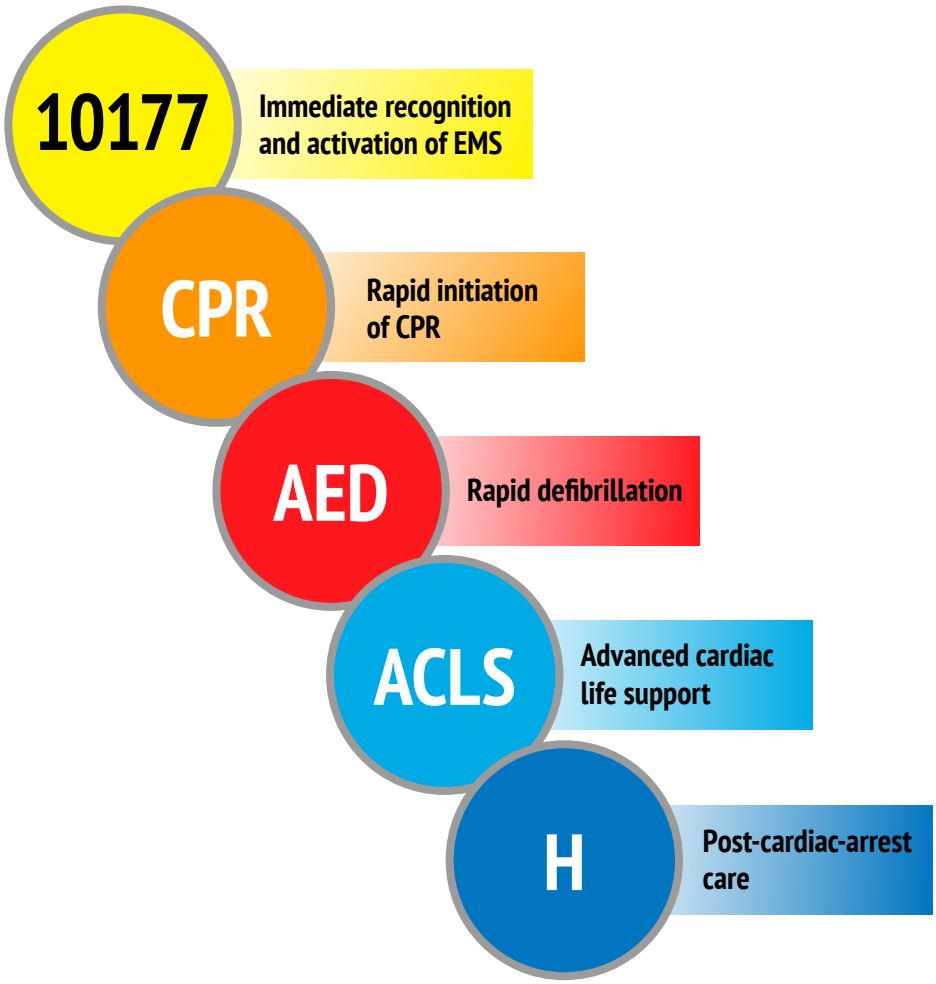
As a potential first responder, you have no legal obligation to provide medical care. In some areas, however, you may have an obligation to notify authorities that someone is in need of medical assistance. If you engage in basic life support, be sure to provide care within your scope of training.

Ask a patient for permission before you provide care. This can be done by saying: "My name is _____, and I am a first aid provider. May I help you?"

If responsive, the patient should give permission before care is provided. Not asking for permission or forcing care against a victim's will exposes you to potential legal action for involuntary assistance or battery. If a person is unresponsive, permission to provide medical assistance is implied.

Chain of Survival

There are five key steps to the chain of survival.



Immediate Recognition and Activation of EMS

Recognition of a medical problem should be followed by prompt action. Once unresponsiveness is established, call EMS. By activating local EMS, the chance of survival increases. Either call EMS yourself or ask a bystander or other rescuer to call EMS.

If you are alone, EMS can be activated using your cell phone on speaker setting as you initiate CPR. This practice minimises lost time and can reduce any delays that otherwise may occur in starting CPR. If you are not alone, have someone else activate EMS while you begin CPR.

There are two scenarios when the solo rescuer may consider initiating CPR prior to activating EMS:

- child or infant victim
- drowning victim

The use of a cell phone as just noted above to activate EMS while initiating CPR is still recommended to expedite the arrival of advanced medical care.

If a cell phone is unavailable, the lone rescuer should perform two minutes of CPR before calling for help. Since cardiac arrest is typically secondary to respiratory arrest in these two groups, this slight alteration in procedural order is recommended. Children and drowning victims may spontaneously recover if CPR is initiated immediately. Additional information on drowning victims is covered later in this course. For information on conducting CPR for children and infants, please consider taking the CPR Health-Care Provider with First Aid course.

In contrast, acute coronary syndromes (heart attacks) often cause unstable heart rhythms that respond best to rapid defibrillation. Activating EMS and getting a defibrillator on scene as soon as possible together provide the best chance of re-establishing a life-sustaining heart rhythm. However, CPR should not be delayed if an AED is not immediately available.

Regardless of who calls EMS, the person relaying information to them should state:

- caller's name
- exact location
- condition of the patient(s)
- care provided
- number of patients
- call-back phone number
- what happened

Do not hang up until the operator releases you. It is important to answer all of the dispatcher's questions to assure an appropriate response team and resources are sent to the site.

The operator may repeat critical information before ending the call, which ensures that the message was received and key facts were conveyed. If someone else calls EMS, be sure to have that person return to the scene after making the call to verify that help is on the way.

Remember, the sooner you make the call, the sooner advanced life support will arrive.

Early CPR

Early CPR significantly improves the chance of survival. Chest compressions temporarily take over the function of the heart by manually circulating blood in the body. Ventilations deliver air to the lungs and ensure a supply of oxygen to the body, especially for critical areas such as the heart and brain.

Rapid Defibrillation

Rapid defibrillation is the single most important intervention in the case of an unstable cardiac rhythm and provides the greatest chance of survival. CPR will not restart the heart but may delay tissue damage associated with inadequate oxygen supplies.

Most cases of adult respiratory arrest are due to cardiac arrest. Cardiac arrest often results from a non-life-sustaining rhythm known as ventricular fibrillation (VF). This rhythm disturbance results in inadequate blood flow to vital organs and is therefore life-threatening.

It is crucial to defibrillate a person with suspected sudden cardiac arrest as soon as possible. Delays of as little as 7-10 minutes greatly reduce the chance of survival.

Advanced Cardiac Life Support

CPR and defibrillation may not restore a normal cardiac rhythm. In those cases, medical interventions such as advanced airway management and the delivery of medications may increase resuscitation success. Should CPR and/or defibrillation be successful, advanced life support will help stabilise the person and make the patient ready for hospital transport.

Remember: Advanced cardiac life support will not arrive until local EMS is activated.

Post-Cardiac-Arrest Care

If a spontaneous heart rhythm resumes and effective circulation is restored, there is still work to do. Maintain airway support and continually monitor the patient until help arrives. Unstable heart rhythms that lead to unconsciousness or death may recur without warning.

Emotional Stress and Fear of Doing Something Wrong

Helping others in need gives you a good feeling, but it might also create emotional stress before, during and after the rescue.

When a person has an accident or is in sudden cardiac arrest, bystanders commonly wait for someone to take charge and provide aid.

Hesitation is often caused by:

- fear of doing something wrong, causing harm or not being able to bring back life
- fear of being sued
- fear of infection (the next section instructs how to avoid infection)

Anxiety is a normal emotion for both the rescuer and patient during an emergency. Some potential rescuers may avoid such situations to avoid making mistakes or providing imperfect care. On the whole, providing some care (even if not "perfect") is a much more effective approach than providing no care at all.

The hard truth regarding cardiac arrest is that in most cases CPR, even when coupled with advanced techniques, does not restart the heart or restore a life-sustaining rhythm, even when it is performed perfectly. CPR increases the chances of survival but does not guarantee it.

Unsuccessful rescues may cause emotional distress. Rescuers may blame themselves for not saving a life and/or think they did something wrong. Some rescuers may benefit from a critical-incident debriefing or professional counselling to help work through such concerns.

A key point to remember if you ever have to perform CPR is that a person in cardiac arrest (with no signs of life) is in the worst possible condition. If no one initiates CPR, someone in cardiac arrest is certain to die; you cannot make them any worse. CPR is a critical link in the chain of survival.

CHAPTER 2 REVIEW QUESTIONS

1. **The goal of CPR (without defibrillation) is to maintain adequate circulation of oxygenated blood to vital organs such as the**
   a. spleen and pancreas
   b. stomach and kidney
   c. heart and brain
   d. liver and muscles

2. **Exhaled air contains about 10% oxygen**
   a. True
   b. False

3. **To avoid legal problems, always ask a patient for _____ before you provide first aid. This may be done by stating: _____**
   a. permission; "My name is… I am a first aid provider. May I help you?"
   b. autograph; "My name is… I am a first aid provider. May I help you?"
   c. certification card; "My name is… I am a first aid provider. May I help you?"

4. **The correct order for the five links in the chain of survival are**
   a. 10117, CPR, AED, Advanced Cardiac Life Support, Post-cardiac-arrest Care
   b. CPR, 10117, AED, Advanced Cardiac Life Support, Post-cardiac-arrest Care
   c. AED, Advanced Cardiac Life Support, Post-cardiac-arrest Care, 10117, CPR
   d. Post-cardiac-arrest Care, Advanced Cardiac Life Support, 10117, CPR, AED

5. **When calling EMS you should tell them**
   a. what happened and the condition of the injured person
   b. the location of the emergency and a call-back number
   c. how many persons are involved
   d. your name and the first aid provided
   e. all of the above

6. **During CPR, the function of the heart and lungs are temporarily taken over by**
   a. chest compressions and ventilations
   b. cardiac defibrillation and an oxygen bottle
   c. advanced medications and ventilator machines

7. **In the case of children and drowning victims, once unresponsiveness has been established, the single rescuer should**
   a. check for injuries
   b. check the mouth for foreign bodies
   c. activate EMS
   d. perform CPR for 2 minutes and then call EMS

8. **Emotional stress may occur before, during or after a rescue**
   a. True
   b. False

9. **In most cases, the heart restarts after someone performs CPR**
   a. True
   b. False

Review answers are on Page 104.

3 Respiration and Circulation

CHAPTER 3 OBJECTIVES

1. What is hypoxia?
2. Why is oxygen necessary for life?
3. Where does gas exchange occur in the body?
4. What body structures comprise the respiratory system?
5. What body structures are included in the cardiovascular system?

It has already been noted that CPR takes over the function of the heart and lungs when someone is in cardiac arrest. A basic understanding of respiration and circulation is beneficial to understanding how CPR can help as well as the impact of injury first aid.

Cardiovascular System

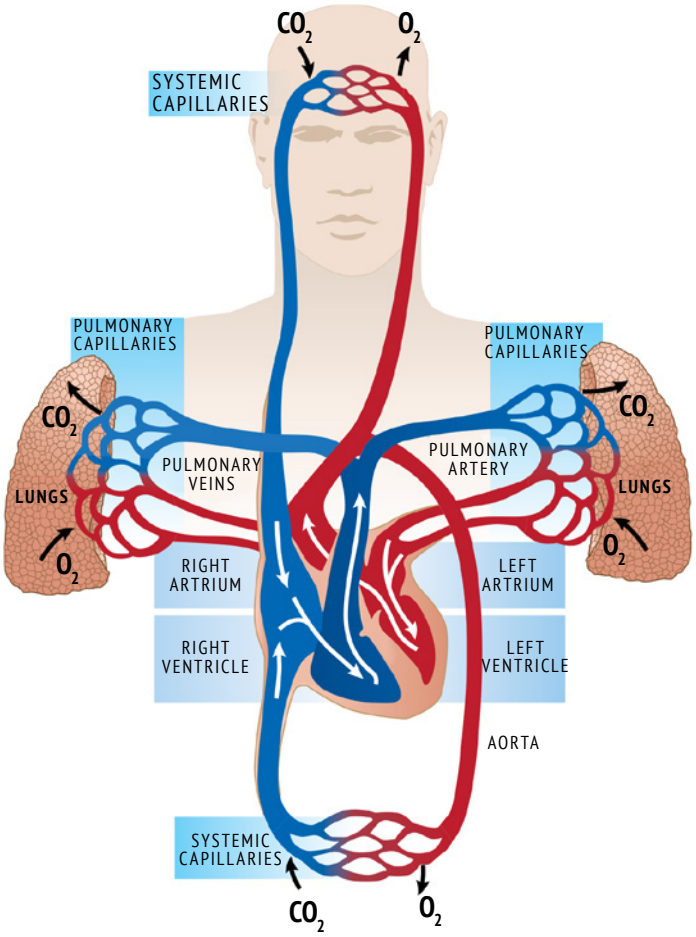
The cardiovascular system includes the heart and blood vessels. It is a closed-circuit system with the primary purpose of pumping blood, transporting oxygen and nutrients to tissues, and removing waste products.

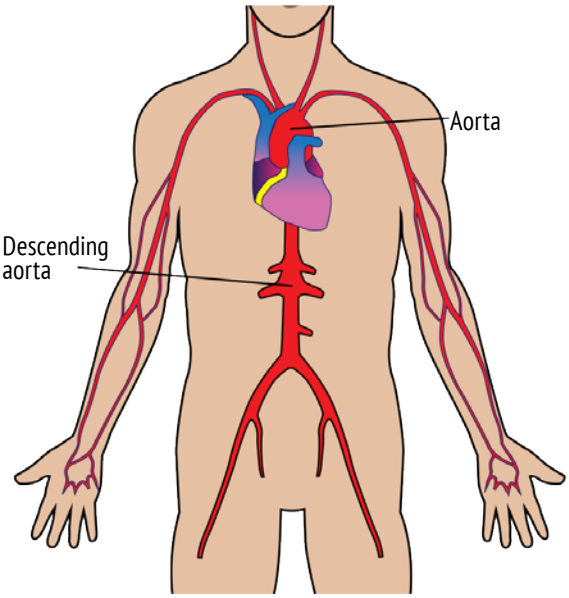
The heart is a hollow, muscular organ situated in the thoracic cavity between the lungs, in a space called the mediastinum. A thin, connective tissue sac called the pericardium surrounds it. The pericardium reduces friction between the heart and surrounding structures.

The heart is a strong, muscular pump that, in the average adult, has the capacity to beat spontaneously at a rate of about 70 times per minute (the normal resting heart rate is 60-100 beats per minute and may be as low as 40 beats per minute in athletes[3]). Every minute, approximately 6 litres of blood is pumped throughout the body. When exercising, this output may double or triple depending upon the amount of exertion.

The heart is divided into a right- and left-pump system (also known as the right heart, or pulmonary circuit, and the left heart, or systemic circuit). The right heart receives deoxygenated blood from the venous system and pumps it to the pulmonary circuit to exchange gasses. Oxygenated blood is returned to the left heart, where it is pumped to the systemic circuit. Transportation of blood through both circuits completes a circulatory cycle.

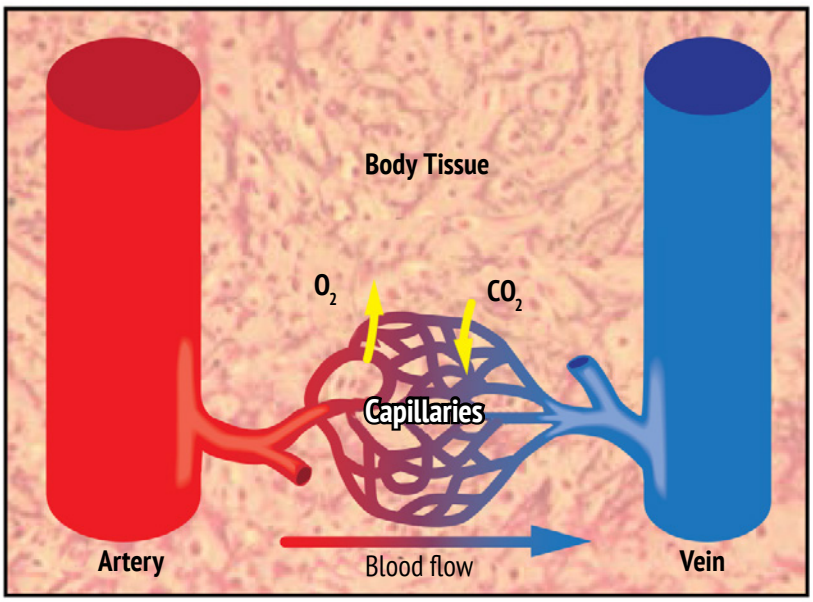
Blood leaves the left ventricle via the aorta, which then branches into smaller arteries to supply the head, arms, torso and legs. The blood vessels make up the vascular tree, with each branch leading to progressively smaller branches, which give rise to capillaries, the smallest of all blood vessels. Through these thin capillary walls, gasses and nutrients are exchanged. Functionally, the heart and large blood vessels represent a pump-and-distribution system for the capillaries, which are responsible for supplying tissues with oxygen and nutrients, and removing CO_2 and other metabolic waste products.





3

From the peripheral capillaries, the blood is gathered into small, thin-walled veins and returned via larger veins to the atria of the heart. Most veins direct blood flow by means of one-way valves that prevent blood from travelling in the wrong direction or pooling due to gravity.

