



St. John Ambulance

FIRST AID

REFERENCE GUIDE



Table of Contents

Chapter 01	14
THE ROLE OF THE FIRST AIDER	15
FIRST AID IN THE WORKPLACE	17
FIRST AID AND THE LAW	19
SAFETY AND PERSONAL PROTECTION	22
MEDICAL HELP ON THE SCENE	29
Chapter 02	37
ESM STEPS	38
PERFORMING A SCENE SURVEY	39
PERFORMING A PRIMARY SURVEY	40
PERFORMING A SECONDARY SURVEY	43
PROVIDING ONGOING CARE	51
POST-EMERGENCY CONSIDERATIONS	54
LIFTING AND MOVING A CASUALTY	55
MULTIPLE CASUALTY MANAGEMENT	71
Chapter 03	76
RESPIRATORY SYSTEM STRUCTURES	77
BREATHING EMERGENCIES	78
CHOKING	88

Chapter 04	100
CIRCULATORY SYSTEM STRUCTURES	101
CARDIOVASCULAR DISEASE	102
ANGINA AND HEART ATTACK	104
STROKE	110
Chapter 05	113
CARDIAC ARREST	114
ADULT CPR	114
CHILD CPR	119
INFANT CPR	122
AED	125
SHOCK	131
CONSCIOUSNESS	135
FAINTING	136
Chapter 06	138
DRESSINGS	139
BANDAGES	140
SLINGS	144
SPLINTS	147

Chapter 07	150
SEVERE EXTERNAL BLEEDING	151
SEVERE INTERNAL BLEEDING	157
AMPUTATIONS	160
CHEST INJURIES	162
BLAST INJURIES	165
ABDOMINAL INJURIES	166
CRUSH INJURIES	167
Chapter 08	169
TYPES OF MINOR WOUNDS	170
WOUND CLEANING AND PREVENTING INFECTION	172
MANAGING MINOR WOUND EMERGENCIES	173
MANAGING EYE INJURY EMERGENCIES	184
MANAGING BURN EMERGENCIES	191
Chapter 09	202
THE SKELETAL SYSTEM	203
FRACTURES	204
DISLOCATIONS AND SPRAINS	205
FIRST AID FOR SPECIFIC BONE AND JOINT INJURIES	209
STRAINS	225

Chapter 10	226
HEAD INJURIES	227
CONCUSSION	230
PELVIC INJURIES	236
Chapter 11	237
WHAT IS MENTAL HEALTH?	238
STIGMA	238
MENTAL HEALTH AND AWARENESS GUIDE	239
RESPONDING TO A MENTAL HEALTH INJURY USING THE TEMA MODEL	245
PHYSICAL VERSUS MENTAL HEALTH INJURIES	249
PANIC ATTACKS	250
OCCUPATIONAL STRESS INJURY (OSI)	251
DIABETIC EMERGENCIES	254
SEIZURE EMERGENCIES	256
COMMON CAUSES OF A SEIZURE	257
FEVER EMERGENCIES IN CHILDREN	259
Chapter 13	261
HEAT-RELATED INJURIES AND ILLNESSES	262
COLD-RELATED INJURIES AND ILLNESSES	267
DROWNING EMERGENCIES	277

BITES AND STINGS	279
Chapter 14	286
TYPES OF POISONINGS	287
HISTORY OF THE SCENE	288
SIGNS AND SYMPTOMS OF POISONING	289
GENERAL FIRST AID FOR POISONING	290
SUBSTANCE USE AND MISUSE	293
Chapter 15	302
PREGNANCY AND CHILDBIRTH	304
EMERGENCY CHILDBIRTH	305
CARING FOR THE MOTHER AND NEWBORN	313
VAGINAL BLEEDING AND MISCARRIAGE	314
Chapter 16	317
AGE CATEGORIES FOR RESUSCITATION	318
ARTIFICIAL RESPIRATION (AR)	320
CPR	329
CHOKING	339
Annexe	346
ANATOMICAL TERMS	347
THE SKIN	348
MUSCULOSKELETAL SYSTEM	349

SKELETON	350
NERVOUS SYSTEM	353
DIGESTIVE AND URINARY SYSTEMS	355
CIRCULATORY SYSTEM	356
RESPIRATORY SYSTEM	360
Glossary	363

Chapter 01

Introduction to First Aid

INTRODUCTION

This First Aid Reference Guide covers a wide range of information that will help you respond appropriately in a First Aid or medical emergency. The introductory chapter contains background information, definitions and other materials related to giving First Aid. Chapter 2 Emergency Scene Management on page 39 explains casualty management including issues that relate to the assessment of the casualty. This chapter also includes topics that are important to understand in the first critical moments at the emergency scene.

Chapter 16 BLS+CPR for Healthcare

Providers on page 309 covers issues of particular interest to healthcare providers responders with a specific duty to respond within the health care system.

This guide is used to support the teaching of these and other courses:

- Standard and Emergency First Aid
- Basic and Intermediate First Aid
- CPR at all levels including Basic Life Support/Healthcare Provider (BLS/HCP)

Some content contained in this guide will not pertain specifically to the level of training you have received. First Aiders should always remember not to exceed their training, or the regulations/ legislation of their province or territory.

THE ROLE OF THE FIRST AIDER

First Aiders do not diagnose or treat injuries or illnesses, except when they are very minor. The diagnosis and treatment of injuries or illnesses are performed by medical doctors. A First Aider suspects injuries and illnesses and gives First Aid at the scene.

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In addition to providing First Aid, it is important for the First Aider to:

- Protect the casualty's belongings
- Keep unnecessary people away
- Reassure family or friends of the casualty
- Clean up the emergency scene and work to correct any unsafe conditions that may have caused the injuries in the first place

First Aiders within a workplace may have obligations and coverage under federal, provincial, and territorial legislation regarding administering medications. Refer to federal, provincial or territorial legislation and regulations for the requirements in your area.

What is First Aid?

First Aid is emergency help given to an injured or suddenly ill person using readily available materials. A person who takes charge of an emergency scene and gives First Aid is called a First Aider. The injured or ill person is called a casualty.

The three priorities of First Aid, in order of importance, are to:

- Preserve life
- Prevent the illness or injury from becoming worse
- Promote recovery

Age Considerations in First Aid and CPR

The procedures related to the provision of First Aid and cardiopulmonary resuscitation (CPR) differ in some ways, depending on the age and size of the casualty.

In First Aid and CPR:

- An infant casualty is under one year old
- A child casualty is from age one to age eight
- An adult casualty is over eight years of age

It is important to recognize that these ages are guidelines. The size of the casualty must be considered.

Assisting with Medications

First Aiders may need to assist a casualty with their prescribed medications. When assisting with medications, the First Aider should check the label and ensure the following Rights of Medication are met:

- Right Person Is the name of the casualty the same as the name on the medication?
- Right Medication Is this the right medication for this situation?
- Right Amount What are the dosing instructions?
- Right Route How is this medication to be taken? (Orally, inhaled, etc.)
- Right Time Is this the right time to take this medication?
- Right Documentation Recording what was given and when
- Right to Refuse - Casualties have a choice in care and although the First Aider can assist with medications, the casualty can say no to taking them



FIRST AID IN THE WORKPLACE

Workplace First Aid is emergency care given by a person who is trained (and designated) to be the First Aid provider to a co-worker who is injured or suddenly ill. All provinces and territories have a provision within legislation relating to First Aid in the workplace.

Refer to your provincial or territorial regulations for what is required in your area.

01 First Aid as Part of Your Job

When providing First Aid is part of your job, you have a duty to use reasonable skill and care based on your level of training. There are regulations to protect the First Aider. For example, in workplaces regulated by the Canada Labour Code, Section 126(3) of the Code states:

"No employee is personally liable for anything done or omitted to be done in good faith by the employee when the employee is assisting the employer, as requested by the employer, in providing First Aid or in carrying out any other emergency measures."

Every workplace in Canada is required under federal, provincial or territorial regulations to have a First Aid kit. The size and contents of the First Aid kit will be determined by those regulations. First Aid providers are encouraged to be familiar with the contents of their workplace First Aid kit, its location, and to conduct regular inspections of the kit.

First Aid as Part of Occupational Health and Safety (OHS)

Provincial and territorial regulations and legislation contain requirements for First Aid training in their jurisdiction. Most regulations require at least one designated First Aid provider at work at all times.

The level of training required by the First Aid provider will depend on the size of the workplace, the distance to medical help, and the risk of injury in the workplace.

To help ensure compliance with regulations, it is recommended to have more than one person on each shift trained in First Aid to account for holidays, illness, and breaks.

OHS Legislation

Provinces and territories are responsible for establishing Occupational Health and Safety (OHS) legislation to protect workers.

All workplaces that fall under provincial or territorial jurisdiction concerning regulations must adhere to the legislation and regulations of that province or territory. Those workplaces that fall under federal jurisdiction are subject to the Canada Labour Code.

Housed within the legislation and regulations are provisions for adequate First Aid coverage for a workplace, usually based on some or all the following:

- The number of workers
- The potential risks
- The distance from medical care

FIRST AID AND THE LAW

Note that St. John Ambulance is not providing legal advice. This guide is not intended to replace advice given by a lawyer or legal professional.

Good Samaritan Laws and Principles

Across Canada, Good Samaritan laws and principles protect First Aiders from lawsuits. You are a Good Samaritan if you are a bystander who helps a person when you have no legal duty to do so. As a Good Samaritan, you provide your help without being paid, and you give it in good faith. Whenever you help a person in an emergency situation, you should abide by the following principles:

- You identify yourself as a First Aider and get permission to help the injured or ill person before you touch them this is called consent

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- You use reasonable skill and care in accordance with the level of knowledge and skill that you have
- You are not negligent in what you do
- You do not abandon the person

Negligence

Provide only the care that you have been trained to give, and always act in the best interest of the casualty.

Abandonment

Never abandon a casualty in your care. Stay until:

- You hand them over to medical help
- The casualty is better and can care for themselves
- You hand them over to another First Aider
- They no longer want your help this is usually because the problem is no longer an emergency, and further care is not needed

Reasonable skill and care

As a Good Samaritan, when you give First Aid you are expected to use reasonable skill and care according to your level of knowledge and skills.

Consent

The law says everyone has the right not to be touched by others. As a First Aider, you must respect this right.

Expressed consent

Always ask if you can help. You are looking for the casualty to indicate yes either by saying it, nodding, or in another way that can clearly be interpreted as yes.

Informed and ongoing consent

Building on expressed consent, informed and ongoing consent is obtained as you tell the casualty what you will be doing and confirming that it is okay to continue. A person has the right to withdraw their consent at any time.

Implied consent

If the casualty cannot answer, you have what is called implied consent and you can help. An unresponsive casualty is in serious condition and it is assumed that they would agree to any help you can give them.

Consent with children

If the casualty is an infant or a young child, you must get consent from the child's parent or guardian. If there is no parent or guardian at the scene, the law assumes the casualty would give consent if they could, so you have implied consent to help.

Refused consent

A person has the right to refuse your offer of help. In this case, do not force First Aid on a conscious casualty. If you do not have consent to help, there may be other actions you can take without touching the casualty, such as controlling the scene, and calling for medical help.

Duty to respond

The Quebec Charter of Human Rights and Freedoms declares that any person whose life is in danger has the right to be helped. This means that you are required to help a person whose life is at risk, provided you do not put your own life, or anyone else's, in danger.

In the rest of Canada, there is no legal obligation for you to give First Aid to someone unless it is your role within the workplace.

As noted above, every workplace is required to have a designated First Aid provider on every shift. If an emergency happens in the workplace, the designated First Aider is required to respond unless their safety is at risk.

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SAFETY AND PERSONAL PROTECTION

In any emergency, First Aid providers must always be aware of workplace hazards and risks and give First Aid safely. Hazards are psychological, environmental, and physical sources of potential harm, injury or death to the First Aider. Examples of workplace hazards include occupational stress, extreme temperature exposure and workplace violence.

A risk is the probability of being harmed or injured given an exposure to a hazard. For example, a physical hazard may be working at a height (e.g., on a ladder), and the risk is the likelihood of falling and sustaining an injury.

There are three basic types of hazards to be aware of:

- The energy source that caused the original injury: Is the mechanism that caused the original injury still active, causing injury to others? Example: Where an injury has been caused by machinery, is the machinery still running?
- There may be hazards caused by external factors. Example: Passing vehicles may pose a risk at the scene of a motor vehicle incident
- There may be hazards associated with First Aid procedures or a rescue. For example, moving a heavy casualty could place the First Aider at risk of injury

Some hazards can be controlled by the First Aid provider. When controlling hazards, keep the following principles in mind:

- Use mechanical means whenever possible (broom, dustpan, tools, etc.)
- Be careful when lifting or moving objects on or near a casualty
- Have someone assist you where possible
- Turn on lights where no other risks to doing so exist

- Ensure safe footing - many injuries to First Aiders are a result of slips and falls

Hazards that require specialized training to control (electrical hazards, fire, gases, etc.) should only be controlled by those who are properly trained. Most workplaces that deal regularly with these types of hazards will have a specialized response team. Refer to your workplace's policies and protocols.

When dealing with chemical hazards, a Safety Data Sheet/ Material Safety Data Sheet (SDS/MSDS) should be accessible and will provide information on how to control the hazards, along with First Aid directions.