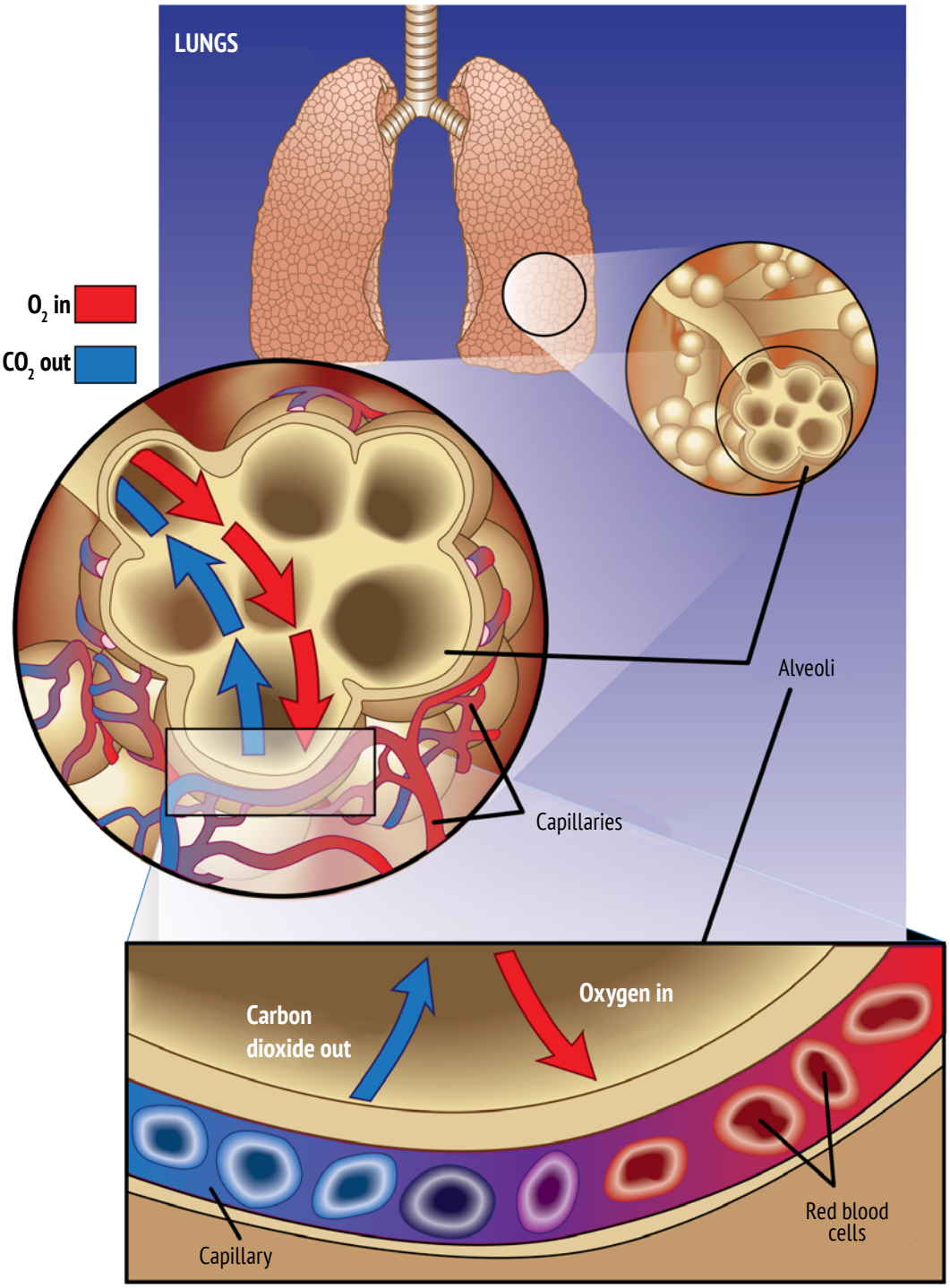


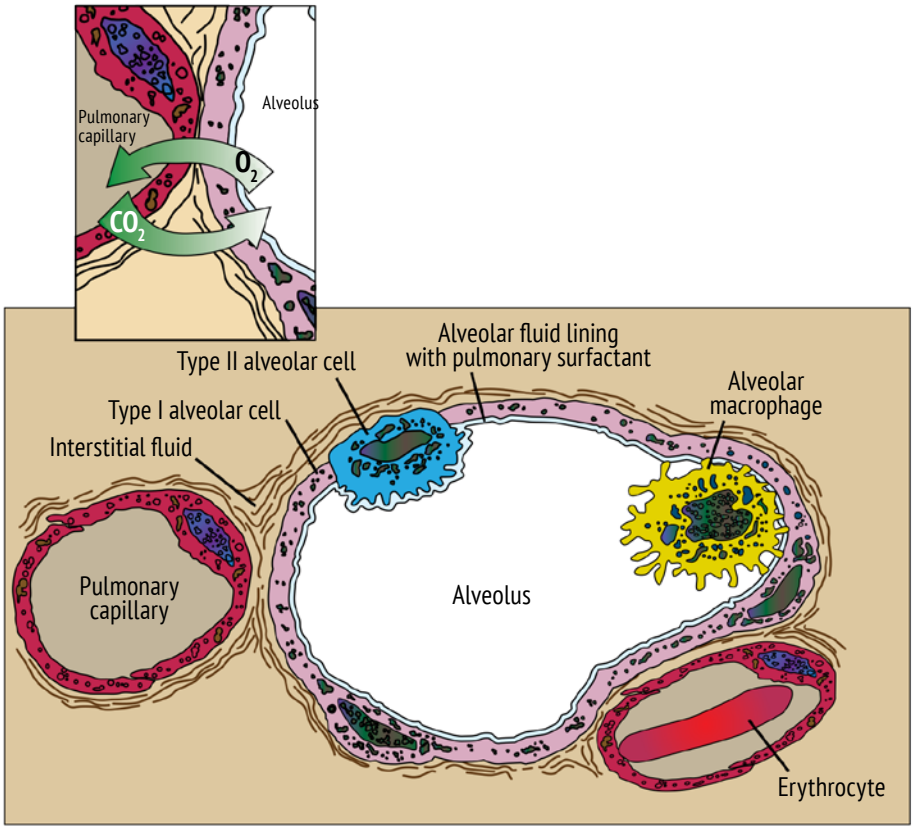
Respiratory System

The respiratory system is comprised of the upper airways (mouth, nose and pharynx), the trachea (windpipe) and the lungs. Key supporting structures include the chest wall (ribs and intercostal muscles) and diaphragm (a muscle critical to respiration that separates the thorax from the abdomen). Surrounding the lungs and lining the inside of the chest wall is a thin membrane called the pleura. Although this is one continuous membrane, its coverage of both the lungs and chest wall forms a double layer. Between these two pleural membranes is a potential space that contains a thin layer of fluid which acts as a lubricant, allowing efficient movement of the lungs during breathing. Air is drawn into the mouth and nose, and passes into the pharynx. The pharynx divides into two distinct passages: The trachea and the oesophagus.

The opening to the trachea is protected from food (solids and liquids) during swallowing by a flexible flap of tissue called the epiglottis. The oesophagus, located behind the trachea, is a conduit for food and fluids on their way to the stomach. It is the proximity of these two structures that makes appropriate lung volume critical during CPR. Overventilation can lead to stomach distention and regurgitation of stomach contents. If this happens, stomach contents can enter the lungs and compromise recovery.

In contrast to solids and fluids, air travels from the pharynx, through the larynx (voice box) and into the trachea. The trachea consists of a series of semi-circular cartilaginous rings that prevent collapse. The trachea passes down into the chest cavity and branches into the right and left bronchi, which enter the right and left lungs respectively. The bronchi progressively divide into smaller and smaller tubes and finally into the alveoli. This branching pattern is commonly referred to as the bronchial tree.


LUNGS
O_2 in
CO_2 out
Alveoli
Capillaries
Carbon dioxide out
Oxygen in
Capillary
Red blood cells



The alveoli, located at the end of the smallest branches of the bronchial tree, have extremely thin walls and are surrounded by the pulmonary capillaries. The alveoli have been likened to tiny balloons or clusters of grapes. In both lungs, millions of alveoli cover a combined surface area of around 70 m^2 – roughly the size of a tennis court.

The average adult alveolus has an estimated diameter of 200-300 micrometers and is only a cell layer thick. Alveoli lie adjacent to capillaries that are also one cell layer thick. This proximity enables the rapid exchange of CO_2 and O_2. The thin alveolar-capillary membrane separates the content of the lungs from the bloodstream. If this membrane tears or becomes compromised due to trauma, it may enable gas to pass out of the alveoli and into the bloodstream. Gas entering the vascular system can travel throughout the body as an air embolism.

CHAPTER 3 REVIEW QUESTIONS

1. **The respiratory system includes the**
   a. heart, lungs, brain
   b. arteries, spinal cord, nose
   c. nose, trachea, lungs
   d. bones, muscles, skin

2. **The cardiovascular system includes the**
   a. veins, arteries, heart
   b. mouth, lungs, stomach
   c. skin, bones, muscles
   d. nose, lungs, pharynx

3. **Gas exchange takes place at the**
   a. vein-artery interface
   b. long bone joints
   c. alveolar-capillary membrane
   d. muscle-nerve junctions
   e. lungs

Review answers are on Page 104.

4 Scene Safety Assessment

CHAPTER 4 OBJECTIVES

1. What is S-A-F-E?
2. What are some hazards that need to be assessed before providing first aid?
3. Why is exposure protection critical for rescuers?
4. What are some examples of personal exposure-protection equipment?

Rescuer safety comes first. The ability to provide first aid is impaired if the rescuer is injured when approaching the victim or rendering care. Taking the time to assess the scene and circumstances surrounding the victim may prevent compromising the rescuer and causing further injury to the victim. Before providing BLS, assess the scene and take steps to avoid or remove any sources of potential injury.

Scene Safety Assessment

Before providing aid, take a moment to remember the mnemonic **S-A-F-E**.

S-A-F-E is a reminder to:

- **Stop:** Take a moment to think and then act
- **Assess** the scene: Before assisting another person, determine if the scene is safe. Dangers may include:
  - fire
  - chemicals
  - electricity or gas
  - traffic
  - animals (tentacles from a jellyfish or a pet that feels threatened)
- **Find** your first aid kit, oxygen unit and AED
- **Exposure** protection: Avoid contact with blood and other body fluids
  - Locate and don barriers such as gloves, eye shields and resuscitation masks

S Stop
- Stop
- Think
- Act

A Assess the Scene
- Scene safe?
- Safe to approach?
- Any hazards?
- Additional risks?

F Find the first aid kit, oxygen unit and AED, and take them to the injured person
- First aid kits contain critical supplies such as barriers

E Exposure Protection
- Use barriers such as gloves and mouth-to-mask barrier devices
- Don gloves and inspect them for damage

Risk of Infection

Anyone in a position to provide medical care may come into contact with body fluids or other potentially infectious tissue. Personal protection is a critical aspect of first aid and should be exercised in all situations and for all people – this is the principle of standard precautions.

For individuals who may be providing CPR and first aid as part of their occupational duties, the U.S. Occupational Safety and Health Administration (OSHA) has created a blood-borne pathogen standard to help minimise occupational exposures. This standard addresses the immediate safety of those who may come in contact with human blood, body fluids, body tissues, human waste, vomitus or organs.

If you believe you potentially have been exposed to a blood-borne pathogen through an open wound, follow these steps:

- Milk the wound, encouraging it to bleed
- Wash the wound with soap and water
- For splashes in your face, flush potentially contaminated material from the mucous membranes of your eyes, nose and mouth, using large amounts of running water
- Wash potentially contaminated material off your skin as quickly as possible with soap and water. This is especially important when your skin has cuts, rashes or scrapes

Report the exposure immediately to your personal physician and follow local protocols. If the incident occurred in the course of work activity, report the exposure immediately to your supervisor and follow your employer's exposure control plan.

There are three main blood-borne infection concerns: Viral hepatitis types B and C, and human immunodeficiency virus (HIV).

Hepatitis B[4]

Hepatitis B virus (HBV) is an infection that attacks the liver and may cause both acute and chronic disease. The virus is transmitted through contact with infected blood and other body fluids but not through casual contact. HBV is 50-100 times more infectious than HIV. Those infected with the HBV are themselves potentially infectious, although only about a quarter of them actually show symptoms. Approximately 5-10% of people infected with HBV as adults go on to have chronic disease. Between 15 and 25% of people with a chronic infection will die of either liver failure or liver cancer.

Symptoms

HBV can cause an acute illness that lasts several weeks. Symptoms may include:

- yellowing of the skin and eyes (jaundice)
- dark urine
- extreme fatigue
- nausea
- vomiting
- abdominal pain

For some, symptoms may persist for several months or up to a year.

Transmission
HBV is transmitted via blood and other bodily tissues including blood transfusions, needle sticks, intravenous (IV) drug use and sexual intercourse (vaginal fluids and semen).

HBV is very contagious; one in three people exposed to the virus from a puncture wound with a contaminated object will become infected. The virus is also very stable on surfaces outside the body. It can last for up to seven days, making decontamination and clean up very important. A vaccine is available for HBV that is 97% effective and is required of most health-care workers.

Hepatitis C[5]
Hepatitis C virus (HCV) is another blood-borne pathogen that can cause severe liver damage.

Of those infected with HCV, about 40% recover fully. Those who do not clear the virus become chronic carriers. Of these, 20% develop cirrhosis and up to 20% of those who develop cirrhosis develop liver cancer.

HCV may cause a relatively mild acute illness or jaundice (in about 10% of those infected) and many people do not know they are infected until many years later. Most people are completely asymptomatic and go on to have chronic disease that leads to cirrhosis and liver cancer (hepatocellular carcinoma). It may take 20 years or more to develop symptoms.

Symptoms
People infected with HCV are potentially infectious even if asymptomatic. Symptoms for HCV include:
- nausea
- abdominal pain
- loss of appetite
- fatigue
- itchy skin
- jaundice

Transmission
Routes of transmission/infection are the same as for HBV. The most common source of infection is IV drug users who share needles. People also have contracted HCV from blood transfusions (prior to July 1992), needle sticks in health-care settings and through sexual intercourse.[6]

The likelihood of an infection from HCV – a 1 in 20 risk – is less than with HBV. The virus can remain viable outside the body but it is not as sturdy as HBV. Currently, no immunisation is available for HCV.

HIV/AIDS

HIV, which causes acquired immunodeficiency syndrome (AIDS), attacks the immune system and impairs the body's ability to fight infections.

Symptoms

People infected with HIV may remain asymptomatic for up to 10 years but can still pass the infection to others. Once infected, it usually takes about three months for the HIV enzyme-linked immunosorbent assay (ELISA) blood test to turn positive.

Some of the potential signs and symptoms of infection include:

- loss of appetite
- weight loss
- fever
- night sweats
- skin rashes
- diarrhoea
- fatigue
- reduced infection resistance
- swollen lymph nodes

Transmission

HIV can be transmitted from person to person through contact with infected blood and bodily fluids. The chance of infection from HIV is much less than from other blood-borne pathogens. A puncture-wound exposure from an infected source has an infection risk of 1 in 300. No immunisation or known cure for HIV is currently available.

Standard Precautions

The first aid provider must be aware of possible disease transmission. Blood, semen and vaginal secretions have the highest risk of transmitting blood-borne pathogens. Saliva, sweat, urine and faeces have a lower risk. Casual social contact will not transmit these infections.

When providing care to an injured person, be aware of any active bleeding and protect yourself from possible exposure. Use appropriate personal protective equipment (PPE), including gloves, face shields, protective eyewear and ventilation masks. In some instances, you may consider gowns for added protection. Many employers provide PPE in locations where high-risk exposures are likely.

Additional safety precautions

- Avoid contaminated sharps such as needles or scalpel blades. Dispose of sharps in an approved container after use

NOTE

In the event of an accidental needle stick or cut from a potentially infected sharp, immediately wash the area with copious irrigation and warm, soapy water. Further medical attention is warranted to determine if an infection occurred.

Responsibility for standard precautions lies with the rescuer. To minimise your risk, carry protective barrier devices in every first aid kit. Gloves should be a standard part of your emergency response kit and should be donned before providing care. Replace them if they become torn, punctured, contaminated or compromised.

When removing gloves, avoid contact with the contaminated exterior of the gloves. Remove them in a manner that keeps the outer surfaces of the gloves from touching your bare skin. The skills section provides details about how to remove gloves safely.

NOTE

Gloves protect a rescuer but may become contaminated while providing aid. Be careful to avoid skin contact with bodily fluids when removing gloves.

CHAPTER 4 REVIEW QUESTIONS

1. **Potential dangers at the scene of an accident or injury requiring assistance may include**
   a. fire, downed power lines, overcast skies
   b. animals, fire, chemicals
   c. chemicals, sunny skies, open beaches
   d. all of the above

2. **The S-A-F-E mnemonic helps us remember**
   a. to activate EMS
   b. scene safety assessment
   c. to use personal protective equipment
   d. b and c
   e. none of the above

3. **Personal protective equipment is a critical part of keeping yourself safe while providing care**
   a. True
   b. False

4. **Three examples of protective equipment are gloves, face shield, oronasal resuscitation mask**
   a. True
   b. False

5. **When removing gloves after providing first aid, it is important to keep the outer surface of the glove from touching your skin during removal**
   a. True
   b. False

Review answers are on Page 104.

5 Initial Assessment

CHAPTER 5 OBJECTIVES

1. What are the three steps to the assessment sequence?
2. What technique assists the rescuer in placing an unresponsive person on his back?
3. What is agonal breathing?
4. When should the recovery position be used?
5. When should the recovery position not be used?

The assessment sequence consists of three primary steps:

- Assess for responsiveness and activate EMS
- Determine if the victim is breathing normally
- Adjust the patient's position for ongoing care, if necessary

Assessing Responsiveness

Once a rescuer ensures the scene is safe, assess the victim's level of responsiveness. Tap the victim's collarbone and shout, "Are you OK?"

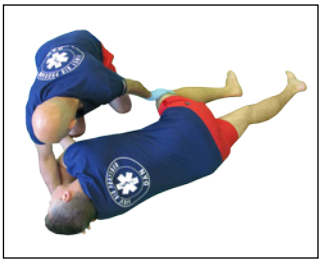
Remember to introduce yourself, state you are trained in first aid and express your desire to help. Reassure the patient by showing a caring attitude and talking to him about what is happening. The rescuer should also try to keep bystanders at a distance to avoid added stress.

If the victim can answer, he should initially be left in the position in which he was found. Call EMS and then conduct a secondary assessment (discussed later in this course) to determine if any injuries are present. If no evidence of injury is present, then the rescuer can place the victim in the recovery position or a position of comfort. The rescuer should reassure the patient and try to find out what happened.

If the patient does not respond, call EMS, turn him on his back and assess for normal breathing. To turn a patient from a face-down position onto his back, use the log roll.

NOTE
Abnormal respirations are commonly associated with cardiac arrest. Breathing efforts may be infrequent, irregular, diminished or characterised as noisy gasps known as agonal breathing. This type of breathing is quite different from that seen in a normal, resting or sleeping person and is not adequate to support life.

Recovery Position
If normal breathing is present or resumes, place the unresponsive, injured person in the recovery position to ensure an open airway. This helps to prevent blood and vomit from obstructing the airway or flowing into the lungs. Should vomiting occur or if blood or other fluids are present in the mouth, gravity will aid in their removal and minimise the chance of aspiration.