As a workplace First Aider, it is important to survey the scene for hazards, assess the hazards for the level of risk, identify appropriate controls to mitigate or eliminate the risk, and then ensure the controls are implemented.

Preventing Infection

As a First Aider, you want to avoid becoming infected by something a casualty may have, as well as avoid infecting them. More information on cleaning wounds and preventing infections is covered in Chapter 8 on page 171. To protect yourself from infection from the casualty, it helps to understand pathogens and the way infections transfer.

Airborne pathogens

The following are examples of infections that can be spread through the air:

- Meningitis is a bacterial or viral infection which causes swelling that affects the spinal cord and brain
- Tuberculosis is a bacterial infection that primarily affects the lungs, but can affect any part of the body
- Influenza, or the flu, is a viral infection that is easily spread, and can vary from being mildly debilitating to fatal

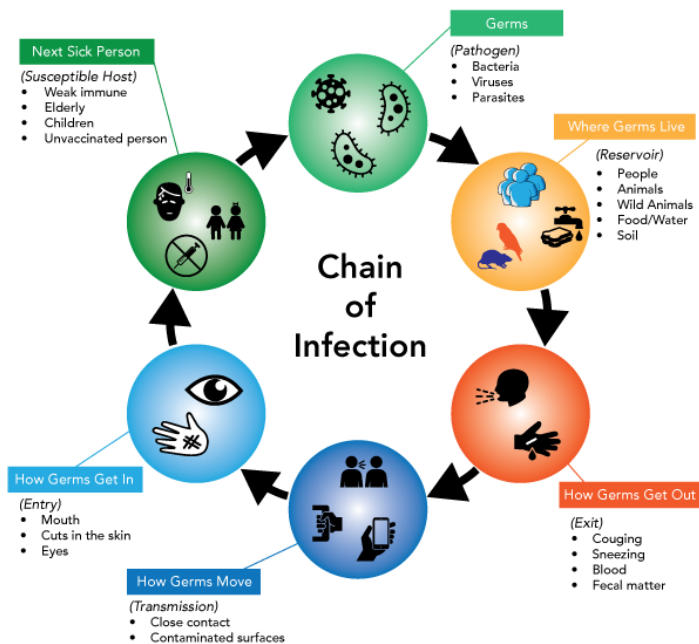
01 Fluid and blood-borne pathogens

Exposure to blood or body fluids (e.g., vomit, feces) poses a health risk to First Aiders.

There are three diseases that First Aiders should be aware of:

- Human Immunodeficiency Virus (HIV) is the virus responsible for AIDS. There is no vaccine to protect people from this virus. The best defence remains adequate protection to help prevent infection
- Hepatitis B is one of the three common forms of hepatitis, a viral disease that can cause severe liver damage. Some people who have Hepatitis B have no symptoms but are still contagious. There is a vaccine to prevent Hepatitis B
- Hepatitis C causes much of the same liver damage as Hepatitis B, but there is currently no vaccine available to prevent this disease

Chain of Infection



The Chain of Infection is a way of understanding the cycle of infection. Disrupting any point in the chain can help break the cycle of infection and potentially stop further infections.

Pathogens – Comprised of bacteria, viruses, and parasites. These are what actually make people sick. They can be new or a mutation of an existing pathogen.

Reservoirs – Where pathogens live before moving around. Common reservoirs are animals, food and water, soil, or other people. Contaminated water is one of the most frequent reservoirs.

Exit – How the pathogen leaves the reservoir. When infections transfer between people, the common exit paths are coughing, sneezing, blood, or fecal matter.

Transmission – How the pathogen moves from one location to another. This can be through close contact with an infected person, or via contaminated surfaces (called fomites).

Entry – How the pathogen enters the next host. This can occur through the mouth (eating or drinking), the eyes or nose (mucous membranes), or breaks in the skin (cuts or injection).

Susceptible Host – The potential new host must be susceptible to the pathogen for it to take hold. Often it is the elderly and children who are susceptible. In some cases, vaccinations can prevent infection, and a lack of vaccination will provide a susceptible host.

A cold virus is a common infection that impacts people every year. Following the chain, it starts in a sick person and exits through coughing and sneezing. It will travel from one person to another through close contact or droplets left on a surface (like a doorknob). The next host touches the contaminated

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surface and then touches their mucous membranes (nose, mouth, eyes) before washing their hands. Because the host has not encountered this particular variant of the cold before, they are susceptible and become infected. Once in the new host, the virus may change slightly, or simply be carried, starting the whole process again.

Sharp objects

If a sharp object touches infected blood and then pricks or cuts your skin, you could become infected. First Aiders do not use sharp objects like scalpels and needles, but there may be broken glass or other sharp objects that have been in contact with blood or other bodily fluids. Always wear gloves and handle sharp objects with extreme care.

Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE)

is clothing and equipment used to protect the First Aider and to minimize the risks of health and safety hazards when in contact with a casualty. PPE can consist of gloves, a pocket mask used for ventilations, a helmet, eye protection, safety boots, etc.



Use a face mask or shield when providing artificial respiration or CPR. Always follow the manufacturer's directions for disinfecting and cleaning reusable items. Single-use masks, one-way valves, and gloves are disposed of by double bagging them with other contaminated articles. If used in the workplace, follow provincial/territorial and/or company protocols for the disposal of hazardous items.

Disposable gloves prevent direct hand contact between the First Aider and the casualty. Wear gloves when you might touch blood, bodily fluids, tissue, or anything that has come in contact with one of these.

If you tear a glove, wash your hands as soon as possible, and put on a new pair. Dispose of contaminated gloves by sealing them in a plastic bag and double bagging them.

Post-emergency clean-up

After an emergency, it is important to properly clean-up the area and equipment used. Any hard surfaces should be disinfected. Fabrics, where possible, should be laundered. Porous surfaces or materials that cannot be laundered may need to be disposed of.

- Items intended to be reused (scissors, forceps) should be wiped free of blood and fluids, immersed in a 10% bleach solution (or other disinfecting solution) for 10 minutes, then rinsed and dried.
- Single-use items (gauze, gloves) should be put into a garbage bag, which should then be tied. That garbage bag can then be put into the regular garbage. Any surfaces contaminated by blood or other fluids should be cleaned with a bleach solution or other disinfecting solution.

Sharps

In an emergency, sharp objects (or sharps) may be the cause of the injuries, or used in the First Aid. It is important to dispose of these sharp objects properly for both the safety of First Aid providers and others. Sharps can include needles, knives, and broken glass.

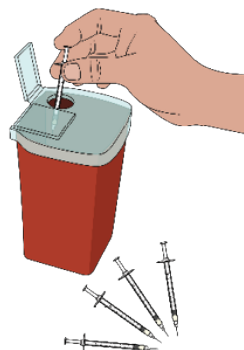
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These items may contain contaminated blood and can cut the First Aider, exposing them to the contamination.

Glass should always be cleaned up using mechanical means such as a broom and dustpan. The cleaned up glass should be placed in a puncture-proof container like a cardboard box.

When handling knives, always grasp them by the handle and carry them blade down. When cleaning knives, follow the steps above for cleaning hard surfaces.

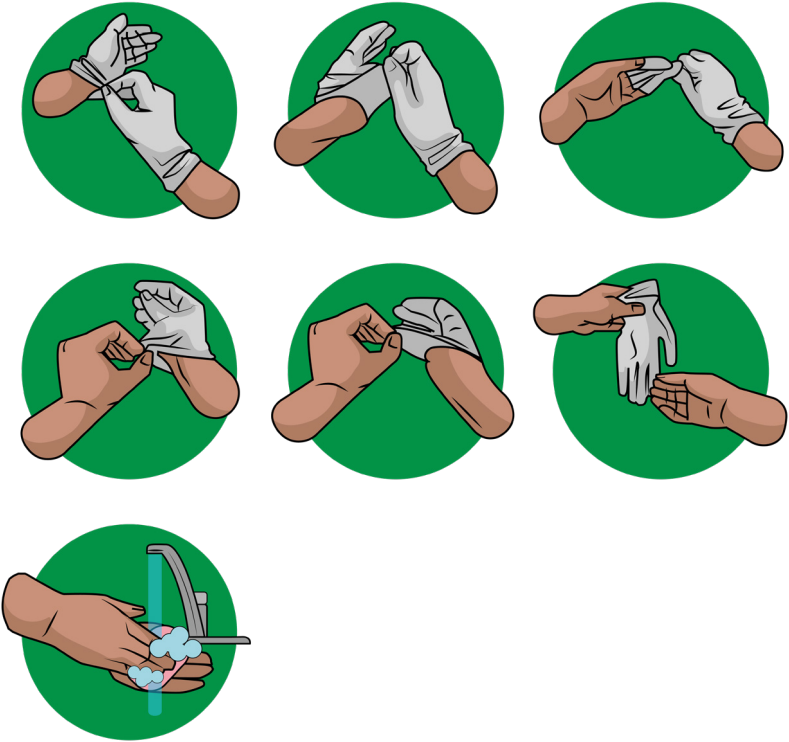
Needles should be disposed of in a sharps container. These plastic containers have thick walls and a secured lid that prevent accidental punctures. Ambulances will carry sharps containers and any needles found or used during an emergency can be placed in these containers. Always handle needles by the barrel (the plastic part with the plunger) and never try to re-cap a used needle.



Needles must never be discarded into the general garbage.

Gloves

Once gloves have been used, they are contaminated and are a possible source of infection. Take them off without touching their outer surface following these illustrated steps.



MEDICAL HELP ON THE SCENE

The following sections discuss medical help, bystanders, and managing stressful situations while on the scene of an emergency.

Importance of Medical Help

In First Aid, any type of medical care is referred to as medical help.

Unless an injury is very minor, you should always make sure the casualty receives medical help following First Aid. Medical help may be given at the scene, on the way to a medical facility, or in a hospital.

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Know the EMS telephone number for your community. This is usually 9-1-1 in most of Canada. Calling for medical help is important. Every second counts in life-threatening emergencies.

You can ask a bystander to call for medical help.

Provide them with the following details:

- Emergency phone number(s)
- A description of the casualty's condition
- Directions to follow to reach the scene
- Instructions to report back to you after getting medical help

If you are alone, you must decide whether to stay with the casualty or leave to get help. The correct decision will depend on the specifics of the situation. If you have a mobile phone, call from the scene and perform First Aid with the dispatcher's assistance.

Medical care

As a First Aider, you are not trained to diagnose the nature and extent of an injury or illness; a medical doctor has the training to do this. As a rule, make sure the casualty receives medical care following First Aid. For minor injuries, this may not be necessary. Medical care is either given by a medical doctor or under the supervision of a medical doctor. Paramedics provide medical care because they work under the supervision of medical doctors.

Help at an Emergency Scene

Bystanders should be asked to leave unless asked to stay and assist.

Other First Aiders may offer to help. Identify yourself and accept their assistance. If someone is more qualified to handle the situation, you may ask that person to take control. Off-duty doctors, nurses and other health professionals may identify themselves and offer to help.

First responders include ambulance personnel, police officers, and firefighters. They will take charge of the scene as soon as they arrive.

Other authorities may be called to the scene (e.g., an electrical utility crew may arrive if there are downed power lines).

Identify yourself and continue giving First Aid.

Ten ways a bystander can help

A bystander can provide help in the following ways:

1. Make the area safe
2. Find all the casualties
3. Find a First Aid kit
4. Control the crowd
5. Call for medical help
6. Help provide First Aid, under your direction
7. Gather and protect the casualty's belongings
8. Take notes
9. Reassure the casualty's relatives
10. Lead the paramedics to the scene of the emergency

01 Communication Best Practices

Communication is necessary in every emergency, regardless of the details. As the First Aider, there are many people you may need to communicate with the workplace casualty, bystanders, family members, other First Aiders, EMS providers, and other professionals (e.g., police, fire, utility workers). Effective communication skills will help you to assess the casualty's condition and explain what you are doing and why.

The following are some rules for effective communication:

- Be calm and direct
- Be respectful
- Do not use medical terms
- Call the casualty by name
- Do not diagnose the casualty's condition
- Always be honest, reassuring, and choose your words carefully

As a First Aider, the first thing you do when you arrive at an emergency scene is to take charge of the situation. You stay in charge until you hand control of the scene over to more qualified people. While in charge, many other people may offer to help.

When handing the scene over to someone other than the casualty, describe the complete history of the incident and pass along any notes you have taken.

Be sure to include:

- Your name
- The time you arrived
- The history of the illness or injury, including signs and symptoms observed
- What First Aid has been provided

- Any changes in the casualty's condition since you took charge

Communication principles

Though each situation is different, the following general guidelines help improve communication.

Focus

Maintain your attention on the casualty. Position yourself at eye level and maintain eye contact.

Terminology

Refrain from using medical terminology when communicating with the casualty or bystanders. Explanations and answers must be clear, concise, and easily understood.

Body Language

Refrain from using body language that could be perceived as



BODY LANGUAGE IDEAL POSTURE

- + At-level with patient
- + Attentive and active listening
- + Arms uncrossed to display openness
- + Smiling or showing positive facial features



BODY LANGUAGE DISCOURAGED

- + Not at-level with patient
- + Not actively listening
- + Arms crossed, which can convey anger
- + Frowning or showing negative facial features



threatening or aggressive.

Professionalism

Always maintain your professionalism. Explain everything you are doing and why. If what you are doing may be painful, let the casualty know.