Remember to call local EMS. Until help arrives, continually check that the victim is still breathing.

The recovery position is accomplished from a supine position.

- Kneel beside the patient and make sure that both of his legs are straight
- Place the patient's arm nearest to you at right angles to his body, with the elbow bent and palm facing upward
- Bring the far arm across the patient's chest and hold the back of his hand against the cheek nearest to you
- Place your other hand under the leg farthest from you, just above the knee, or grab the pant leg of the patient's clothing and pull the knee up, keeping the foot on the ground
- Keeping the patient's hand pressed against his cheek, pull the far leg to roll him toward you and onto his side
- Adjust the top leg to form 90-degree angles at both the hip and knee
- Tilt back the patient's head to ensure the airway remains open
- Adjust his hand under his cheek, if necessary, to keep the head tilted
- Check breathing regularly

NOTE
Do not place people with suspected spinal, pelvic or hip injuries in the recovery position because it places them at increased risk of further injury.

If you use the recovery position, monitor the peripheral circulation of the patient's lower arm and ensure that the duration of pressure on this arm is kept to a minimum.

Log Roll

If the patient is not on his back, you need to roll him into that position.

To minimise the risk of neck and back injury or in the case of suspected spinal trauma, use the log-roll technique.

- Kneel at the patient's side
- Carefully straighten the injured person's arms and legs, place the arm closest to you above the person's head and place the other arm against his torso
- Support the head and neck with one hand
- Place the other hand on the opposite elbow and pull it gently into his side
- Roll the victim toward you, while avoiding twisting his head, neck and back
- Use a smooth, continuous movement to roll the patient to his side and then onto his back
- Keep twisting movements to a minimum throughout the entire roll

NOTE

When two rescuers are present, one should immobilise the head while the second person rolls the patient on his back. The rescuer at the head controls the action by directing when to roll the patient.

CHAPTER 5 REVIEW QUESTIONS

1. **Any breath sounds at all are considered normal**
   a. True
   b. False

2. **Placing an unconscious, breathing victim in the recovery position is important to maintain an open airway and to minimise the potential of blood and vomit to cause obstruction**
   a. True
   b. False

3. **Persons with back, neck or pelvic injuries should not be placed in the recovery position**
   a. True
   b. False

Review answers are on Page 104.

6 Cardiopulmonary Resuscitation

CHAPTER 6 OBJECTIVES

1. What is the recommended rate for compressions during CPR?
2. What is the recommended depth for CPR compressions on an adult?
3. What is the compression/ventilation ratio?
4. When is full CPR always recommended?
5. What CPR protocol is to be followed for drowning victims?
6. What barrier devices (exposure protection) are recommended when doing rescue breathing?
7. How long should ventilations last?

Starting CPR — Support Circulation

When normal breathing is not present, activate EMS immediately. Inform them that the patient is not breathing normally. After notifying EMS, begin CPR, starting with 30 compressions followed by two breaths.

Begin chest compressions by stacking your hands, with the fingers of both hands interlocked, and the heel of the bottom hand on the centre of the chest, between the nipples. Keep the fingers raised off the chest wall and compress the chest 30 times at a rate of 120 per minute.

The depth of the compression should be 5-6 cm. Excessive depth during chest compressions can reduce survivability due to internal damage. Regardless of the size of the individual, limit compression depth to 5-6 cm. It is important to release the pressure on the chest between the compressions but do not lose contact between the chest and your hands. Avoid leaning on the chest between compressions because it will inhibit full recoil of the chest wall. Full recoil is required for adequate circulation. The skills section covers the exact hand position and compression technique in detail.

During compression, blood is pushed out of the left side of the heart and then throughout the body. At the same time, deoxygenated blood is squeezed from the right side of the heart to the lungs, where it will take oxygen from the lungs. When releasing the pressure on the chest, blood flows from the body into the right side of the heart and oxygenated blood returns from the lungs to the left side of the heart.

When compressions are too fast, the heart does not have time to refill with blood, and thus the resulting volume that flows out of the heart is decreased. When compressions are too slow, the amount of circulating oxygen available to tissues decreases. When compressions are not deep enough, the amount of blood pushed out of the heart may be inadequate to support tissue oxygen demands.

Ventilations, described on the next page, follow chest compressions. Together they are delivered at a ratio of 30 compressions to 2 ventilations.

NOTE
If more than one rescuer is present, alternate the role of performing chest compressions about every one to two minutes to minimise rescuer fatigue.

Drowning
Drowning is the third-leading cause of accidental death worldwide.[7] Responding to these incidents promptly and effectively can help reduce the mortality of drowning.

It has already been noted that, for victims of drowning, a lone rescuer should conduct CPR for two minutes before activating EMS.

Another shift in protocol for drowning victims is for rescuers to initiate CPR with ventilations (not compressions) after determining unresponsiveness. This change is due to the hypoxic condition of drowning. It also is possible that prompt oxygenation of tissues with the use of a ventilations-first protocol can prevent cardiac arrest (if it has not already occurred). The rescuer can also consider using supplemental oxygen if available.

Begin CPR for drowning victims by establishing an open airway, delivering two ventilations and then performing 30 compressions – a protocol acronym of A-B-C. Continue with two ventilations after every 30 chest compressions. Hands-only CPR is not appropriate in this situation.

Ventilations

Ventilations deliver oxygen to the lungs to oxygenate the blood and are an important part of CPR. For effective ventilations, tip back the victim's head and extend the jaw. This position opens the airway and prevents the tongue from creating an obstruction.

A seal must be created with either a barrier device or directly on the victim's mouth. Barriers are recommended to minimise exposure risk. They are available as small as a simple face shield that can be carried in minimal space like a wallet. Larger barriers include various oronasal resuscitation masks and devices. Mouth to mouth may be the only option if no barrier aids are available.

Alternatively, in the absence of a barrier device you may perform hands-only CPR if you are unwilling to or uncomfortable with performing unprotected ventilations. Compression-only support is acceptable in the case of a witnessed collapse of an adult who stops breathing normally. However, for drowning victims or scuba diving injuries injuries, CPR is always recommended. This course teaches full CPR, which is part of the requirements for certification.

After each cycle of 30 compressions, provide two ventilations. Each ventilation should last about one second. Allow the chest to fall (exhalation) for about one second and then deliver a second ventilation.

If the first ventilation does not cause the chest to rise, reposition the victim's head and try again. Regardless of effectiveness of ventilations, compressions should not be interrupted for more than 10 seconds. If ventilations do not make the chest rise after two attempts, return to compressions. Check for visible obstructions after completing an additional cycle of 30 chest compressions and/or try to ventilate again. Each pause from chest compressions to ventilate should not last more than 10 seconds.

NOTE

Remove the victim's dentures only if they cannot be kept in place. In all other situations, keep them in the victim's mouth because they will make it easier to create a seal.

Full CPR

Full CPR is accomplished by using chest compressions and ventilations together, as this chapter describes. The skill-development portion of this course will provide an opportunity to develop compression and ventilation techniques, as well as the opportunity to perform full CPR on manikins.

Use of Oxygen During Resuscitation

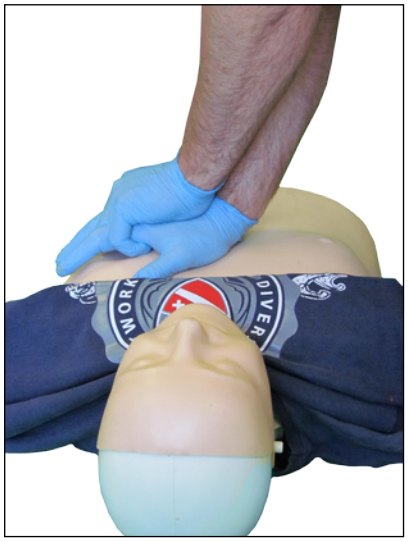
Supplemental oxygen improves the delivery of oxygen to tissues during resuscitation. When used effectively, the concentration of delivered oxygen may increase to levels approaching 100%.

The use of oxygen is very important for victims of drowning and scuba diving accidents, where hypoxia is a major concern. Oxygen should be present at every swimming pool and dive site. BLS: CPR and First Aid providers are encouraged to complete the Emergency Oxygen for Scuba Diving Injuries course.

What About Children?

Many children do not receive resuscitation because rescuers are fearful of causing harm. The current CPR compression and ventilation ratio (30:2) is also used for children. The lone rescuer should perform CPR for approximately two minutes before going for help (or while simultaneously calling EMS via cell phone). For children, compress the chest by approximately one-third its depth using one or two hands. For infants under one year, use two fingers.

For in-depth information and training on providing CPR for children and infants, plus two-person CPR for adults, children and infants, consider taking the CPR Health-Care Provider with First Aid course.



Special Circumstances with Resuscitation[8]

Pregnancy

While cardiac arrest is rare in pregnant women, it appears the rate may be increasing for women who are in the second half of their pregnancies. There are several potential causes but these are irrelevant to the first aid responder. To perform effective compressions when the top of the uterus is above the mother's umbilicus, the recommendation is to manually displace the uterus to the mother's left to reduce pressure in return circulation to the heart while compressions are performed. For quality compressions to be delivered, a second rescuer is required. Activate EMS immediately because additional measures will be required in a hospital setting.

Opioid Overdose

In 2012, opioid overdose became the leading cause of death for people 25-60 years of age in the United States. Most of these deaths are associated with prescription medications. Because of its presentation, opioid overdose can be confused with unconsciousness and can be difficult to ascertain as the cause of death. An opioid overdose progresses from central nervous system (CNS) depression to respiratory arrest to cardiac arrest. For first aid purposes, this situation is referred to as an opioid-associated, life-threatening emergency.

Naloxone is a medication that interferes with the action of opioids in the brain, spinal cord and gastrointestinal system. Because there are no known harmful side effects when this medication is used with or without opioid intoxication present, the U.S. Food and Drug Administration has approved a naloxone auto-injector as well as an inhaled nasal mist for use by lay rescuers in the first aid setting.

As with all life-threatening emergencies, check to see if the patient is breathing or gasping. Begin CPR if the person is not breathing or is gasping. If naxolone is available, administer 0.4 mg with an auto-injector as well as an inhaled nasal mist and continue CPR. The dose may be repeated every four minutes. Watch for purposeful movement or regular breathing to indicate the patient becoming responsive.

Continue to monitor the patient's breathing and responsiveness until EMS arrives. Resume CPR if the person's condition relapses and administer additional doses of naloxone.

If the patient does not respond, continue CPR and verify that EMS is on the way.

CHAPTER 6 REVIEW QUESTIONS

1. **The recommended rate of compression for an adult is**
   a. 60-80 per minute
   b. 120 per minute
   c. at least 140 per minute
   d. rate is not important as long as compressions are being done

2. **The recommended depth of chest compression for an adult is**
   a. 4-5 cm
   b. 5-6 cm
   c. 8-9 cm
   d. Depth is not important as long as compressions are being done

3. **The compression/ventilation ratio for an adult is**
   a. 30:2
   b. 15:2
   c. 5:1
   d. 50:2

4. **Full CPR is always recommended for drowning and scuba diving injuries**
   a. True
   b. False

5. **Each ventilation should take about _____ in duration**
   a. 2 seconds
   b. 1 second
   c. 5 seconds

6. **CPR for drowning victims should follow an A-B-C protocol**
   a. True
   b. False

Review answers are on Page 104.

7 Use of AEDs During CPR

CHAPTER 7 OBJECTIVES

1. Why are AEDs recommended when they are available?
2. What is the reduction in survival rate when AED use is delayed?
3. What specific condition does an AED help resolve?

The heart has an inherent electrical system that stimulates heart muscle contractions. As these electrical impulses fire and the muscles contract, blood is pumped from the heart to the lungs and and the arteries to allow for systemic circulation.

When something upsets these electrical impulses and breaks the heart's rhythm, sudden cardiac arrest (SCA) may occur. The most common life-threatening rhythm disturbance (arrhythmia) that occurs during an SCA is called ventricular fibrillation (VF). Fibrillation refers to disorganised and ineffective muscular contractions. When this occurs in the ventricles (the chambers responsible for pumping blood to the lungs and body) circulation essentially stops and a person will die.

The most effective way to re-establish a normal heart rhythm is with defibrillation. While CPR helps to oxygenate blood and circulate it throughout the body, CPR cannot re-establish a normal heart rhythm.

Defibrillation sends an electric shock through the heart and essentially hits a "reset" button. The electric shock overrides the misfiring rhythm and allows the body's natural pacemaker to restore a normal rhythm.

Prior to the advent of automatic external defibrillators (AEDs), the use of defibrillators required a lot of training and only highly trained professionals could use them. Fortunately, AEDs available to the general public are simple to use and reduce the time from initial collapse to initial shock delivery. AEDs available in public areas differ but all provide audible user prompts. Turn on the AED and follow the directions provided by the unit. The skill-development portion of this course will introduce the process by using an AED training unit.

When defibrillation is provided in conjunction with CPR within minutes of VF beginning, the person's chances for survival are at the highest rate. Survival rates drop by about 7-10% for every minute a person is in VF without CPR.[9] The longer a person remains in an unstable rhythm, the lower the chances of successful defibrillation and subsequent survival.

It is recommended that the lone rescuer retrieve any readily available AED unit while concurrently using a cell phone to activate EMS, thereby reducing the time for emergency care arrival and providing for quick implementation of the AED. Place the cell phone on speaker function and keep it close, allowing for constant contact with EMS dispatch while initiating care.

To use an AED, the patient's chest must be bare. Place the AED pads on reasonably dry skin, following the diagrams on the pads — one pad on the upper-right chest and the other wrapped around the lower-left side of the rib cage. If the pads are switched, the AED will still work.

Software within the AED performs heart-rhythm analysis and will advise the rescuer if a "shockable" rhythm is detected. If a non-shockable rhythm is detected, the unit will provide a "no shock advised" message. The rescuer should then continue CPR uninterrupted until EMS arrives or another rescuer takes over.

If a shockable rhythm is detected, the AED unit will prompt rescuers to clear the area ("Do not touch the patient") and then will deliver the shock. Once the AED delivers the shock, immediately resume chest compressions. The heart still needs the support of chest compressions, so resume them immediately after the shock is delivered. There is no lingering charge from the use of an AED that will cause harm to the rescuer. Continue CPR for two minutes or until the AED unit advises it is analysing the heart rhythm again. The unit may advise for additional shocks, so be prepared to deliver multiple shocks based on the AED prompts.

Take time to notice the locations of AEDs in businesses and other areas you frequent so you will know where to find one if it is needed. Also be aware that rules and regulations concerning AED use vary from region to region. Check for laws that may apply in your area or ask your BLS: CPR & First Aid Instructor about possible restrictions on AED use where you live or work.

Cautions
While AEDs can be used in wet environments, they should not be used in standing water. Move a patient away from pools of water if necessary.

If supplemental oxygen is being used in care for the patient, discontinue it and move it away from the patient.

Troubleshooting
AEDs are typically trouble-free, but when problems do occur they frequently involve the pads. When the AED unit detects problems, it will provide prompts to check for issues such as poor pad placement or attachment. Chest hair or wet skin may interfere with pad adhesives, so make sure the chest is free of excessive moisture. It may be necessary to shave off heavy chest hair for adequate pad contact.

The vibrations caused by running boat engines may make it difficult to use an AED on moving boats.

Maintenance
Check the AED status indicator daily. If the battery is low, replace it with a new or freshly recharged one. Do not use an AED with a low battery charge.

AED pads have expiration dates. Check components regularly and replace items as necessary.

Carefully handle pads using the provided tabs or the space where the wires attach. If the pads appear damaged or if wires are loose, a new set of pads may be required for the AED to operate properly.

CHAPTER 7 REVIEW QUESTIONS

1. **The use of an AED is often helpful but may decrease the chance of survival**
   a. True
   b. False

2. **Every minute the heart is in fibrillation, survival rates decrease by**
   a. 3-5%
   b. 7-10%
   c. 12-15%
   d. 20-25%

3. **All cardiac arrests can benefit from the shock delivered by an AED**
   a. True
   b. False

4. **The charge from a delivered shock should be allowed to dissipate before touching the patient to resume CPR**
   a. True
   b. False

Review answers are on Page 104.

8 Foreign-body Airway Obstruction (FBAO)

CHAPTER 8 OBJECTIVES

1. What is the most common cause of choking in adults?
2. How can a partial airway obstruction be identified?
3. How should a rescuer respond to a partial airway obstruction?
4. How can a complete airway obstruction be identified?
5. How should a rescuer respond to a complete airway obstruction?
6. What action should be taken if a choking victim becomes unconscious?
7. When can a finger sweep be used?

Foreign bodies are the main cause of blocked airways and choking. Food is the most frequent culprit in adults. In children it may be toys, coins, nuts or other small objects. Airway obstruction prevents normal airflow into the lungs and may result in respiratory arrest.

Airway obstruction may be partial or complete. A choking victim may suddenly become silent or grasp at his throat– this is the universal sign for choking. Ask the victim, "Are you choking?" People who are able to move air will usually cough to dislodge the object and may not require an intervention.

Of greater concern is a severe obstruction, when a person is unable to breathe at all and can only nod his head to your question. He cannot cough or speak. This person is unable to move air and will become unconscious without intervention. If possible, provide assistance before unconsciousness occurs.

First Aid

In the case of a partial or mild airway obstruction (the victim can speak, cough, make sounds), the rescuer should encourage the choking victim to cough but should do nothing else.

If the victim shows signs of a severe airway obstruction and is conscious, perform abdominal thrusts (often called the Heimlich manoeuver) in the following way:

- Stand behind the patient, and put both of your arms around the upper part of his abdomen
- Clench your fist and place it between the navel and bottom tip of the sternum, with the thumb side of your fist against the choking victim's abdomen
- Grasp your fist with your other hand and pull sharply inward and upward
- Repeat until the object is expelled or the patient loses consciousness

If the victim at any time becomes unconscious:

- Carefully lower the victim to the ground
- Activate EMS
- Begin CPR (chest compressions followed by ventilations)
- Look in the mouth for the obstruction before each ventilation. Use a finger sweep to remove any visible objects

Finger Sweep

When you can see solid materials in the airway, use a gloved finger to remove the foreign matter. Do not perform a finger sweep if you cannot see an obstruction or foreign object in the mouth. If the removal of a foreign object enables spontaneous breathing, continue to monitor the patient and call EMS. If spontaneous breathing does not start with the removal of foreign material, initiate CPR.