Communication barriers

Despite following the principles of communication above, there are certain barriers that may arise, making communication difficult.

- **Language** The casualty or bystanders may not speak the same language as the First Aid provider
- **Physical** The casualty or bystanders may have a hearing, speech, or visual impairment
- **Cognitive** The casualty or bystander may not understand the questions or requests
- **Cultural** Different cultures approach interactions with others in a manner that is different from yours, which may impact communication
- **Environment** Noisy situations can make communication very difficult
- **Technical** Failure or limitations of communication devices (radios, phones) can hinder communication

When faced with these barriers, the First Aid provider may have to attempt several different ways to gather information or give directions.

First Aid providers should also remember to keep things simple, clear, and to the point. Drawn out descriptions using large words can make it very difficult for the casualty or those around to understand. An example would be Get me the AED instead of I need you to find an Automated External Defibrillator while I perform cardiopulmonary resuscitation.

Stress Management in Emergency Situations

First Aiders may experience a certain level of stress because of the assistance they provide. Stress is the body's normal reaction to physical and psychological events. It can be seen in certain attitudes and behaviours in both casualties and First Aiders.

It is a biological response and may be reflected in:

- An increase in heart rate
- An increase in blood pressure
- An increase in blood sugar
- Dilation of the bronchi and pupils

Possible reactions of casualties

Casualties may react to stressors in different ways and First Aiders must observe and adjust to such reactions, which can include:

- **Denial** – The casualty may deny the seriousness of the situation and refuse assistance.
- **Resignation** – The casualty may be resigned to dying even if their life does not seem to be in danger, and does not want to make any effort to do what is needed.
- **Aggressiveness** – The casualty may be hostile.
- **Assertiveness** – The casualty is positive, cooperative, and may even want to take charge of their own care, including directing the First Aiders.

Stress management

Managing stress in an emergency can make a significant difference in the quality of First Aid provided. Appropriate mental preparation and regular First Aid skills practice can help First Aiders react effectively when faced with an emergency. The negative impact of stress can be reduced by understanding it and taking measures to try and overcome it. After serious incidents, it is important for First Aiders to process their emotions.

When faced with a highly stressful situation, some First Aiders

01 may experience prolonged effects of stress and they should seek professional assistance.

Chapter 02

Emergency scene management

INTRODUCTION

02

Emergency scenes generally begin with confusion as people realize there is an emergency unfolding in front of them. No one knows what to do first, who should be in charge, or how they can help. In this situation, the first aider needs to follow a sequence of actions that ensures safe and appropriate first aid is given and everyone's safety is protected. First aiders use emergency scene management (ESM) to do this. Emergency scene management is the sequence of actions you should follow to ensure safe and appropriate first aid is given.

ESM STEPS

The following are the steps required in ESM:

- **Scene survey** During the scene survey you take control of the scene, find out what happened, and make sure the area is safe before assessing the casualty
- **Primary survey** Assess each casualty for life-threatening injuries and illnesses, call or send someone to call 9-1-1, and give lifesaving first aid
- **Secondary survey** The secondary survey is a step-by-step way of gathering information to form a complete picture of the casualty's overall condition; giving first aid for non-life-threatening injuries
- **Ongoing casualty care** During ongoing casualty care you continue to monitor the casualty's condition until medical help takes over

These steps are generally done in the order above. The initial scene survey, primary survey, and the start of lifesaving first aid usually happen within one or two minutes. The secondary survey is not always necessary.

PERFORMING A SCENE SURVEY

To perform a scene survey, complete the following steps:

1. Take charge of the situation
2. Assess hazards and make the area safe
3. Call out for help to attract bystanders
4. Find out the history of the emergency. How many casualties are there? What is the mechanism(s) of injury?
5. Identify yourself as a first aider and offer to help.
Get consent
6. Assess responsiveness

Send or go for medical help as soon as you identify a serious problem and then begin the primary survey. If you have a mobile phone, you can dial 9-1-1 or your local emergency number, and put the device on speaker phone, if possible. This allows the first aider to remain with the casualty.

Mechanism of Injury

Mechanism of injury encompasses both what happened to the casualty, and how the injury has affected the casualty. It identifies the cause of the injury. Mechanisms of injury that require an ambulance right away include:

- A fall from 6.5 metres (20 feet) or more
- A vehicle collision with signs of a severe impact
- Severe damage to the inside of the vehicle, a bent steering wheel, or a broken windshield
- Casualty was thrown from a vehicle
- The vehicle has rolled over
- Casualty was struck by a vehicle
- Crush injuries

When any of these mechanisms are apparent, call an ambulance as soon as you can. When we understand the cause of the injury, we are able to predict what injuries may be present and what injuries are not likely, even in situations in which there are no visible signs of injury and/or the casualty is unable to describe their symptoms.

PERFORMING A PRIMARY SURVEY

Check for life-threatening conditions. These are called the A.B.Cs:

1. A = Airway
2. B = Breathing
3. C = Circulation

The sequential steps of the primary survey are performed with the casualty in the position found unless it is impossible to do so.

The primary survey begins immediately after the scene survey.

Check the Airway

If the casualty is conscious (or responsive), ask, What happened? How well the casualty responds will help you determine if their airway is clear.

If the casualty is unconscious:

- Loosen tight clothing at the neck, chest, and waist
- Use a head-tilt/chin-lift to open the airway. Using gentle pressure tilt the head back and lift the chin up

If you suspect a head or spinal injury, and have been trained, use the jaw-thrust method without the head-tilt.

Check for Breathing

If the casualty is conscious, check by asking how their breathing is. A person able to speak in sentences has normal breathing. If the casualty is unconscious, check for breathing for at least five seconds, and no more than 10 seconds.

If breathing is effective, move on to check circulation. If breathing is absent or ineffective (gasping and irregular, agonal), begin CPR.

Check for Circulation

A breathing casualty will have a pulse. Assess circulation to determine if their circulation is impaired. Check for shock by checking their skin condition and temperature.

Control any obvious severe bleeding.

Perform a Rapid Body Survey

The rapid body survey is a quick assessment of the casualty's body, which is performed during the primary survey.

By running your hands over the casualty's entire body from head to toe (and under heavy outwear), you can feel for severe bleeding, internal bleeding, and any obvious fractures.

When performing the rapid body survey:

- Wear gloves when possible, and check gloves for blood often
- Be careful not to cause any further injuries while performing the survey
- Look at the casualty's face to notice any responses to the rapid body survey

First Aid for Life-Threatening Injuries or Conditions

02

To give first aid for life-threatening injuries or conditions, perform the following steps:

1. Maintain an open airway with a head-tilt/chin-lift or by placing the unconscious (unresponsive) breathing casualty into the recovery position.
2. Provide CPR if the unconscious casualty is not breathing or not breathing normally (gaspings).
3. Control severe bleeding.
4. Provide support for obvious fractures.
5. Give first aid for shock by providing first aid for life-threatening injuries and maintaining the casualty's body temperature.
6. Evaluate the situation and decide whether to perform a secondary survey.