Victims of Drowning: Aspiration of Water

The aspiration of water can be suspected in cases of drowning. Removal of water, however, is not part of medical treatment, as it is usually a much smaller volume than expected. There is no need to clear the airway of aspirated water before starting CPR.

Regurgitation of stomach contents is common during drowning resuscitation and can make it difficult to maintain a clean and open airway. Whenever regurgitation occurs, turn the victim on his side using the recovery-position technique and wipe or suction vomitus using a finger sweep or suction device.

CHAPTER 8 REVIEW QUESTIONS

1. **The most common cause of airway obstruction and choking in adults is**
   a. tongue
   b. food
   c. dentures

2. **Grasping the throat is a common sign made by choking victims**
   a. True
   b. False

3. **If you suspect that someone is choking, _____**
   a. look in the mouth
   b. check for responsiveness
   c. ask "Are you choking?"
   d. ask a doctor

4. **With complete airway obstruction, the victim will be unable to _____ but might nod his head in response to your question. If the victim is unable to speak or has a limited ability to move air, he may soon lose _____**
   a. yell for help, his breath
   b. talk, his breath
   c. breathe/cough/speak, consciousness

5. **In the case of a partial airway obstruction, the rescuer should encourage the choking victim to cough but should do nothing else**
   a. True
   b. False

6. **If the victim at any time becomes unconscious, the rescuer should _____**
   a. allow the victim to drop to the floor in the hope that the fall will dislodge the foreign body
   b. ease the victim to the ground, remove the foreign body if visible and start CPR
   c. ease the victim to the ground, initiate supplemental oxygen therapy

7. **What must you do when a victim regurgitates?**
   a. Roll the patient on his side, and wipe or suction out the mouth
   b. Blow vomit back into the stomach
   c. Remove gloves and wipe away vomit with bare hands

Review answers are on Page 104.

9 Shock Management

CHPATER 9 OBJECTIVES

1. What is shock?
2. What are some causes of shock?
3. What are the signs and symptoms of shock?
4. What is the first aid treatment for shock?

Shock is a life-threatening condition resulting from inadequate blood supply to the brain and other vital organs. Clinical signs of shock are expressions of the body's attempt to compensate for reduced circulating blood volume. Increased heart and respiratory rate, peripheral vasoconstriction (narrowing of blood vessels), cold, mottled skin and reduced blood pressure are all compensatory mechanisms aimed at redirecting available blood to vital organs.

Shock requires medical intervention. First aid providers can serve a vital role by recognising signs of shock, providing first aid and activating emergency services. Without medical assistance, the patient's condition may worsen.

There are several kinds and causes of shock:

Hypovolemic shock is due to any cause of prolonged or severe fluid loss, including severe bleeding, vomiting, diahrroea and burns.

Cardiogenic shock is due to inadequate pumping of the heart. This may occur after a heart attack, heart failure or arrhythmia.

Septic shock is due to circulatory insufficiency caused by infection (such as blood poisoning). Severe sepsis can cause systemic vasodilation and profound drops in blood pressure.

Anaphylactic shock is caused by a severe allergic reaction. Defined as involving two or more body systems, anaphylactic shock is characterised by swelling, rash and possible airway compromise. It may also involve gastrointestinal symptoms. Common causes include reactions to bee stings, nuts, penicillin and shellfish.

Insulin shock is seen in diabetics who have injected too much insulin, causing severe hypoglycemia (low blood-sugar levels).

Neurogenic shock is caused by damage to the central nervous system. Such injuries may cause systemic vasodilation and insufficient blood pressure to perfuse tissues.

Signs of shock may include:

- pale, cold, clammy skin
- thirst
- anxiety, restlessness, confusion
- nausea and vomiting
- rapid, shallow breathing
- weakness and unconsciousness
- rapid heart rate, weak pulse

NOTE

Although a person in shock may be extremely thirsty, use caution if providing oral fluids. The patient may have an altered mental status and may thus be more prone to aspiration and choking. In general, oral fluid administration is not recommended.

Administration of IV fluids is recommended but can be given only by professional health-care providers.

Treatment of Shock

The principal role of the first responder is to assess for signs of shock and activate EMS. In addition the first responder must also address underlying causes of shock such as active bleeding. You may also be called upon to assist in the administration of personal medications (such as inhalers, nitroglycerin or epinephrine auto-injectors) or food (in the case of insulin shock).

Rescuers should also do the following:

- Assess if the scene is safe
- Support the airway and breathing
- Keep the victim calm
- Position the victim lying on his back. If neither trauma nor spine or pelvic injury are suspected, consider elevating his legs 13-26 cm. Do not elevate the legs if it causes pain
- Help the victim maintain a normal body temperature. People in shock may become cold. Use isothermal blankets or other materials (such as a sweater or jacket) to protect the victim from excessive heat loss. The rescuer must also prevent the victim from becoming overheated. Strive for a comfortable temperature
- Activate EMS
- Do not give the victim anything by mouth

NOTE

Do not force a person to lie down if he is not comfortable in that position.

People in shock require assessment by medical professionals and may require hospitalisation.

CHAPTER 9 REVIEW QUESTIONS

1. **What is shock?**
   a. A dramatic drop in blood sugar
   b. A life threatening condition resulting from inadequate blood supply to the brain and vital organs
   c. A feeling of nausea brought on by the rocking motion of a boat

2. **Which of the following is not a type of shock?**
   a. Hypovolemic
   b. Cardiogenic
   c. Cryogenic
   d. Insulin
   e. Anaphylactic

3. **Signs and symptoms of shock include**
   a. pale, clammy skin, thirst
   b. anxiety, restlessness, confusion
   c. rapid, shallow breathing
   d. any of the above

4. **Adding blankets over someone in shock always helps to maintain a normal body temperature**
   a. True
   b. False

5. **Oral fluid administration is recommended in the case of shock**
   a. True
   b. False

6. **Persons in shock should receive prompt medical attention and may need to be hospitalised for further treatment**
   a. True
   b. False

Review answers are on Page 104.

10 First Aid Assessments

CHAPTER 10 OBJECTIVES

1. How is first aid distinguished from basic life support?
2. How is level of consciousness assessed?
3. What is S-A-M-P-L-E?
4. What is a secondary assessment?

First aid is the care you provide for injuries or illnesses that are not immediately life-threatening. Before initiating care, perform a general assessment.

General Patient Assessment

a. State of health: Obtain a general impression of the patient's health and well-being. Is he in physical distress or pain?
b. Observe respiratory effort, chest expansion, pulse rate and use of accessory muscles.
c. Notice if the skin is pale or red and flushed.
d. The level of consciousness can be evaluated using the A-V-P-U acronym:

A	Patient is alert
V	Not alert but responds to verbal stimuli
P	Not alert but responds to painful stimuli
U	Unresponsive to all stimuli

History

When talking to a patient, gather and record a history of the event(s) that led to the injury. If it was a traumatic event, determine the mechanism of injury, if possible. This information helps determine the potential severity of the injury. It may also reveal other injuries that are not immediately detectable. Also ask about previous injuries to the same area that may confuse your findings.

To help you remember what information to gather when taking a history, use the mnemonic S-A-M-P-L-E:

- **S**igns/Symptoms
- **A**llergies
- **M**edications
- **P**ertinent medical history
- **L**ast oral intake
- **E**vents leading to the current situation

It is not necessary to determine pulse and respiratory rates.

Illness Assessment

In a medical emergency, determine the patient's complaints and when they started.
Examples of common concerns include the following:

- breathing difficulties
- chest pain
- abdominal pain
- altered level of consciousness

Secondary Assessment

After you have stabilised a patient and addressed any immediate life-threatening concerns, perform a secondary assessment to check for any other injuries of which you were not initially aware. Conduct the assessment with the patient in the same position in which she was found. Do not move the patient if the nature of the injury or their position indicates there may be a neck, spine, hip or pelvic injury. Talk to the patient to determine if she has any pain or particular discomfort and focus on those areas.

Before you begin this secondary assessment, remember to be S-A-F-E and protect yourself from bodily fluids with personal protective equipment. The assessment involves touching the patient, so ask for permission before you begin.

Use your eyes and hands to find any abnormalities or possible problems.

Start at the head, watching for signs of injury or blood and any areas that cause apparent pain.

If the patient experiences pain, stop the assessment and notify EMS if you have not already called them.

Gently palpate (touch) the entire scalp and face.

Inspect the patient's nose and ears for blood or fluid.

Palpate the patient's neck. The mechanism of injury will give you a good idea about whether a head or neck injury is likely.

Move in front of the patient and shade his eyes from the sun or lights. Do this one eye at a time to see if the eyes dilate in response to the shade.

If the injury is related to scuba diving, feel the front of the neck for air bubbles and a crackling sound coming from under the skin. This sign indicates subcutaneous emphysema, which is caused by air bubbles escaping from the lungs and chest cavity, or it can indicate a lung-overexpansion injury. If this sign is present, call EMS if you have not already done so.

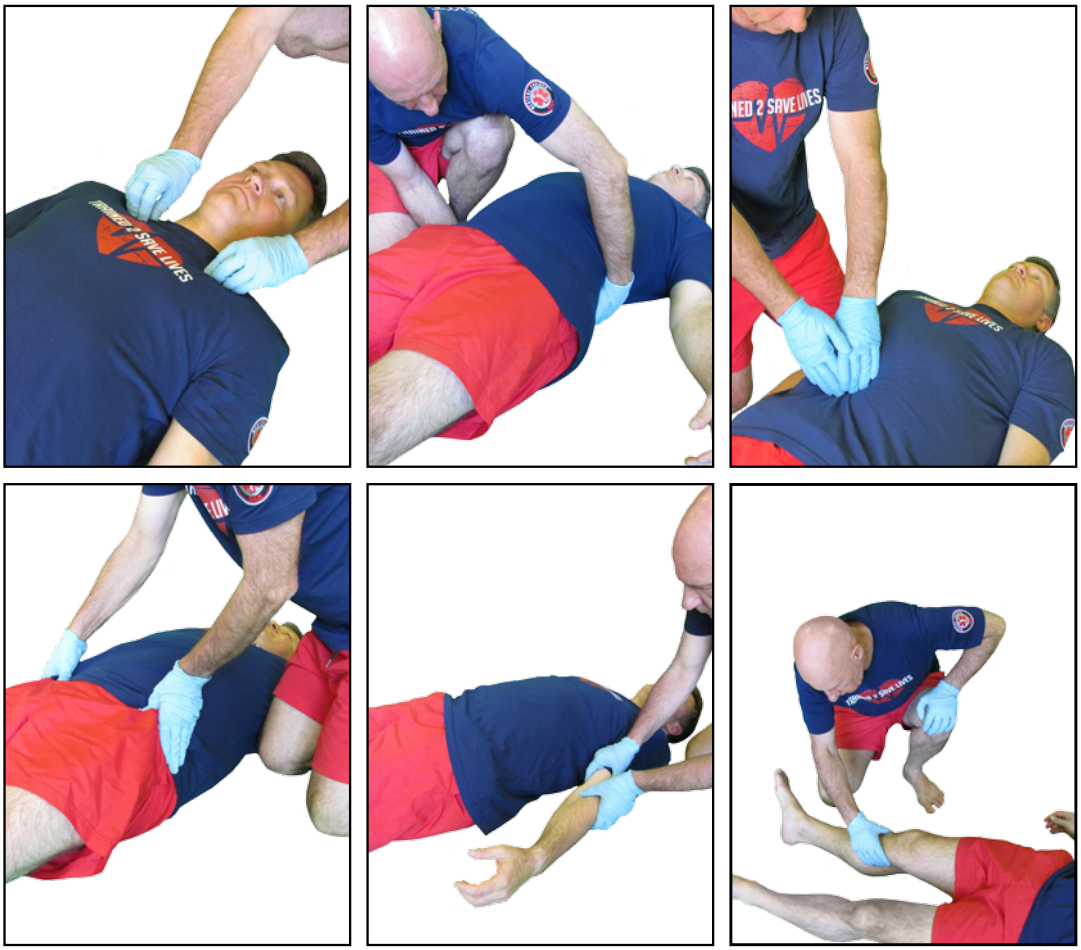
Next, palpate the patient's collarbone to check for deformities or discolouration. Press your fingers along each collarbone individually to assess movement or reaction to your examination.

Examine the chest by placing both hands on either side of the rib cage and ask the patient to take a deep breath. Note any open wounds. If you see bubbling, apply direct pressure to the wound to stop air from moving in and out.

Divide the abdomen into four quadrants with the navel as the centre point. Gently press on each quadrant in turn to check for any areas that are sensitive, stiffened, hard or painful. If the patient complains of pain in any particular area, press on that area last.

Next, place a hand on either side of the patient's pelvis and gently push straight down and then in from both sides. Note any instability or painful responses.

Finally, palpate down the arms and legs by gently squeezing to feel if bones beneath the skin and muscle are displaced. Ask the patient to wiggle her fingers and toes.



CHAPTER 10 REVIEW QUESTIONS

1. **First aid is care provided for injuries or illnesses that are not life-threatening**
   a. True
   b. False

2. **The A in S-A-M-P-L-E stands for**
   a. allergies
   b. asthma
   c. anxiety
   d. aneurism

Review answers are on Page 104.

11 Control of External Bleeding

CHAPTER 11 OBJECTIVES

1. What is the primary function of blood?
2. What is the body's response to bleeding?
3. How can the rescuer help control bleeding?
4. When and how should a tourniquet be placed?

The primary function of the blood is to supply nutrients and oxygen to body tissues, and to remove waste products such as carbon dioxide. Blood consists of approximately 55% plasma (liquid) and 45% cells or solid particles (44% red blood cells and 1% white blood cells and platelets).

The circulating blood volume in an adult is approximately 5 litres. Actual blood volumes will vary depending on body size. Acute blood loss may result in hypovolemic shock, a condition in which decreased blood volume causes inadequate tissue oxygen supply. Severe bleeding (haemorrhaging) must be stopped to avoid hypovolemia, which is especially important in children because they have less circulating blood volume than most adults.

The body has two mechanisms for limiting blood loss. The first is vasoconstriction (narrowing of blood vessels), which occurs in response to injury and helps reduce blood loss. Second, platelet activation initiates blood clotting. For minor bleeding, this process works extremely well and with little support will stop blood loss. When bleeding is more severe, additional intervention may be needed.

First responders can aid the clotting process by applying direct pressure on the wound, using an absorbent bandage.

When approaching an injured person perform the following steps:

- Assess the scene and ensure that the person is breathing
- If the injury requires medical attention, activate EMS
- Ask permission to provide first aid
- Don gloves/personal protective equipment

Direct Pressure

Direct pressure over a bleeding site is usually sufficient to control most bleeding. This is accomplished by using an absorbent pad or dressing and gloved hands. If the bleeding continues and seeps through the pad, add additional absorbent material on top of the original pad. Do not remove the original pad. Dressing removal may remove clotting blood and disrupt the clotting process. Continue to hold direct pressure until the bleeding stops.

Secure the pad with a clean or sterile bandage. The bandage should be big enough to cover the pad, extending past the edge (2.5-5 cm if possible). Wrap the bandage from the distal side (farthest from the heart) of the wound site toward the heart.

The bandage should help maintain direct pressure but not prevent circulation. You can check circulation by squeezing the nail beds and looking for the pink colour under the nails to return quickly after pressure is released. It should return to its normal pink colour in 2-3 seconds. In cold conditions, colour refill may take slightly longer. If colour does not return in a timely manner, loosen the bandage and rewrap.

Tourniquets

If direct pressure fails to control massive bleeding, the next step may be to use a tourniquet if the injury is on an extremity. Tourniquets are a primary intervention when the bleeding is a massive arterial (spurting) bleed and is life-threatening.

A tourniquet is a wide band placed tightly enough around an arm or leg to stop blood flow. It must be applied with sufficient force to stop arterial bleeding, not just venous bleeding. Arteries are deeper in the body and therefore require forceful pressure to stop blood flow, which is accomplished with the use of a windlass device (part of a commercial tourniquet or makeshift in an improvised tourniquet). Double check the effectiveness of a tourniquet by assessing distal pulses, which should not be present if the tourniquet is applied tightly enough.

A tourniquet should be:

- used only when direct pressure is not effective
- wide (at least 5 cm wide if an improvised tourniquet is used)
- well-padded (6-8 layers of a bandaging material)
- placed 2.5-5 cm proximal to the wound

NOTE

A tourniquet should NOT be:

- *placed directly over knees, elbows or other joints. If there isn't room to place a tourniquet between a wound and a joint, place the tourniquet 2.5-5 cm proximal to the joint*
- *made of wire or rope. A narrow, excessively tight or insufficiently padded band may cause local damage to tissues in minutes*

Applying a tourniquet

Before applying a tourniquet, inspect the wound to ensure direct pressure was being applied directly to the site of the bleeding. If not, attempt direct pressure once more.

Place a commercial tourniquet, as noted above, and secure it in place. Twist the windlass until bleeding stops and secure it with the mechanism on the tourniquet.

Wrap an improvised tourniquet proximal to the wound, as noted above, several times. Secure in place with an overhand knot. Place a stick or similar object on top of the knot and tie a second overhand knot over it. Twist this "handle" just until the bleeding stops. Secure the handle in place by wrapping with a second bandage.

Using a marker, write on the patient's forehead "T" or "TK" (for "tourniquet") and the time the tourniquet was placed. This ensures subsequent caregivers are aware the tourniquet is there and how long it has been on. The tourniquet should not be removed until advanced medical care is available.

NOTE

- *Death of tissue below the tourniquet is possible after two or more hours*
- *Tourniquets may cause pain in the extremity*

Haemostatic Dressings

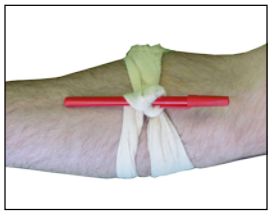
A final option to control bleeding that is not responding to a tourniquet or is located in an area where a tourniquet cannot be used is a dressing impregnated with haemostatic agents.

Remove any other dressing materials so the agents can have direct contact with the bleeding site. Cover the entire bleeding surface with the haemostatic dressing and continue direct pressure. Apply additional layers of haemostatic dressings if necessary. Hold dressings in place with a pressure bandage.