Perform a secondary survey if:

- The casualty has more than one injury
- Medical help will be delayed by more than 20 minutes
- Medical help is not coming to the scene and you have to transport the casualty

If you do not perform a secondary survey, steady and support any injuries found and give ongoing casualty care until medical help arrives.

PERFORMING A SECONDARY SURVEY

A secondary survey follows the primary survey and any lifesaving first aid. It is a step-by-step way of gathering information to form a complete picture of the casualty. In the secondary survey, the first aider is looking for injuries or illnesses that may not have been revealed in the primary survey. You should complete a secondary survey if:

- The casualty has more than one injury.
- Medical help will be delayed for 20 minutes or more.
- You will transport the casualty to medical help.

The secondary survey has four steps:

1. History
2. Vital signs
3. Head-to-toe exam
4. First aid for any injury or illness found

Obtain Casualty History

A S.A.M.P.L.E history is used to gather a brief medical history of the casualty. This information may be useful for healthcare professionals who will continue to assist the casualty. If the casualty is unable to respond, some of the S.A.M.P.L.E history could be answered by a close family member. S.A.M.P.L.E questions include:

Symptoms What is the casualty feeling (such as pain, nausea, weakness, etc.)?

Allergies Are there any allergies, specifically allergies to medications?

Medications Are there any medications or supplements they normally take, have taken in the past 24 hours, or any doses they may have missed?

Past or present medical history Is there any medical history, especially if it is related to what they are experiencing now?

02 Do they have **medical alert information**?

Last meal What was the last meal they ate and when? Did they take anything else by mouth?

Events leading to the incident What was happening before the injury/illness? How did the injury occur?

Check Vital Signs

There are four vital signs to check on the casualty:

- Pulse
- Breathing/Respirations
- Level of consciousness (LOC)
- Skin condition and temperature

Check the pulse

The pulse rate is the number of beats your heart takes in one minute, and it is an essential skill for assessing all casualties. The most common places to assess a pulse are at the wrist or neck, and for infants, the inside of the upper arm.

To assess the pulse, use two fingers and gently place them on either the inside of the wrist (just below the hand on the thumb side), or on the side of the neck (carotid artery).

For infants, place two fingers on the inside of the upper arm, on the brachial artery.

Press just gently enough to feel the pulse. You may have to feel around the area until you find it. Once you have found the pulse, count the number of beats over 30 seconds and multiply that number by two.



Normal Pulse Rates

Age	Normal Pulse Range
Infant	120 150
Child	80 150
Adult	60 100

Check respirations

To assess the breathing rate, watch the casualty closely for a total of 30 seconds. It is OK to place your hand on their upper abdomen to feel the rise and fall. Check the quality of the breathing. Carefully count each breath over the 30 seconds and multiply that number by two for breaths per minute.



Normal Breathing Rates

Age	Too Slow	Normal	Too Fast
Infant	Below 25	30 50	Above 60
Child	Below 15	20 30	Above 40
Adult	Below 10	10 20	Above 30

Check level of consciousness (LOC)

A common method of obtaining a casualty's LOC is using the mnemonic A.V.P.U.

- **A** Alert
- **V** Verbal/Voice
- **P** Pain
- **U** Unresponsive/Unconscious*

***Note:** For the purposes of first aid terminology, an unresponsive casualty is equivalent to an unconscious casualty. Conversely, a responsive casualty is equivalent to a conscious casualty.



Alert An alert casualty will have their eyes open, will be able to answer questions and follow simple directions. An alert casualty usually knows their name, where they are, and the approximate time (oriented to person, place, and time).

If their eyes are open, they can speak clearly, and follow the command of squeeze my fingers they are alert.

Verbal The casualty will respond when spoken to but may not be able to communicate effectively. They are often described as out of it, and may not be oriented to person, place, or time.

Pain The casualty will only respond when a painful stimulus is delivered, such as pinching their ear or shoulder, or if you rub your knuckle on their collarbone. They may move or make a sound, but they will not usually open their eyes or communicate.

Unresponsive/Unconscious The unresponsive/unconscious casualty will not respond to any stimulus.

Check the skin condition

The skin can be a great indicator of a casualty's condition. It is often one of the first signs of an emergency. When checking the skin, we are looking at three factors:

- **Condition** Dry or sweaty
- **Temperature** Cool or warm
- **Colour** Normal or lacking colour

All these factors are influenced by the amount of oxygen in the blood and how that affects the major organs (including the skin). A casualty in shock (refer to Shock on page 129) will have lower levels of oxygen in the blood and/or the blood flow will be directed away from the skin. As a result, the skin will become sweaty, cooler, and lack the normal reddish undertone.



This lack of colour means people with lighter skin tones will look ashen or pale, and people with darker skin tones will look grey.

If you are unable to assess the skin colour by looking at the casualty, you can check the inside of the lip, nail beds and earlobes for signs of cyanosis. For people with paler skin tones this will present as a blue tinge to the skin. For Black, Indigenous and People of Colour (BIPOC) with darker skin tones this will present as grey or purple.

Head-To-Toe Exam

02

The head-to-toe exam is a complete and detailed check of the casualty for any injuries that may have been missed during the rapid body survey. Do not examine for unlikely injuries. You may need to expose an area to check for injuries, but always respect the casualty's modesty and ensure you protect them from the cold. Only expose what you absolutely must.

- Ask the casualty if they feel any pain before you start. Note any responses
- Speak to the casualty throughout the process. Explain what you are checking for as you proceed
- Always watch the casualty's face for any facial expressions that may indicate pain
- Do not stop the exam. If you find an injury, note it and continue
- Do not step over the casualty. If you need to, walk around them
- During a detailed exam, you are looking for all bumps, bruises, scrapes, or anything that is not normal
- If the casualty is unconscious, look for medic alert devices during your survey, such as a tag, bracelet, necklace, watch, or other indicator
- Look, then feel

To conduct a head-to-toe exam, perform the following steps:

1. Start at the head

- Check the skull for anything abnormal.
- Check the ears for fluid.
- Check the eyes. Are the pupils the same size?
- Check the nose for drainage.
- Check the mouth. Are the teeth intact?
Are the lips blue or pale?



2. Check the neck

- Are the neck veins bulging?
- Is there a medical alert necklace?
- Check the collarbones.
- Check the shoulders on both sides.



3. Check the arms

- Check each arm completely.
- Check the fingernails for circulation by squeezing and watching the blood return.
- Ask the casualty to squeeze two of your fingers in both hands at the same time. Do they have an adequate strength and is the strength equal?