Advise medical personnel that a haemostatic agent was used to assist with control of bleeding. Retention of the dressing's packaging material may be helpful to emergency personnel. Haemostatic dressings should not be left in place more than 24 hours.

Open Chest Wounds

When presented with an open chest wound, contact EMS immediately. Leave the open chest wound exposed to ambient air. Dressings should not be applied except to address active bleeding. Take care to ensure that a saturated dressing does not cause occlusion, partial or complete.



CHAPTER 11 REVIEW QUESTIONS

1. **The primary function of the blood is to supply nutrients and oxygen to the body tissues, and to remove carbon dioxide**
   a. True
   b. False

2. **Which of the following should be applied first to control external bleeding?**
   a. Direct pressure
   b. Tourniquets
   c. Haemostatic dressings

3. **Should the first dressing become soaked, you should**
   a. remove the dressing and replace it with a fresh dressing
   b. place additional dressings on top of the existing dressing as needed
   c. remove the dressing and irrigate the wound
   d. leave it as is

4. **A tourniquet should be placed**
   a. if the wound exhibits massive arterial bleeding
   b. if bleeding is not stopped by direct pressure over the wound
   c. 2.5-5 cm above the wound
   d. all of the above

5. **A tourniquet should be removed after two hours regardless of continued bleeding**
   a. True
   b. False

Review answers are on Page 104.

12 Bandaging and Wound Management

CHAPTER 12 OBJECTIVES

1. What is the key role of first aid when a wound is bleeding?
2. When should a bandage be applied?
3. What is the purpose of a pressure bandage?
4. When should impaled objects be removed?
5. What is the purpose of a splint?

Our skin creates an important barrier between the external environment and our body. Breaks in the skin often result in bleeding and may enable bacteria that either live on the skin or are introduced through the wound to enter our body and cause infection. The key role of first aid for wound management is to minimise wound contamination and control bleeding.

General Approach

Once scene safety has been ensured and permission to provide care has been given, use standard precautions and don gloves prior to rendering aid. Your next priority is to clean, wipe or wash away obvious dirt and then cover the wound to provide protection from further injury and to stop bleeding. Depending on what materials you have available, this may require the use of non-medical equipment such as clean, cotton towels. You should use whatever materials you have on hand and adapt your methods to the situation as long as you meet some basic recommendations.

A dressing is the material used to cover a wound. Dressings should be as clean as possible. Sterile dressings are ideal but not a requirement. Keep dressings free from dirt and debris, and the wound as clean as possible.

Apply the initial dressing (layers of gauze or absorbent pad) and maintain pressure until bleeding stops. If blood soaks through before the bleeding stops, add additional layers of absorbent material and continue to apply direct pressure. Once bleeding has stopped, bandage the dressing so the wounded area remains covered. Be careful not to wrap a limb too tightly because this may interfere with circulation.

The dressing material you use should completely cover the wound to include a margin of normal skin beyond the wound. When applying a bandage to an arm or leg, begin wrapping from the farthest point away from the heart. Remove any rings or other pieces of jewellery that are present in the affected area. Local injury can cause swelling and if rings are still in place, they may cause finger constriction and additional injury.

Special Circumstances

Bandaging Joints

When applying bandages across joints, ensure the area is in a comfortable position and try to keep the joint immobilised to minimise further discomfort or bandage displacement.

Eyes

With eye injuries, it may be necessary to cover the injured eye to minimise pain and to provide comfort. To patch an eye, fold clean gauze over the closed eyelids and then place tape over the eye, with anchors at the forehead and cheek. Bandage both eyes to prevent the injured eye from moving with the uninjured eye.

Pressure Bandage for Envenomations

In the case of venomous bites or stings, a pressure bandage may be applied to help slow the spread of venom to the body. The dressing technique is similar to that described earlier. Additional information on this type of wound is available in the First Aid for Hazardous Marine Life Injuries course.

Impaled Objects

If the injury includes an impaled object, leave the item in place. Secure it with dressings and bandages, and transport the patient to advanced medical care.

Object removal is generally not advised because it may cause additional injury. An exception to this protocol is when the object penetrates the cheek and into the mouth. In this case, removal is advised if it will not result in further harm. Objects that have penetrated into the mouth may cause airway obstruction or impede airway management and it is therefore best to remove them. Once the object is removed, apply absorbent material (gauze) to both sides of the wound.

Abdominal Wounds

Abdominal injuries that result in exposure of internal organs are medical emergencies and should prompt immediate activation of EMS. If faced with an abdominal injury in which internal organs are exposed or protruding, do not touch the organ or push it back into the abdominal cavity. Simply cover it with a dressing that is moistened with sterile or clean drinking water and protect the patient from further harm. Provided the patient has not suffered a spinal injury, you may also flex the patient's knees and hips to relax the abdominal muscles.

Fractures

Bone fractures or breaks often cause considerable pain and may result in limb deformity. Fractures that cause a bone to stick through the skin are referred to as open fractures. Open fractures are at high risk for infections, including bone infections, and should be covered with sterile dressings as soon as possible and the limb immobilised. Although such wounds will bleed, avoid excessive pressure.

Check the patient's pulse, capillary refill and sensation in the injured limb. Also see if movement of the fingers and toes is possible, and if the victim has normal sensation distal to the injury. Repeat these checks every 15 minutes after you apply the splint to ensure that circulation has not been impaired.

A properly applied splint or cast will not only secure the injured area but will also immobilise the joints above and below the injury. For example, when splinting a forearm, immobilise both the wrist and elbow.

Apply a splint any time you think it might be helpful but do not attempt to push bones back into place. Pad the injured area to provide both security and comfort, and prepare to evacuate the patient to the nearest appropriate medical facility.

Splinting

When dealing with bone or joint injuries, a splint will enable immobilisation and pain reduction. If emergency medical services are readily available, protect and stabilise the injury, and wait for help. If you are in a remote location or emergency services are delayed, prepare a splint to prevent movement of the bones or joints that could cause further injury and pain.

You can use just about anything to immobilise an injured limb. Commercial splints may be made for a specific purpose, but splint materials can be improvised.

Prior to splint application, remove all jewellery, and ensure adequate visualisation of the areas. This may involve cutting away clothing. A splint should be applied while keeping the injured limb in the position in which it was found. Do not attempt to straighten or adjust the limb in any way.

Once the splint is in place, continue to monitor circulation and sensation.

CHAPTER 12 REVIEW QUESTIONS

1. **When should you bandage a dressing in place?**
   a. After the bleeding has stopped
   b. Immediately
   c. After allowing the wound to air out
   d. Never

2. **You should always remove an impaled object**
   a. True
   b. False

3. **When applying a splint, make sure the joints above and below the injury move freely**
   a. True
   b. False

Review answers are on Page 104.

13 Medical Emergencies

CHAPTER 13 OBJECTIVES

1. What is asthma?
2. What are the signs and symptoms of heart attack?
3. What is hypoglycaemia versus hyperglycaemia?
4. What is F-A-S-T?
5. What is the primary first aid response for seizures?
6. What is the rescuer's primary action for poisoning victims?
7. What is the preferred first aid for exertional dehydration?
8. What restrictions should be observed by someone who may have suffered a concussion?
9. What action provides the best chance for survival of an avulsed tooth?

The term "medical emergency" describes a situation in which a person's life, limb or eyesight is threatened. Emergencies may result from unexpected trauma or underlying disease. The conditions described in this chapter represent a short list of common emergencies that first aid providers are likely to encounter.

Asthma

Asthma is a non-contagious, respiratory illness characterised by airway narrowing and enhanced bronchial thickening. People with asthma are more prone to abrupt airway narrowing if exposed to particular triggers. Most asthmatics are aware of their condition and have medications that can help reverse symptoms of chest tightness or shortness of breath. Asthma medications are commonly administered with a metered-dose inhaler, and symptom relief can be rapid.

However, when someone with asthma has a prolonged attack with severe symptoms, this can be a life-threatening situation and requires prompt medical attention. When this happens, activate EMS immediately. Try to calm the person to reduce his breathing workload and anxiety. Assist the patient with his prescribed inhaler if necessary (an inhaler should not be given to someone for whom it is not prescribed).

Heart Attack

A heart attack – acute myocardial infarction (AMI) or acute coronary syndrome (ACS) – is the term used to describe the symptoms associated with blockage of the arteries that supply the heart. If the heart attack is severe enough to cause the heart to stop functioning or stimulate a life-threatening arrhythmia, first responders may need to initiate CPR and use an AED. When the person suffering from a heart attack is still conscious and breathing, your role is more supportive.

In this situation, keep the person in a position of comfort and activate EMS. If the patient has no history of allergy or recent bleeding, consider giving one or two adult aspirin (325 mg) or four baby aspirin (81 mg). Some people with a history of heart problems carry nitroglycerine, which is available as either pills or a sublingual spray. You may be called upon to assist the patient with taking his own prescription, but do not attempt to give nitroglycerine to a person who does not have a prescription. When assisting someone with nitroglycerine, do not handle the pills with bare hands because the medication can be absorbed through the skin. Nitroglycerine is administered under the tongue to be absorbed and not swallowed. It is administered every five minutes for a total of three doses. If the person becomes pale or feels faint, do not administer subsequent doses of nitroglycerine. Do not administer more than three doses, regardless of the person's condition, unless directed to do so by medical personnel.

Not all heart attacks are painful and there are many different variables to look for when it comes to heart conditions.

Possible warning symptoms of acute coronary syndrome

- heavy pressure or squeezing pain in the centre of the chest or centre of the back
- shoulder, arm, neck or jaw pain
- shortness of breath
- sweating
- feeling weak or faint
- nausea and vomiting
- indigestion, heartburn
- sense of impending doom

Symptoms vary between men and women as well as among individuals with pre-existing medical conditions.

NOTE

The term "massive heart attack" is often used to describe a sudden cardiac arrest. The term "heart attack" refers to pain secondary to a blocked artery that feeds the heart. As a result of blood-flow restriction, an area of the heart muscle may die, but this does not necessarily result in death of the individual.

Diabetic Emergency

Diabetes is a disease that affects normal blood-sugar control. When blood-sugar (blood-glucose) levels are markedly elevated (hyperglycaemia) or low (hypoglycaemia), people can become symptomatic.

Blood glucose comes from the breakdown of dietary carbohydrates found in foods such as rice, cereals, grain, potatoes, fruits and sweets. Insulin, a hormone made in the pancreas, facilitates cellular uptake of blood glucose. When insulin is either made in insufficient quantities or is ineffective (in the case of insulin resistance), blood-sugar levels will rise and may result in hyperglycaemia.

For diabetics who require insulin injections, use of insulin without adequate dietary intake will cause a drop in blood-glucose levels and may cause hypoglycaemia.

If someone with diabetes suddenly feels unwell or starts behaving uncharacteristically, consider having them check their blood-glucose level with a glucometer (blood-glucose measuring device which is standard equipment for all diabetics). Most diabetics will recognise their symptoms, but if they are unable to think clearly they may need your help. Confusion, altered behavior, excessive sweating or tremors in someone with a history of diabetes can quickly lead to a serious medical emergency that requires advanced medical care as quickly as possible. Some people will wear medical-alert tags to inform rescuers that they have diabetes.

Signs of Hypoglycaemia	Signs of Hyperglycaemia
- hunger - tremors or seizures - anxiety - sweating - dizziness or lightheadedness - sleepiness - confusion and/or changes in level of consciousness - difficulty speaking - nervousness - weakness	- increased thirst - headaches - difficulty concentrating - blurred vision - frequent urination - fatigue (weak, tired feeling)

Hypoglycaemia is an acute condition that requires rapid intervention. Interventions by a first aid provider should be limited to assisting with ingestion of foods with high sugar concentrations such as glucose tablets or 20 g of carbohydrates such as candy (quantity varies), jelly beans (15-20), fruit strips (two pieces) or orange juice (200 ml or 3/4 cup). It may take 10-15 minutes for the hypoglycaemic symptoms to resolve, so waiting to activate EMS is suggested. If symptoms do not resolve in that time frame, administer additional high sugar concentrations as noted previously and call EMS.

Once a diabetic has either taken his insulin or had something to eat or drink, stay with him to ensure that his condition and mental status improve. If his mental status deteriorates, it may become necessary to call EMS and continue to provide support until help arrives.

Hyperglycaemia may require medical intervention but rarely requires emergency treatment from the first aid provider. The diabetic experiencing hyperglycaemia will usually be capable of checking his own blood sugar and administering his own insulin if needed.

Stroke

Stroke is a leading cause of long-term disability and death in the U.S.

Strokes are a medical emergency that can result in permanent neurological injury, disability and death. They result from either blood-vessel blockage (usually from a blood clot or thrombus) or from blood-vessel rupture that causes bleeding (haemorrhage).

Strokes can manifest with sudden loss of motor function (ability to move one half of the body), inability to understand or formulate words or loss of a visual field. Many strokes are not associated with headache. Most strokes come on suddenly and are painless — the person suffering from one may be unaware of its occurrence.

In the absence of head trauma, stroke should be suspected when neurological symptoms (those affecting the nervous system) suddenly appear. The faster acute injury is detected and emergency services alerted, the greater the chances that medical treatment will reduce injury and disability.

Signs of stroke include the following:

- facial droop
- slurred, garbled or nonsensical speech
- inability to raise or move an arm

If any of these signs are present, call EMS immediately.

The **F-A-S-T** mnemonic may help you quickly identify a possible stroke and reinforces the need for immediate activation of EMS. For additional training in neurological assessment, consider taking the Neurological Assessment course.

F	Facial droop
A	Arm weakness
S	Speech difficulty, sudden severe headache
T	Time (note the time and call EMS immediately)

Remember: F-A-S-T first, then call EMS.

Facial droop. Facial droop occurs on one side of the face and may involve either the left or right side during a stroke.

Arm weakness. Assess arm weakness by asking the injured person to raise both his arms and bend his wrists so his hands point upward. Ask the person to hold that position for about 10 seconds. Watch for lowering of an arm or straightening of a wrist.

Speech. Stroke is frequently associated with speech difficulty or reduced vocal clarity.

Time. Rapid recognition and activation of EMS is critical as timely intervention can dramatically influence outcome and recovery time.

The **F-A-S-T** examination is an easy way to determine if signs of neurological injury have occurred. If signs are present, call EMS.

Call EMS at the first sign of stroke. Depending on the victim's condition, BLS may be necessary as airway management can become compromised.

Seizures

Seizures (also known as fits and convulsions) result from a sudden massive electrical discharge within the brain. Seizures may present as brief trance-like states or full-body convulsions. Epilepsy is a disorder that results from surges in electrical signals inside the brain, causing recurrent seizures.

Generalised seizures affect both cerebral hemispheres (both sides of the brain). They cause loss of consciousness for either brief periods or for several minutes. A common type of generalised seizure is the tonic-clonic or grand-mal seizure. Seizures may also be focal and involve only one limb.

Generalised seizures often start with a brief cry followed by a fall to the ground. Alternating stiffening (tonic phase) and jerking (clonic phase) movements of the arms, legs and face characterise a seizure.

The period following a generalised seizure is known as the postictal phase. During this period people may be unresponsive, in a deep sleep, weak, disoriented or combative. This phase usually resolves within 30 minutes.

As a first aid provider, there is not much you can do for a seizing person, nor is there much you need to do. During a seizure, your first priority should be to move objects that may be struck or cause injury away from the seizing person. Protect, but do not attempt to restrain, an individual during a seizure and avoid placing anything in the person's mouth.

Once the person has stopped actively convulsing, conduct your initial assessment and ensure an open airway. Continue to monitor the patient for changes.

Next, take a history and establish whether the person has a seizure disorder. If not, attempt to determine any other conditions that may have caused the seizure. This information will be useful for EMS.

Conditions associated with seizure predisposition include the following:

- high fevers (primarily in young children experiencing spiking fevers)
- infections, including meningitis or encephalitis
- poisoning, including drugs or heavy metals
- hypoglycaemia
- head trauma
- shock
- hypoxia/hyperoxia
- drug or alcohol overdose or withdrawal
- intracerebral bleeding (i.e., stroke)
- certain complications of pregnancy

Poisoning

A poison is any substance that is harmful to your body if too much is eaten, inhaled, injected or absorbed (through the skin). Any substance, including medications, can be poisonous if too much is taken.

Common signs of poisoning include the following:

- nausea/vomiting
- abnormal blood pressure – high or low
- headache
- abdominal pain
- dilation or constriction of pupils
- altered mental status
- shortness of breath
- seizures
- injury to skin
- irregular heart rate
- diarrhoea

Any time you suspect poisoning, call 10177, other local emergency number or a poison control centre (Tygerberg Poison Centre number is 021 931 6129). Stating the poison type (type of medication, drug, etc.), approximately how much was used and current symptoms will help guide management. A patient's medical status can worsen rapidly, so all suspected poisonings should be evaluated in a hospital.

Once EMS has been called, your primary role is to monitor breathing and be prepared to perform BLS if the person has a compromised airway, stops breathing or becomes unconscious.

Provide EMS or the treating medical facility with the substance to ensure appropriate treatment. If the substance is not available, attempt to find out the name, chemical composition or list of ingredients.

If the poison is a liquid that was absorbed through the skin or came into contact with broken skin, irrigate all affected parts of the body with water for 20 minutes or until EMS arrives. If the poison is a powder, brush any residual powder off (use exposure protection) before irrigating the exposed area. Immediately treat an eye injury due to any chemical exposure (liquid or powder) by flushing the eye with tap water for 15 minutes or until EMS arrives.

Contact the local poison control centre for additional information/assistance

All poisoned patients need to see a physician, even if it appears that all signs of a problem have been controlled and the emergency is over.

Exertional Dehydration

Vigorous exercise with profuse sweating, especially in hot, humid environments, can lead to dehydration and loss of electrolytes. As long as the individual can swallow, oral rehydration in the absence of shock or confusion is a reasonable first aid approach. Attempt rehydration with 5-8% carbohydrate-electrolyte solutions (commercially available sports drinks). Plain water is an alternative but is not as effective. If the individual has heat-related symptoms, refer to the Temperature-related Injuries chapter in this book.

Concussion

Concussion is a mild, traumatic brain injury that results in symptoms such as feeling stunned or dazed, dizzy or unsteady. Headache, visual disturbances, confusion or memory loss are also symptoms of concern following a head injury. The range of symptoms can make recognition of concussion difficult. The potential for long-term consequences makes any decision about response critical. Anyone who experiences any of these symptoms after a blow to the head should be evaluated by a health-care professional. Defer use of mechanical machinery, driving, cycling, participation in sport activities or use of any electronic equipment until after evaluation and clearance by a health-care provider.