4. Check the chest and underneath their body

- Does it hurt the casualty to breathe?
- Does the chest rise and fall with breaths as it should?
- Reach around the back as far as you can.



5. Check the abdomen and underneath their body

- With flat hands, check the abdomen carefully.
- Do not push into the abdomen. Gently feel for pain, tenderness, or rigidity.
- Place a flat hand on their abdomen and ask the casualty to push against it. Does this cause pain?
- Reach around the back as far as you can.



6. Check the pelvis

- Place your hands on top of the pelvic bones and very gently squeeze for stability.



7. Check the legs, ankles, and feet

- Check each leg completely one at a time.
- Is one leg shorter than the other?
- Carefully check the stability of the kneecap and under the knee.
- Squeeze or pinch a foot. Ask the casualty what you just did to see if they answer correctly.
- Place both hands on both feet. Ask the casualty to push and then pull against you. Feel for equal strength. Ask the casualty to wiggle their toes and watch for the response.
- Check circulation.



Provide First Aid for Injuries Found

When you have completed your exam, give appropriate first aid for any injuries or illnesses found. If the casualty has more than one injury, give first aid to the more serious injuries first.

PROVIDING ONGOING CARE

Once first aid has been completed, and while waiting for medical help to arrive, provide ongoing care to the casualty. Position them according to their injuries or condition, record what happened and what you have done, reassure them, and monitor their condition.

Turning a Casualty into the Recovery Position

This position protects the unresponsive casualty and reduces bending and twisting of the spine. This position protects the airway if you must leave the casualty.

To turn a casualty into the recovery position, perform the following steps:

1. Position the casualty's arm closest to you at 90 degrees in front of the casualty, keeping it out of the way when rolling them.



2. Position their arm furthest from you on the casualty's chest. Bend their far knee.

02



3. Reach behind the casualty's shoulder and roll the casualty toward you by pulling on their far knee.



4. Adjust the position of their arms and leg so the casualty is in a stable position. Place their far arm at 90 degrees to the casualty with the palm down.



5. Give ongoing care.



Documentation

Upon completion of the secondary survey, document your findings as accurately as possible. This information may be valuable to medical professionals who will continue to assist the casualty.

Documentation is also important in a workplace emergency as it may be used as part of an investigation. Documentation of the incident and the first aid given should be completed on

preprinted forms and maintained as required by provincial regulations/ legislation for reference by investigators.

Handover to Medical Help

When an ambulance arrives, do not stop the first aid you are providing until the crew has arrived at the casualty and indicates they are ready to take over. Give a short report to the ambulance crew on the situation; the condition of the casualty; and what you have done so far.

Use the **M.I.S.T** mnemonic to help remember what to report:

02

M Mechanism of Injury

I Injuries or illnesses found

S Signs and symptoms

T Treatment (first aid) provided so far

Note: Check with your Provincial Council on whether M.I.S.T is commonly used for your province.

POST-EMERGENCY CONSIDERATIONS

Once these practical matters are out of the way, we expect things to return to normal. However, you will likely find yourself thinking about the situation and the details of what happened while you were involved. Following a stressful event, many people review the details and try to evaluate what they did and how they could have done it better.

This reviewing of the events is completely normal, and you can expect it to happen. But if thoughts of the incident continue for many weeks, or if they affect your day-to-day life, you may be experiencing the negative effects of critical incident stress (CIS).

Critical incident stress is a common reaction to a stressful emergency. The effects of CIS can interfere with your daily life: your job, your relationships, and your peace of mind. If this happens to you, obtain help.

Consider these resources for addressing critical incident stress:

- Workplace Employee Assistance Program (EAP)
- Family physician

- Faith or spiritual leader
- Crisis line or distress centre
- Community counselling services

The effects of critical incident stress can appear many weeks, months, or even years after the event.

LIFTING AND MOVING A CASUALTY

Always try to give necessary first aid where the casualty is found, then wait for the ambulance to move the person. However, there are times when this is not possible. You may have to move a casualty when:

- There are life-threatening hazards to yourself or the casualty, e.g., danger from fire, explosion, gas, or water.
- Essential first aid for wounds or other conditions cannot be given in the casualty's present position or location. For example, CPR is needed and the area does not provide a firm flat surface.
- Emergency crews cannot access the casualty in their current location (construction locations, clean rooms, secure areas).
- Rescuers need to stabilize the casualty.
- There is no other way to get help.
- Access to other casualties is needed.
- The casualty must be transported to a medical facility.

If life-threatening hazards make it necessary to move a casualty right away, you may need to use a rescue carry.

In urgent and dangerous situations where casualties are moved without proper support for injuries, the casualty's injuries may be made worse. The chance of further injury can be reduced with proper rescue carry techniques.

Always move the casualty the shortest possible distance to safety and to provide essential first aid. Use bystanders to help you and support any injuries the best you can during the move. Keep the risks to the casualty, yourself, and others to a minimum.

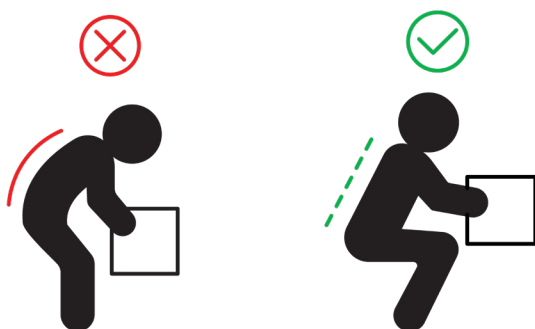
Repositioning the Casualty from Face Down

You should give first aid in the position in which the casualty is found when possible. Sometimes you must turn a casualty over to assess for life-threatening injuries or to give lifesaving first aid.

To reposition a casualty from face down, perform the following steps:

1. Extend the arm closest to you over the casualty's head.
2. Tuck the far arm against the casualty's side.
3. Cross the far foot over the near foot.
4. Support the head and neck. Firmly grip the clothing at the waist. Roll the casualty toward you.
5. Position the casualty onto their back before giving first aid.

Lifting Techniques and Proper Body Mechanics



Moving any casualty from an emergency scene poses dangers to the rescuer as well as the casualty. If the casualty must be moved, select the method that will pose the least risk to the casualty and to you. You can be of little help to a casualty if you injure yourself in the rescue.

Using incorrect body mechanics in lifting or moving a casualty may cause injury to the first aider, such as muscle strains.

When lifting and moving a casualty, use the following guidelines to help reduce the risk of injury:

- Use as many people as possible and as is practical.
- Stand close to the person to be lifted.
- Bend at your knees, not at your waist.
- Ensure a good grip on the person using clothing, belts, sheets, etc.
- Use your leg muscles to lift and keep your back as straight as possible.
- Keep the weight of the person as close to your body core as possible.
- When turning, do not twist your body. Turn your feet first.
- When lowering, reverse the procedure.