Dental Avulsion

Traumatic loss of a tooth can damage both the tooth and the supporting structures in the mouth. The greatest chance for survival of the tooth is reimplantation within an hour. If the first aid provider can reimplant the tooth without undue pain to the patient, it should be done.

Otherwise, store the tooth in one of the following solutions and seek immediate dental care.

- egg white
- whole milk
- coconut water
- injured person's saliva (but not in the person's mouth)

If available, the following solutions may be used:

- Hank's Balanced Salt Solution
- Ricetral
- propolis

CHAPTER 13 REVIEW QUESTIONS

1. **Asthma** _____
   a. is a non-contagious respiratory illness
   b. is airway narrowing that makes breathing difficult
   c. can be treated by metered-dose inhalers
   d. can be life-threatening if severe and prolonged
   e. all of the above

2. **All heart attacks are painful**
   a. True
   b. False

3. **Hypoglycaemia is a condition** _____
   a. in which blood sugars are low
   b. that should be treated with additional insulin
   c. that can be reversed by eating and/or drinking foods with high sugar content
   d. all of the above
   e. only a and c

4. **F-A-S-T stands for face, arms, smile, time**
   a. True
   b. False

5. **During a seizure, the rescuer's primary concern is to move objects that may cause injury if the patient should hit them**
   a. True
   b. False

6. **In the event of suspected poisoning,** _____
   a. attempt to determine what was ingested
   b. attempt to determine how much was taken
   c. note current symptoms
   d. call the local poison control centre or EMS
   e. all of the above

7. **Plain water is the preferred first aid measure for exertional dehydration**
   a. True
   b. False

8. **Someone who appears to have suffered a concussion can resume his regular activities regardless of how he may feel**
   a. True
   b. False

9. **An avulsed tooth can be stored in** _____
   a. egg white
   b. whole milk
   c. the injured person's saliva
   d. any of the above

Review answers are on Page 104.

14 Burns

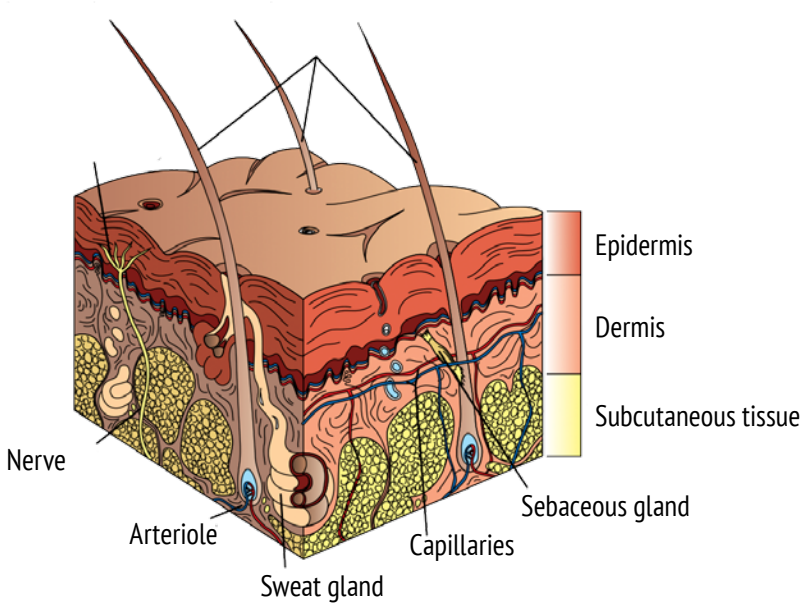
CHAPTER 14 OBJECTIVES

1. How are burns categorised?
2. What is a superficial burn?
3. What is a second-degree burn?
4. What is a third-degree burn?
5. What is the general first aid treatment for burns?
6. How should chemical burns be treated?

Burns refer to tissue damage caused by heat, chemicals, electricity, sunlight or radiation.

Thermal injury from hot liquids, steam, building fires, flammable liquids and chemicals are the most common causes. As with all cases of severe injury, continuously monitor the patient and treat for shock if any signs of that condition become apparent.

Burns can disrupt the protective function of skin, and result in fluid loss and increased risk of infection. They can cause swelling, blistering, scarring, shock and even death. Burns are named or categorised based on the depth of tissue involvement.



This diagram shows the primary layers of normal skin.

Burn Categories

Superficial Burn (first-degree burns)

- tissue injury is limited to the epidermis (outermost layer of the skin)
- characterised by redness (erythema) and minimal swelling, such as in a sunburn
- mild discomfort
- commonly treated on an outpatient basis

Partial-Thickness Burn Injury (second-degree burns)

- involves the epidermis and variable depths of the dermis (skin layer below the epidermis)
- often occurs with scalding injuries and severe sunburns
- may present as blisters and blanching skin to white, glistening/wet-appearing base
- most painful of all burns
- requires medical evaluation and ongoing care especially if hands, feet, face, genitals or buttocks are affected
- deeper burns may take three to four weeks to heal
- deeper burns may require excision/debridement (removal of dead tissue)

Full-Thickness Burn (third-degree burns)

- involves epidermis, all layers of dermis and extends down to subcutaneous tissue
- appears dry, leathery and insensate (without sensation in the area most affected), often without blisters
- may appear waxy or charred
- presents with variable degrees of pain
- can be difficult to differentiate from deep, partial-thickness burns
- commonly occurs when clothes catch on fire
- always requires emergency medical care and prompt attention by a burn surgeon and will need skin grafting to heal

Fourth-Degree Burn

- full-thickness burn extending to muscle or bone
- commonly the result of high-voltage electric injury or severe thermal burn
- requires hospital admission

First aid Provider Response to Burns

Determination of burn depth is not a primary concern of a first aid provider. Of immediate importance is removing the patient from the source and stopping further injury. To stop further burning, use cool or very cold, but not freezing, running water or saline for at least 10 minutes but refrain from prolonged immersion. It may take more time and water than anticipated to halt burn progression. Cooling measures applied too aggressively or for too long can cause more tissue damage and may lead to hypothermia.[11]

Refrain from applying ointments, lotions or antiseptics. Topical antibiotic ointments or creams should be used only under the direction of a physician.

Avoid the use of ice or butter on burn wounds because these measures will not help and may cause more tissue damage. In addition, medical staff will want to inspect the wounded area and will have to remove any applied product.

If there are blisters, keep them intact and refrain from releasing blister fluid. Removal of blistered skin increases the risk of infection (as the primary skin barrier is removed) and will also expose tender tissue, resulting in additional pain.

If the burn was caused by a semisolid or liquid, such as tar, grease or oil, flush the area with water to cool the tar or anything that has burned to the skin (such as clothing) or grease and stop the burning process. Refrain from attempts to remove substances such as tar because you may cause additional tissue damage. These burns can be severe, so seek medical attention or call EMS.

Depending on the circumstances and extent of injury, always remain ready to provide airway support and BLS. Burns to the face are associated with smoke inhalation and may cause upper-airway damage that compromises airway patency. Any signs of breathing difficulty should prompt activation of EMS if they have not already been notified.

After you have ensured that the patient is stable, breathing easily, removed from the source and the burning process has been stopped or slowed, cover the injured area with a dry sterile dressing. If available, use adaptic or iodoform gauze (petroleum impregnated – non-adhering) over the injured area as a primary dressing, followed by dry gauze. This will enhance patient comfort and make dressing changes more comfortable. If burns involve vital areas such as the face, hands, joints or genitals, seek immediate medical attention.

Burns of the Fingers and Toes

If the burn involves the hand, foot, fingers or toes, remove all jewellery on the affected extremity. When dressing burned fingers or toes, ensure digit separation with the use of gauze padding if the digits can be easily separated. Seek medical evaluation of these burns.

Facial Burns

Burns to the face may affect vital structures such as the eyes, ears or airway. Medical professionals should assess injuries to these areas. If the eyelids are burned, refrain from opening and seek immediate medical attention.

Chemical burns to the face and eyes require immediate action. Call EMS and continuously flush affected area with cold water for about 20 minutes.

CHAPTER 14 REVIEW QUESTIONS

1. **Superficial burns are severe and involve all skin layers**
   a. True
   b. False

2. **Immediate first aid for burns includes removal from the source and the application of cool water to stop the burning process**
   a. True
   b. False

3. **In the event of chemical burns to the face or eyes, continuously flush the area with cool water for approximately 20 minutes and call EMS**
   a. True
   b. False

Review answers are on Page 104.

15 Temperature-related Injuries

CHAPTER 15 OBJECTIVES

1. What is hypothermia?
2. What is the first aid response to hypothermia?
3. What special consideration must be taken into account for hypothermia?
4. What is hyperthermia?
5. What are four methods of heat conduction and how can they benefit the hyperthermic patient?
6. What are the signs and symptoms of heat exhaustion and heat stroke?
7. What is the first aid response to hyperthermia?

The human body has a limited tolerance for temperature extremes. Prolonged, unprotected exposure may raise or lower core body temperatures and cause health concerns that require prompt attention. The body maintains a relatively stable core temperature, which represents a balance between heat production and heat loss. The normal core body temperature is 37°C.

Hypothermia

When external temperatures are too low or the body's heat production is inadequate relative to the external demands, core temperatures can drop. Hypothermia (*hypo* = less than normal + *thermia* = generation of heat) is defined as core temperatures below 35°C.

MILD hypothermia is classified as a body core temperature of 32-35°C. Expected symptoms include shivering, lethargy and apathy. Motor skills also may be compromised.

MODERATE hypothermia occurs with body core temperatures of 28-31°C. At this point, the shivering stops, cognitive function is markedly reduced (stupor), and heart and respiratory rates tend to slow.

SEVERE hypothermia occurs when body core temperatures go below 28°C. At this point, coma and unconsciousness are likely and victims may appear dead.

Cold-water Immersion

Water has the ability to conduct heat away from the body 20-27 times faster than air. As such, cold-water immersion should raise the suspicion of potential hypothermia and prompt rewarming efforts.

Rewarming Strategies

When hypothermia is suspected, prevent further heat loss and initiate rewarming strategies.

Remove the victim from the cold and place him in a dry, warm environment away from wind. Remove wet clothing and replace with dry, warm coverings that also cover the head and activate EMS. Monitor breathing and heart rate, and be prepared to perform CPR should either become dangerously slow or stop and the patient goes unconscious.

When providing care, avoid rough handling of hypothermic patients. Rough handling may cause an irritable heart to develop arrhythmias such as ventricular fibrillation.

In addition to the steps described above, rewarming can also include the use of hot-water bottles or heating pads applied to the chest, neck and groin to optimise core warming.

Symptom severity and the patient's mental status will largely determine the course of further treatment. Anyone presenting with a history of confusion, lethargy, unconsciousness or stupor should receive prompt medical attention. Calling EMS may enable faster recovery (with more aggressive rewarming techniques) and appropriate monitoring.

Hypothermia can cause cardiac arrhythmias and subsequent unconsciousness but this condition that may stabilise with rewarming. This condition has led to an axiom within emergency medical circles that, "Patients are not dead until they are warm and dead." Therefore, resuscitation efforts are often performed for prolonged periods with hypothermic patients, especially with children who have been saved after prolonged cold-water immersions.

Special Consideration: Core Temperature After-drop

The term "core temperature after-drop" refers to a reduction in core temperature subsequent to rewarming and is characterised by clinical deterioration.[12] Current theory for this phenomenon reasons that as peripheral tissues warm, vasodilation allows cooler blood from the extremities to circulate back into the body core. This may result in additional core cooling and cardiac arrhythmias. Rewarming efforts aimed at core temperature elevation minimise the chances of the after-drop phenomenon.

When treating moderate to severe hypothermia, focus on rewarming strategies, keep the patient horizontal, activate EMS and be prepared to initiate CPR. Minimise or, better yet, eliminate any exertion by the patient during or after care until evaluated by medical personnel.

Hyperthermia

Hyperthermia occurs when the body is overheated and the normal cooling mechanisms are overwhelmed (*hyper* = above normal + *thermia* = generation of heat).

The body's natural cooling mechanisms include sweating and peripheral vasodilation. Sweating enables evaporative heat loss and peripheral vasodilation (seen as flushing) brings blood to the body's surface, which enables cooling through evaporative heat loss and other cooling mechanisms described below.

Personal factors or individuals at elevated risk of hyperthermia include the following:

- infants and children
- obesity
- people over 65 years of age
- exertion/exercise
- dehydration
- health issues such as diarrhoea that predispose to dehydration

The severity of hyperthermia can range from mild to life-threatening. Signs, symptoms and appropriate first aid will vary depending on the degree of overheating and the patient's condition.

Cooling Measures

There are four primary mechanisms for heat loss: Conduction, convection, evaporation and radiation. The process of breathing can also result in heat loss but this process is passive and does not affect the first responder. When trying to cool someone with hyperthermia, the use of multiple methods simultaneously will have the greatest effect.

Conduction is the transfer of heat from a warmer object to a cooler object when the two objects are in direct contact. An example of conductive heat loss occurs when backpackers sleep on cold ground.

- *Cooling methods:* Sponge around the head and neck, or immerse in a tepid (lukewarm) bath or shower. Refrain from ice-water immersion because this causes peripheral vasoconstriction and may be counterproductive

Convection is heat loss that occurs in response to the movement of fluid or gas. This method of cooling is experienced by wind chill or an indoor fan.

- *Cooling methods:* Use a fan, air-conditioning vent or exposure to wind. It works best if combined with a cool mist spray to use evaporative heat loss

Evaporation is heat absorbed by sweat that is then released or removed from the body when liquid phase-changes to gas as part of evaporation.

- *Cooling methods:* Sponge with cool water or use mist to maintain skin moisture. Key areas are the head, neck and torso

Radiation is transfer of electromagnetic energy (primarily in the infrared spectrum) between two objects of different temperatures. The temperature difference between objects will determine the direction of heat transfer. As an example, fire radiates heat and will warm a cooler room. When body temperature is higher than the surroundings, our heat will generate ambient warmth.

- *Cooling methods:* Remove from direct sunlight, place in the shade or a cool room and remove heavy or unnecessary clothing

Seek immediate medical attention if:

- symptoms are severe
- history of heart problems or high blood pressure exists
- symptoms worsen or last longer than one hour

The next sections describe the progression of hyperthermia severity and the appropriate care for each level.

Heat Rash

Heat rash, commonly seen around the neck, groin, elbow creases and beneath breasts, looks like small pimples and is caused by excessive sweating. While seen in all ages, it is most common in young children. Treatment is simple and involves cooling and keeping areas dry. This rarely requires medical attention and usually resolves on its own.

Heat Cramps

Heat cramps are muscle spasms resulting from excessive fluid and electrolyte loss. They are often associated with strenuous activity and may be a sign of heat exhaustion.

Immediate first aid measures include the following:

- Stop all activity and rest in a cool place
- Drink clear liquids, preferably with electrolytes (sports drinks)
- Do not return to strenuous activity for several hours
- If symptoms do not resolve within about an hour, seek medical attention

Heat Exhaustion

Heat exhaustion occurs as a result of excessive fluid and electrolyte loss. Those most prone to heat exhaustion include the elderly, people taking diuretics (medications that cause fluid and electrolyte loss) and people working or exercising in hot environments where fluid and electrolyte loss are most likely to exceed the rate of replacement.

Warning signs of heat exhaustion:

- heavy sweating
- fatigue
- nausea/vomiting
- weakness
- headache
- fainting
- muscle cramps

Untreated, heat exhaustion can progress to heat stroke and should therefore receive prompt attention. If symptoms are severe, call EMS immediately and perform cooling measures until they arrive.

Immediate first aid measures include the following:

- Remove from heat source
- Rest
- Place in a cool environment
- Remove unnecessary clothing
- Replacement of fluids and electrolytes — oral intake is usually safe
- Cooling methods: evaporation, conduction, convection and radiation
  - Sponge the head, neck and torso
  - Place the patient near an air-conditioning vent or fan

Heat Stroke

Heat stroke is a life-threatening condition in which the body's temperature exceeds its ability to effectively regulate cooling. Core temperatures may exceed 41°C.

Signs and symptoms of heat stroke may include the following:

- rapid pulse
- red, hot and often dry skin
- strange behavior
- hallucinations
- confusion
- seizures
- coma and death

NOTE

Symptom onset may be rapid, and requires aggressive cooling and immediate activation of EMS.

Immediate first aid measures include the following:

- Remove from heat source
- Activate EMS
- Keep the patient at rest
- Place the patient in a cool environment and on a cool surface
- Remove unnecessary clothing
- Replace fluids and electrolytes (IV fluids are usually advised because airway management may be compromised)
- Cooling methods: evaporation, conduction, convection and radiation
  - Apply cold packs to the head, neck, armpits and groin
  - Cover the patient with water-soaked towels or blankets (keep coverings wet with additional cool water)
  - Place the patient near an air-conditioning vent or fan

Continually monitor the patient for airway compromise, seizure, unconsciousness or cardiac arrest.

CHAPTER 15 REVIEW QUESTIONS

1. **The first step in rewarming is to prevent further heat loss**
   a. True
   b. False

2. **Management of hypothermia may include**

   _____

   a. removal from the cold
   b. removal of wet clothing
   c. use of blankets and heat packs
   d. calling EMS
   e. all of the above

3. **Heat stroke is a medical emergency that requires aggressive cooling and activation of EMS**
   a. True
   b. False

Review answers are on Page 104.

16 Lifting and Moving

CHAPTER 16 OBJECTIVES

1. What are the general considerations for a rescuer when attempting to move a patient?
2. When should a patient be moved?

It is extremely rare that a rescuer would be called upon to move an injured person. In fact, moving a person is strongly discouraged due to the additional injury that is often caused to the patient during the attempt. You should leave the person in the position found.

There are two exceptions:

- The person needs to be moved onto his back for CPR
- The person is in imminent danger (fire, explosives or uncontrolled traffic)

Use discretion when moving a patient and avoid it if at all possible. However, if a situation presents in which a move is absolutely necessary, there are several ways to move someone.

Move the person in an orderly, planned and unhurried fashion to protect both the first aid provider and the patient. Plan ahead, and select the safest and easiest method(s) that involves the least chance of rescuer injury. Remember that rescuer safety comes first. Putting yourself in danger is not recommended.

Armpit-forearm Drag (Rautek Technique)

To perform the armpit-forearm drag (also known as the Rautek move), reach under the patient's armpits from behind and grab his left forearm with your right hand and his right forearm with your left hand. Pull the patient in the direction of the long axis of the body.

Shirt Drag

If the patient is wearing a collared shirt, you can use it to support the patient's head and pull by grabbing the shoulders and collar of the shirt. Support the patient's head at the base of his skull with your fists and pull along the long axis of the body. Be careful not to strangle the patient.

Coat or Blanket Drag

Another effective technique is to use a coat or a blanket to drag the patient to safety. To get the patient onto the blanket, you will need to roll him onto his side and then tuck the blanket underneath. Lay the patient back down and pull out the other edge of the blanket from beneath him. Gather the blanket into place under the patient's head and pull.

Lifts

When lifting, protect yourself and remember important principles of body mechanics, including maintenance of a straight, rigid back and bending at the hips and not at the waist. Also keep your head in a neutral position and not flexed forward or extended backward. Use your legs to lift, not your back.

To lift a person off the ground, use a direct ground or an extremity lift. Use these techniques only when there is immediate danger to the patient as none of these techniques allows you to adequately protect the patient's spine in case of an injury to the head, neck or spine. With heavier patients, a long backboard is more effective and minimises potential injury to the victim and rescuer.

A direct ground lift requires two or more rescuers. They should be on the same side of the patient. One rescuer supports the patient's head, neck and lower back. The other rescuer supports the hips and legs.

The extremity lift also requires two rescuers. One rescuer lifts from behind the victim, reaching under the arms and grasping the patient's opposite wrists. The other rescuer lifts at the victim's knees by wrapping his arms around the patient's legs.

CHAPTER 16 REVIEW QUESTIONS

1. **Patient movement should be avoided except to move the person onto his back to perform CPR or when the current location places the victim or rescuer at risk of further injury**
   a. True
   b. False

2. **Body mechanics to be followed by the rescuer when lifting include**
   a. keeping his back straight and bending from the hips
   b. lifting with his legs
   c. keeping his head in a neutral position
   d. all of the above

Review answers are on Page 104.

17 Home Emergency Plan

CHAPTER 17 OBJECTIVES

1. Why should you have a home emergency plan?
2. Where should a home emergency plan be kept?
3. What information should be included in a home emergency plan?

A home emergency plan can be a vital resource when an accident or emergency occurs. It will not only save valuable time but also may enable others (such as children and house guests) to engage emergency resources with important details.

Keep this information easily accessible, and teach your children and other family members what to do and who to call in an emergency.

An example of a home emergency plan is provided at the end of this chapter and you can personalise it for your own use.

First Aid Kits

First aid kits should be appropriate for their intended use. There are many commercially available kits on the market or you can assemble one yourself.

The following items should be included, at a minimum, in a standard first aid kit:

- protective case (waterproof if used in wet environments)
- resuscitation barrier device (face shield or mask)
- examination gloves
- cleansing wipes
- sterile saline for wound irrigation
- bandages
- sterile dressings – various sizes
- sterile gauzes
- sterile eye pads
- adhesive tape
- scissors (strong enough to cut away clothes)
- triangular bandage
- safety pins
- tweezers
- adhesive dressings (several sizes)

Optional, but recommended, items:
- wound-closure strips (Steri-Strips)
- isothermal blanket
- irrigation syringe
- infectious waste bag
- penlight
- splint to immobilise fractures
- thermometer
- NuMask® or oronasal resuscitation mask
- disposable razor
- first aid manual
- cold and hot compresses
- list with emergency numbers

Regularly check for items that have been used or have expired and replace them.

Medications and ointments also may be helpful but may require input from your doctor to ensure appropriate use. While this list suggests some common over-the-counter medications, first aid providers are not legally authorised to dispense medications or share their own prescriptions.

Recommended medications include the following:
- antiseptic solution
- eyewash
- hydrocortisone ointment
- antihistamine tablets
- antibiotic ointment
- pain reliever

Home Emergency Plan

When you recognise that an emergency exists, dial

_____

(Write your area's EMS number above)

The EMS dispatcher will ask you: "What is the emergency?"

Stay on the line, keep calm and follow instructions.

Your street address:

_____

Your phone number: _____

If possible, send someone outside to meet emergency personnel

ADDITIONAL INFORMATION

National Poison Control Centre
Contact: _____

Family Doctor
Name: _____

Contact: _____

Neighbour
Name: _____

Contact: _____

Family Member
Name: _____

Contact: _____

18 BLS: CPR and First Aid Skills

CHAPTER OBJECTIVES

1. **Scene Safety Assessment**
   - List the steps in performing a scene safety assessment
   - Perform a scene safety assessment in a scenario
   - Use appropriate first aid barrier devices in a scenario
2. **Donning and Doffing Glove**s
   - Demonstrate donning of gloves without tearing or compromising glove integrity
   - Demonstrate removal of gloves without contaminating exposed skin
3. **Initial Assessment**
   - Demonstrate the technique for establishing unresponsiveness
4. **Recovery Position**
   - Demonstrate rolling a patient from his back into the recovery position, keeping the spine aligned
5. **Chest Compressions**
   - Demonstrate proper hand positioning for chest compressions
   - Use proper body mechanics to accomplish chest compressions consistently to a depth of 5-6 cm on an adult CPR manikin, at a rate of 120 compressions per minute
6. **Ventilations**
   - Demonstrate proper ventilation technique on an adult CPR manikin
7. **Full Cardiopulmonary Resuscitation (CPR)**
   - Perform two minutes of full CPR on an adult CPR manikin, completing at least five cycles of 30:2 compressions/ventilations
8. **Automated External Defibrillator (AED)**
   - Follow the prompts of an automatic external defibrillator (AED) training unit to simulate care for a non-breathing patient on an adult CPR manikin
   - Use an AED training unit as part of CPR on an adult CPR manikin
9. **Foreign-Body Airway Obstruction**
   - Demonstrate proper abdominal thrust technique for management of an obstructed airway in an adult
10. **Shock Management**
    - Demonstrate the proper technique for managing shock by placing the victim on his back or in a position of comfort and taking steps to maintain normal body temperature in a scenario
11. **Control of External Bleeding**
    - Demonstrate applying direct pressure to control bleeding on a simulated patient
    - Demonstrate bandaging to secure a dressing in place once bleeding has stopped on a simulated patient
12. **Applying a Tourniquet**
    - Demonstrate applying a tourniquet to control bleeding on a simulated patient

13. **F-A-S-T**
    - Conduct a F-A-S-T assessment on a simulated patient suspected of having a neurological impairment
14. **Secondary Assessment**
    - Demonstrate the technique for head-to-foot secondary assessment using a gentle touch and caring manner
15. **Splinting**
    - Apply a splint to a simulated injured limb, immobilising the joints on either side of the injury. Use of either a professional splint or improvised splint is acceptable
16. **History**
    - Interview a patient in a simulated scenario using the S-A-M-P-L-E mnemonic to identify any previous medical history and determine where he might have problems or feel discomfort. Record findings in a usable format
    - Observe on a simulated patient if breathing is normal or if the patient appears to be struggling to breathe
17. **Severe Allergic Reaction or Opioid Overdose**
    - Demonstrate the proper technique for assisting with an epinephrine and/or a naxolone auto-injector in a scenario

Scene Safety Assessment

Objectives

- *List the steps in performing a scene safety assessment*
- *Perform a scene safety assessment in a scenario*
- *Use appropriate first aid barrier devices in a scenario*

Follow these steps to perform a scene safety assessment.

Skill Description:

S-A-F-E

S – Stop

- Stop
- Think
- Act

A – Assess scene

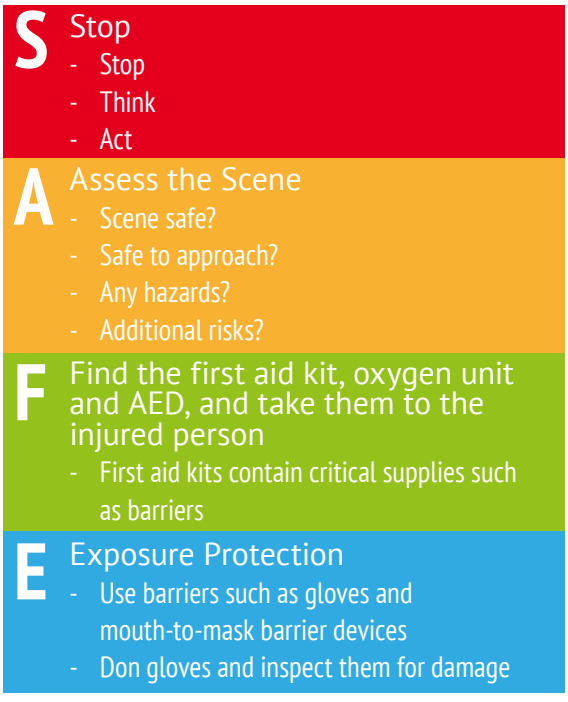
- Is the scene safe?
- Is it safe to approach the injured person?
- Is the ventilation adequate for oxygen?
- Are any other hazards present?

F – Find oxygen, first aid kit and AED unit, and take to injured person

- First aid kits contain critical supplies such as barriers

E – Ensure exposure protection

- Use barriers such as gloves and mouth-to-mask barrier devices



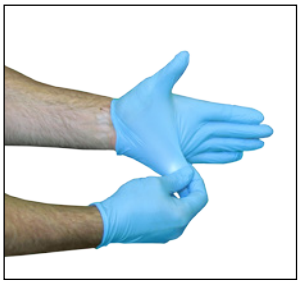
Donning and Doffing Gloves

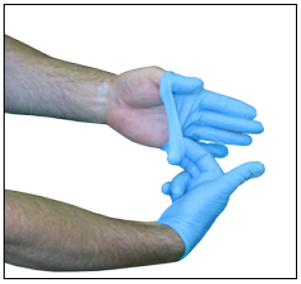
Objectives

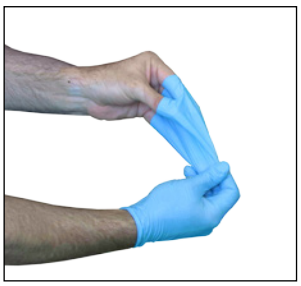
- *Demonstrate donning of gloves without tearing or compromising glove integrity*
- *Demonstrate removal of gloves without contaminating exposed skin*

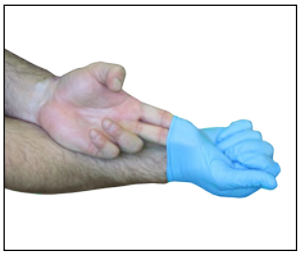
Skill Description:

- Before donning gloves, remove rings or jewellery that may tear the gloves during use
- To doff gloves, grasp the first glove at the outside of the wrist and pull the glove toward the fingers of that hand
- Turn the glove inside out
- Use your protected hand to crumple the glove into a ball (making a fist with the gloved hand)
- When the removed glove is in the palm of the still-protected hand (fist), place an "unprotected" finger inside the second glove (between wrist and glove) and pull the glove toward the fingers as before
- This glove will also turn inside out, and the first glove will be inside the second
- Avoid touching the outside of the glove with your unprotected hand as you remove it
- Place the gloves in a hazardous waste bag to avoid others having contact with the gloves
    - This bag can also be used for the disposal of all other infected materials after use









Initial Assessment

Objective

- *Demonstrate the technique for establishing unresponsiveness*

Remember S-A-F-E.

- State your name, training and desire to help
- Ask permission to help
- Tap the patient on the shoulder and say or shout, "Are you all right?"

If the person responds:

- Have him remain where he is unless urgent evacuation is necessary to avoid further danger
- Try to find out what is wrong and activate EMS if needed
- Reassess frequently until the circumstance resolves or EMS arrives

If the person does not respond:

- Shout for help or call EMS
- Turn the patient on his back
- Check for normal breathing
- If the patient is not breathing normally, send someone for help. If you are on your own, leave him and alert EMS, then return and start CPR, beginning with chest compressions

C irculation

A irway

B reathing

Recovery Position

Objective

- *Demonstrate rolling a patient from his back into the recovery position, keeping the spine aligned*

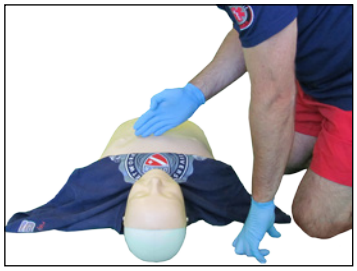
- Kneel beside the patient and make sure that both the patient's legs are straight
- Place the arm nearest to you at right angles to the patient's body, with the elbow bent and palm facing upward
- Bring the far arm across the chest and hold the back of the hand against the patient's cheek nearest to you
- Place your other hand under the leg, just above the knee, or grab the pant leg of the victim's clothing and pull the knee up, keeping the foot on the ground
- Keeping the hand pressed against the cheek, pull the far leg at the knee to roll the patient toward you, onto his side
- Adjust the top leg so 90-degree angles are formed at both the hip and knee
- Tilt the head back to ensure the airway remains open
- Adjust the hand under the cheek, if necessary, to keep the head tilted
- Check breathing regularly

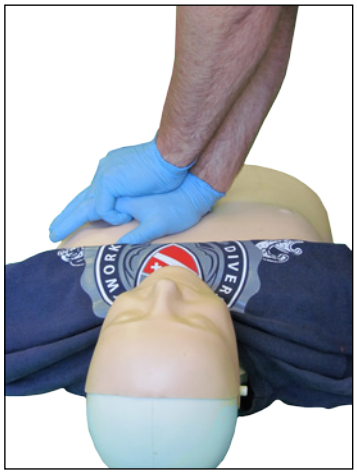
Chest Compressions

Objectives

- *Demonstrate proper hand positioning for chest compressions*
- *Use proper body mechanics to accomplish chest compressions consistently to a depth of 5-6 cm on an adult CPR manikin, at a rate of 120 compressions per minute*

- Kneel by the patient's side
- Place the heel of one hand in the centre of the chest, between the nipples
- Place the heel of your other hand on top of the first hand
- Interlock the fingers of your hands, raising the fingers off the chest wall
- Do not apply pressure over the upper abdomen or the bottom end of the sternum (breastbone)
- Position yourself vertically above the chest, with your arms straight and shoulders directly above elbows. Using your hips as a pivot point and using your whole body, forcefully but smoothly press down on the lower half of the sternum 5-6 cm
- After each compression, release all the pressure on the chest without losing contact between your hands and the chest wall (do not lean on the chest during recoil). Repeat at a rate of 120 per minute
- Compression and release should take the same amount of time





Ventilations

Objective

- *Demonstrate proper ventilation technique on an adult CPR manikin*

- Remain at the patient's side
- Place the face shield or resuscitation mask on the patient's face, using the bridge of the nose as a guide for correct positioning
- Seal the mask by placing your index finger and thumb along the upper border of the mask. Use the hand closest to the top of the patient's head
- Use the thumb and first finger of the other hand to pinch the lower border of the mask to the chin. Other techniques are acceptable but avoid pressing on the soft tissue of the throat under the chin
- Press firmly and completely around the outside margin of the mask to form a tight seal
- Tip the patient's head back so the chin is lifted into the mask and pointing up
- Seal your lips around the one-way valve and blow through it. Each ventilation should last about one second. Watch for the chest to gently rise
- Take your mouth away from the mask, and watch for the chest to fall as the breath is exhaled
- Deliver a second ventilation as before
- If ventilations do not make the chest rise:
  - Reposition the patient's head using the head-tilt, chin-lift technique, making sure the head is adequately extended to open the airway and reattempt to ventilate
  - Check the patient's mouth and remove any obstruction
  - Do not attempt more than two ventilations each time before returning to chest compressions
  - When in doubt, ventilate less, not more
- Do not interrupt compressions for more than 10 seconds during ventilations

Full Cardiopulmonary Resuscitation (CPR)

Objective

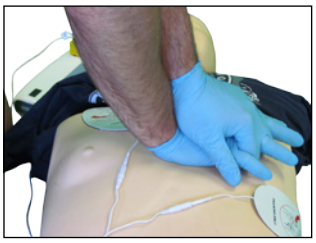
- *Perform two minutes of full CPR on an adult CPR manikin, completing at least five cycles of 30:2 compressions/ventilations*

- Using the compression and ventilation techniques from the previous skills, deliver chest compressions at a rate of 120 per minute to a consistent depth of 5-6 cm, followed by effective ventilations using a ratio of 30:2 for a minimum of five cycles/two minutes
- After completing the two-minute cycle, reassess the patient

Automated External Defibrillator (AED)

Objectives

- *Follow the prompts of an automatic external defibrillator (AED) training unit to simulate care for a non-breathing patient on an adult CPR manikin*
- *Use an AED training unit as part of CPR on an adult CPR manikin*



Remember S-A-F-E.

If the person is unresponsive:

- Shout for help or call EMS

If the person is not breathing normally:

- Send someone for an AED or get one yourself
- Perform CPR 30:2 until AED is attached
- Turn on the AED and follow the prompts
  - Attach the defibrillator pads to the victim and plug the cord into the AED, following the prompts of the specific unit in use
  - Allow the AED to analyse the heart rhythm
- Do not touch the victim during this analysis

If shock is required, follow the AED unit's prompts.

- Visually and physically clear the victim
- State: "I'm clear, you're clear, all clear."
- Administer shock
- Immediately resume CPR 30:2 beginning with compressions. Continue CPR for two minutes

If no shock is required, resume CPR 30:2 until the victim starts to breathe normally or EMS arrives.

Foreign-body Airway Obstruction

Objective

- *Demonstrate proper abdominal thrust technique for management of an obstructed airway in a conscious adult*

In the case of a mild airway obstruction, encourage the choking victim to cough, but do nothing else.

If the victim shows signs of a severe airway obstruction and is conscious, perform abdominal thrusts.

- Stand behind the victim and put both arms around the upper part of the abdomen
- With one hand, locate the victim's navel
- Clench your other hand into a fist and place it just above your first hand, between the navel and bottom tip of the sternum, with the thumb end of your fist against the choking victim's abdomen
- Grasp your fist with your other hand, and pull sharply inward and upward
- Repeat until the object is expelled or the victim loses consciousness

If the victim at any time becomes unconscious:

- Lower the patient carefully to the ground
- Activate EMS
- Begin CPR (chest compressions followed by ventilations)
- Look in the mouth for obstruction prior to giving ventilations

Shock Management

Objective

- *Demonstrate the proper technique for managing shock by placing the victim on his back or in a position of comfort and taking steps to maintain normal body temperature in a scenario*

- Assess scene safety
- Support the airway and breathing if indicated
- Activate EMS
- Control external bleeding if present
- Provide comfort and reassurance
- Place the victim in a position of comfort or on his back
- Protect the victim from cold or heat – maintain normal body temperature
- Monitor the level of responsiveness

NOTE

- *Use extreme caution if providing fluids to someone in suspected shock. If in doubt, refrain from providing oral fluids and activate EMS*
- *Do not force a person (especially with a heart or breathing problem) to lie down. Place him in the most comfortable (sitting) position*
- *Do not elevate his legs if it will make another injury worse*

Control of External Bleeding

Objectives

- *Demonstrate applying direct pressure to control bleeding on a simulated patient*
- *Demonstrate bandaging to secure a dressing in place once bleeding has stopped on a simulated patient*

To control bleeding:

- Cover the wound completely with a sterile or clean dressing and apply direct pressure with your gloved hand until the bleeding stops. Use additional layers of dressing if the dressing becomes soaked. Do not remove any layers of dressing materials as it may disrupt the clotting mechanism of the body
- Once bleeding has stopped, use conforming bandage, roller gauze or tape to secure the dressing and make sure there are no loose edges
- Remove all jewellery or constricting clothing on the injured appendage
- Be careful not to interfere with circulation
  - Check capillary refill on appendage nail beds to ensure adequate circulation
  - Ask the patient if any tingling or numbness is present
  - Adjust bandage if necessary to ensure circulation
- Monitor the patient's pulse and motor function distal to the bandage before and after bandage application

NOTE

- *Bandage small wounds several centimetres on either side to ensure coverage and even pressure distribution*
- *To bandage across a joint, apply the bandage in a comfortable position*
- *Keep the joint immobilised after bandage application. Splint the injury only if EMS will be delayed*

Applying a Tourniquet

Objective

- *Demonstrate applying a tourniquet to control bleeding on a simulated patient*

To apply a tourniquet:

- Inspect the wound to ensure direct pressure was being applied directly to the site of the bleeding. If not, attempt direct pressure once more
- Place the tourniquet 2.5-5 cm proximal to the wound
- Secure the tourniquet
- Turn the windlass device to stop bleeding
- When practicing this skill as part of course requirements, the tourniquet should not be tightened to the point the distal pulse disappears. In an actual emergency tighten the windlass until bleeding stops and/or the distal pulse disappears
- Secure the windlass
- Simulate noting on the victim's forehead use of a tourniquet and time of placement
- Leave a tourniquet used in an actual injury in place until under medical care

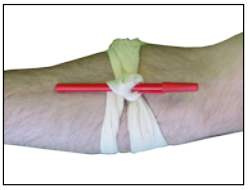
F-A-S-T

Objective

- *Conduct a F-A-S-T assessment on a simulated patient suspected of having a neurological impairment*

Have the patient remain seated during the assessment.

- Have the patient smile. Observe his face for asymmetry. Is one side drooping? Is the smile equal on both sides?
- Ask the patient to extend and raise both arms straight out in front. Can he raise both arms? If so, do both arms remain up, or does one drift down?
- Ask the patient to repeat a simple phrase. Are all the words clear? Is there any slurring? Is the speech garbled?
- If any abnormal signs are present, call 10177 or your local EMS number immediately



F	Facial droop
A	Arm weakness
S	Speech difficulty, sudden severe headache
T	Time (note the time and call EMS immediately)

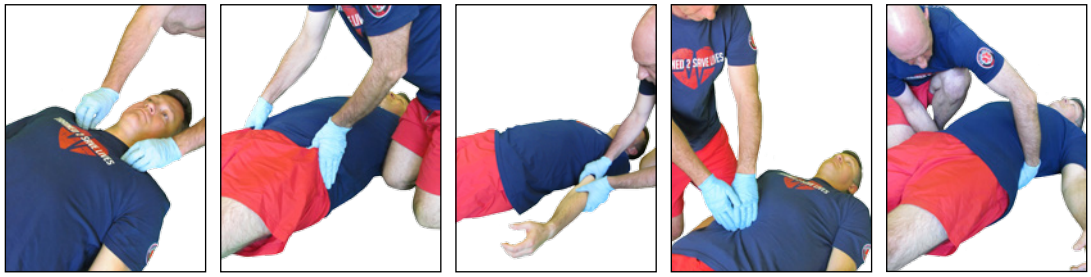
Secondary Assessment

Objective

- *Demonstrate the technique for head-to-foot secondary assessment using a gentle touch and caring manner*

- Remember to be S-A-F-E
- Ask permission to conduct an assessment
- Note any areas that cause pain or are uncomfortable to the patient
- Palpate the patient's head and face for deformities or signs of injury
  - Determine if there are any broken bones under the skin
  - Watch for any fluids or blood
  - If the patient experiences pain, stop the assessment and notify EMS if you have not already called
- Visually inspect the patient's nose and ears for blood or fluid
- Palpate the patient's neck
  - The mechanism of injury will give you a good idea about whether a head or neck injury is likely
- Shade the patient's eyes from the sun or lights, then remove your hands while observing the pupils for reaction to the changing light exposure
  - Determine if they dilate in response to the shade
- If the injury is related to scuba diving, gently palpate the front of the neck for air bubbles and a crackling sound coming from underneath the skin

- Inspect the patient's collarbone for injuries or discolouration
  - Gently slide the fingertips of your index and middle fingers, one on each side of one collarbone, to check for movement or reaction to your examination. Repeat the action on the other collarbone
- Examine the chest
  - Place hands on either side of the rib cage and ask the patient to take a deep breath
  - Note any open wounds
  - If you see bubbling, apply direct pressure to the wound to stop air from moving in and out
- Divide the abdomen into four quadrants using the navel and midline of the torso as dividing points
  - Gently press on each quadrant in turn
  - Note any areas that are sensitive, stiffened by the patient, hard or painful
- Place a hand on either side of the patient's pelvis and very gently push in and down
  - Note any instability or painful response
- Palpate the arms and legs, checking the bones beneath the skin and muscle



Splinting

Objective

- *Apply a splint to a simulated injured limb, immobilising the joints on either side of the injury. Use of either a professional splint or improvised splint is acceptable*

- Apply splint, keeping the injured limb in the position it was found. Do not attempt to straighten
- Place splinting material either along or on each side of the injured limb. Place splint so the joints both above and below the site of injury are immobilised
- Use padding (gauze, towels, clothing, etc.) to fill in voids under the splint and provide additional support to the injured limb
- After the splint is in place, check circulation by squeezing the nail beds and looking for the pink colour under the nails to return quickly after pressure is released. If colour does not return in a timely manner (two seconds or less), loosen the bandage and rewrap
- Be sure to remove rings and jewellery on affected extremity
- Continually reassess the patient and monitor for signs of shock
- Activate EMS if not already done

History

Objectives

- *Interview a patient in a simulated scenario using the S-A-M-P-L-E mnemonic to identify any previous medical history and determine where he might have problems or feel discomfort. Record findings in a usable format*
- *Observe on a simulated patient if breathing is normal or if the patient appears to be struggling to breathe*

S-A-M-P-L-E

- **S**igns/Symptoms
- **A**llergies
- **M**edications
- **P**ertinent medical history
- **L**ast oral intake
- **E**vents leading up to the current situation

While talking to the patient, notice his skin colour. Is it red and flushed or pale? Note the effort he is making to breathe. Is it relaxed and easy or is he struggling with each breath?

Severe Allergic Reaction or Opioid Overdose

Objective

- *Demonstrate the proper technique for assisting with an epinephrine and/or a naxolone auto-injector in a scenario*

- Ensure the patient's airway and breathing
- Assist in the delivery of allergy medications carried by the injured person, such as antihistamines or an epinephrine auto-injector (EpiPen® or Twinject®). Such medication should be administered only if it is prescribed for the individual having the reaction. If using a naxolone auto-injector, follow the prompts provided by the unit. A prescription is not necessary to administer naxolone in most areas
- Activate EMS
- Monitor patient response and administer a second dose if indicated


19 Summary

Prompt action is always important with any sudden illness or injury. However, remember to protect yourself and any other rescuers by completing a scene safety assessment before rendering aid. Using protective barriers is another critical step to rescuer safety.

Life-threatening conditions are the first priority of care. Circulation, airway and breathing are the initial steps for an unresponsive, non-breathing individual. Use of an AED, if available, can increase the chances of survival for someone in cardiac arrest. Obstructed airway, control of severe bleeding and shock management can also be critical elements of first aid care.

Once life-threatening conditions have been addressed, there are other steps the rescuer can take to assist an ill or injured individual. Secondary assessment of illness and injury should not be overlooked. It can direct your next steps of care and provide additional information that may be of use later as the patient goes into advanced medical care.

Keep yourself prepared by practising bandaging, and reviewing illness signs and symptoms. Maintain your first aid kit and check expiration dates on supplies, replacing anything that is no longer within recommended usage dates.

Finally, refresh your skills by regularly reviewing this handbook and recertifying as a BLS: CPR and First Aid provider, as recommended.

Glossary

acute – rapid onset or short-term duration

adaptic gauze – non-adhering dressing

agonal breathing – an abnormal pattern of breathing characterised by gasping, laboured breathing, accompanied by strange vocalisations and involuntary muscle twitching

ambient – surrounding on all sides

arrhythmia – a problem with the rate or rhythm of the heartbeat

aspiration – inhaling fluid or a foreign body into the bronchi and lungs, often after vomiting

asymptomatic – without symptoms

blood-borne pathogens – infectious microorganisms in human blood that can cause disease in humans

cardiopulmonary resuscitation (CPR) – an emergency procedure that is performed in an effort to manually preserve intact brain function until further measures are taken to restore spontaneous blood circulation and breathing in a person in cardiac arrest

chronic – persistent or long lasting

cirrhosis – a consequence of chronic liver disease characterised by replacement of liver tissue by fibrosis, scar tissue and nodules, leading to loss of liver function

debridement – removal of dead, damaged or infected tissue to improve the healing potential of remaining healthy tissue

defibrillation – a therapeutic dose of electrical energy to the affected heart with a device called a defibrillator, which depolarises a critical mass of the heart muscle, terminates the arrhythmia and allows normal sinus rhythm to be re-established by the body's natural pacemaker

distal – away from the centre of the body

dysrthymia – irregular or abnormal heart rate

electrolyte – minerals in your blood and other body fluids that carry an electric charge that affect the amount of water in your body, the acidity of your blood (pH), your muscle function and other important processes

first responder – as used in the context of this course, is an individual who arrives first on the scene and has first aid training that addresses the immediate need for care until EMS arrives or the individual is transported to advanced medical care

hyperoxia – excess oxygen or higher than normal partial pressure of oxygen

hypovolemic – a state of decreased blood volume

hypoxia – inadequate oxygen content

intracerebral – occurring or situated within the brain

iodoform gauze – sterile gauze treated with an antiseptic

isothermal – of, relating to or indicating equal or constant temperatures

jaundice – a yellow colour of the skin, mucous membranes or eyes

lethargy – the quality or state of being lazy, sluggish or indifferent

oronasal – pertaining to the mouth and nose

peripheral – related to or located in the outer boundary of the body

Glossary (continued)

postictal – pertaining to the period following a seizure or convulsion

proximal – nearer to the centre of the body

regurgitation – expulsion of material from the mouth, pharynx or oesophagus, usually characterised by the presence of undigested food or blood; vomiting

resuscitation – to revive from apparent death or from unconsciousness

sepsis – a severe infection that affects the entire body

subcutaneous emphysema – gas bubbles under the skin that can be felt with the fingers

symptomatic – showing symptoms

thrombus – blood clot

venomous – secreting or transmitting venom (toxin)

ventricular fibrillation (VF) – a condition in which there is uncoordinated contraction of the ventricle's cardiac muscles, making them quiver rather than contract properly

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Review answers

Chapter 2, Page 11
1. c
2. b
3. a
4. a
5. e
6. a
7. d
8. a
9. b

Chapter 3, Page 17
1. c
2. a
3. c

Chapter 4, Page 23
1. b
2. d
3. a
4. a
5. a

Chapter 5, Page 27
1. b
2. a
3. a

Chapter 6, Page 33
1. b
2. b
3. a
4. c
5. b
6. a

Chapter 7, Page 37
1. b
2. b
3. b
4. b

Chapter 8, Page 40
1. b
2. a
3. c
4. c
5. a
6. b
7. a

Chapter 9, Page 44
1. b
2. c
3. d
4. a
5. b
6. a

Chapter 10, Page 48
1. a
2. a

Chapter 11, Page 52
1. a
2. a
3. b
4. d
5. b

Chapter 12, Page 56
1. a
2. b
3. b

Chapter 13, Page 65
1. e
2. b
3. e
4. b
5. a
6. e
7. b
8. b
9. d

Chapter 14, Page 70
1. b
2. a
3. a

Chapter 15, Page 77
1. a
2. e
3. a

Chapter 16, Page 80
1. a
2. e

Divers Alert Network Southern Africa

Divers Alert Network Southern Africa (DAN-SA) is an international, nonprofit organisation dedicated to improving dive safety through research, education, medical information, evacuation support, products and services.

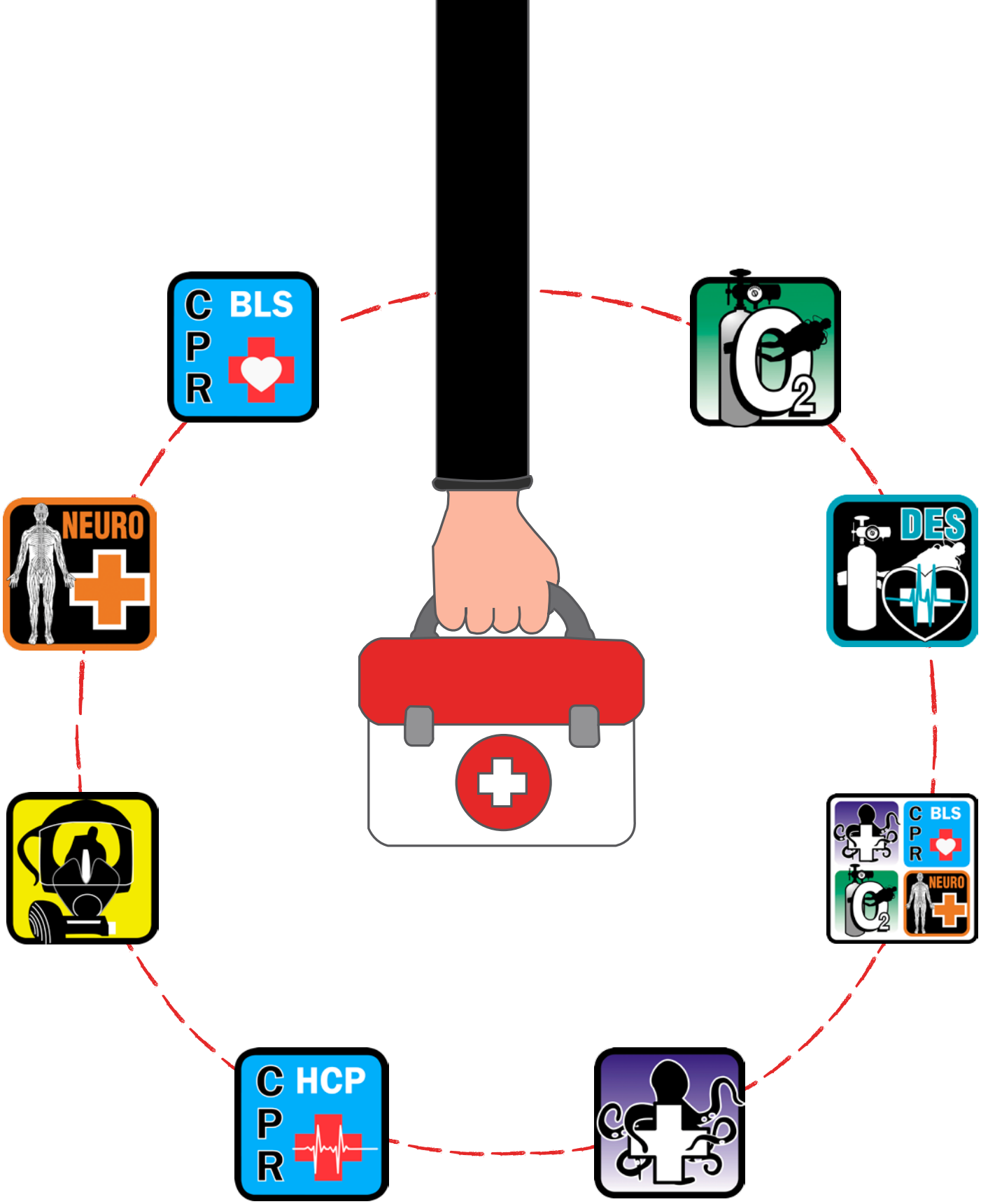
Among the services DAN-SA provides to the diving public is the DAN Emergency Hotline (0800 020 111 (local) or +27 828 10 60 10 (int.)). This hotline is available 24 hours a day, seven days a week for anyone who suspects a diving injury, requires assistance or needs to activate ***your DAN evacuation benefits*** (an exclusive benefit of DAN membership). Callers are connected directly with a member of DAN's Medical Services department, who can facilitate medical consultation with dive medicine specialists and co-ordinate evacuation to ensure appropriate care.

DAN-SA's non-emergency safety resources include the DAN Medical Information Line DAN-SA (0800 020 111 (local) or +27 828 10 60 10 (int.)), the online Health & Diving libary (http://dansa.org/dan-resources.htm) and ***Alert Diver*** magazine, the DAN Shop, the DAN-SA Podcast, a blog and more.

Membership dues and dive cover support DAN's nonprofit efforts. DAN members enjoy benefits such as access to the DAN Dive Accident Cover, medical evacuation support, access to the electronic *Alert Diver* magazine, safety guides and more.

Your participation in this DAN training course demonstrates your commitment to dive safety. Continue your education and your commitment by supporting **the industry's only organisation dedicated solely to improving dive safety**. Join DAN today.

To learn more about DAN and the multitude of resources it provides, or to become a member, please visit dansa.org.



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