Rescue Carries

A rescue carry is an emergency method of moving a casualty over a short distance to safety, shelter, or to transportation. Select the type of carry based on the circumstances:

- The size and weight of the casualty relative to the rescuer
- The number of rescuers available to assist
- The type of injury
- The distance to move the casualty

Whenever possible, ask one or more bystanders to help you. When help is available:

- Remain with the casualty

- Give instructions to the bystanders about what to do and what safety precautions to take
- Fully coordinate the rescue activities

Hazards that pose a risk to both the rescuer and the casualty include the environment (e.g. Is the surface slippery or slick? Are there visual hazards such as smoke or fog?),

incorrect lifting which could cause injury, or aggravate or worsen an injury.

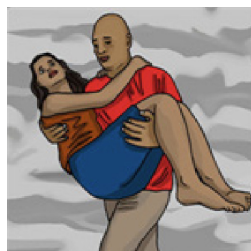
One-Person Rescue Carries

The following are types of rescue carries that can be performed by a single rescuer.

Cradle carry

Use the cradle carry to lift children and lightweight adults.

1. Kneel on one knee at the casualty's side.
2. Place the casualty's arm around your neck as you support their back and shoulders.
3. Pass your other arm under the casualty's knees to grasp the thighs.
4. Ensure a solid footing and place your feet apart for good balance.
5. Lift using your legs, keep your back straight, and your abdominal muscles tense.



Drag carry

This carry is used by the single rescuer to drag a casualty who is either lying on their back or in a sitting position. The drag carry provides maximum protection to the head and neck, and therefore should be used when you are moving a casualty with this type of injury.



If time permits, tie the casualty's wrists together across their chest before dragging them.

1. Stand at the casualty's head, facing their feet.
2. Crouch down and ease your hands under the casualty's shoulders. Grasp the clothing on each side. Support the casualty's head between your forearms to stop movement.
3. Drag the casualty backward only as far as necessary for their safety.



As an alternate method, the first aider can use a blanket to support and drag the casualty.

Because of the risk of aggravating any injuries, only use drag carries in the most extreme cases when there is an immediate threat to life.

Firefighter s carry

Use this carry for casualties who are unable to move and are not too heavy for the rescuer.

1. With the casualty lying face up in front of you, stand with your toes against the casualty's toes. Grasp their wrists and pull them upward and forward.
2. Maintain a grip on one wrist as you turn and bend to catch the casualty's upper body across your shoulder. The lifting maneuver is a continuous, smooth motion to bring the casualty from a sitting position to an upright position, finishing with the casualty draped over your shoulder.
3. Adjust their weight across your shoulders, with the casualty's legs straddling your shoulder.



4. Pass your arm between the casualty's legs and grasp their wrist. This will stabilize the casualty on your shoulders and leave the other hand free.

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Pick-a-back carry

Use this carry for conscious casualties with lower limb injuries, provided they can use their arms. The casualty must be able to help get into position on your back or be already seated at chair or table height.

1. Crouch with your back between the casualty's knees. Have the casualty hold on around your neck.
2. Support the casualty's legs and lift. Use your leg muscles to stand up, keeping your back straight.



If the casualty is to be carried pick-a-back-style for a long distance, make a carrying seat:

1. Form a large adjustable loop from a strap or belt.
2. Put your arm through the loop, arranging it behind your neck and down the front of your shoulders. Leave the bottom half of the loop free at the back about the level of your buttocks.
3. Pass the casualty's legs through the bottom of the loop, one on each side. Position the loop under the casualty's buttocks, adjusting it for a good carrying position and proper weight distribution.

Human crutch carry

If a leg or foot is injured, help the casualty to walk on their good leg while you give support to the injured side.

1. Take the weight of the casualty's injured side on your



shoulders by placing the casualty's arm (on the injured side) around your neck and grasping the wrist firmly.

2. Reach around the casualty's back with your free hand and grasp the clothing at their waist.
3. Tell the casualty to step off with you, each using the inside foot. This lets you, the rescuer; take the casualty's weight on the injured side.



Two-person rescue carries

The following are types of rescue carries that can be performed by two rescuers.

Two-hand seat carry

A casualty who is unable to support their upper body can be carried by two rescuers, using the two-hand seat.

1. The rescuers crouch on either side of the casualty.
2. Each rescuer reaches across the casualty's back to grasp their clothing at the waist on the opposite side.
3. Each rescuer passes their other hand under the casualty's thighs, keeping their fingers bent and holding padding to protect the casualty from their fingernails. Hook the bent fingers together to form a rigid seat. Alternatively, the rescuers can hold each other's wrists.

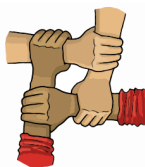


4. The rescuers lift with their legs, keeping their backs straight. Once in the standing position, the rescuers adjust their hands and arms for comfort. When the casualty is securely positioned, the bearers step off together, each using the inside foot.

Four-hand seat carry

A conscious casualty who can use their hands and arms can be carried on a four-hand seat by two rescuers.

1. Each rescuer grasps their own left wrist with their right hand, then grasps the right wrist of the other rescuer with their left hand to form a square.
2. Tell the casualty to put their arms around the rescuers shoulders and hoist themselves up so the bearers can pass their hands under the casualty's buttocks and position them under their thighs at a balance point.
3. Instruct the casualty to hold on to the rescuers shoulders to keep their balance and support their upper body.
4. The bearers step off together, each using the inside foot.



Chair carry

The chair carry enables two rescuers to carry a conscious or unconscious casualty through narrow passages and up and down stairs.

1. Place an unconscious casualty on a chair by sliding the back of the chair under their legs, buttocks, and along the lower back.
2. Strap their upper body and arms to the back of the chair.
3. Two rescuers carry the chair, one at the front and one at the back. The rescuer facing the casualty should hold the front chair legs near the floor. The rescuer behind the casualty should hold the chair wherever it is safe to do so.

The casualty should be moved facing forward (for comfort). Where possible, there should be a third rescuer providing guidance for the rescuer walking backwards.

4. The rescuers walk out-of-step.

Extremity carry

Use the extremity carry when you do not suspect fractures of the trunk, head, or spine. This lift can be used to move someone from a bed to the floor or move through tight spaces.

1. One rescuer passes their hands under the casualty's arm pits, and grasps the casualty's wrists, crossing them over their chest.
2. The second rescuer crouches with their back between the casualty's knees and grasps each leg just above the knee.
3. The rescuers step off on opposite feet. Walking out-of-step is smoother for the casualty.

Three-or-more-person rescue carries

Blanket lift carries and carries requiring a stretcher require the support of three or more rescuers. Use these carries for responsive or unresponsive casualties who are unable to walk and have no suspected head, neck, or spinal injuries.

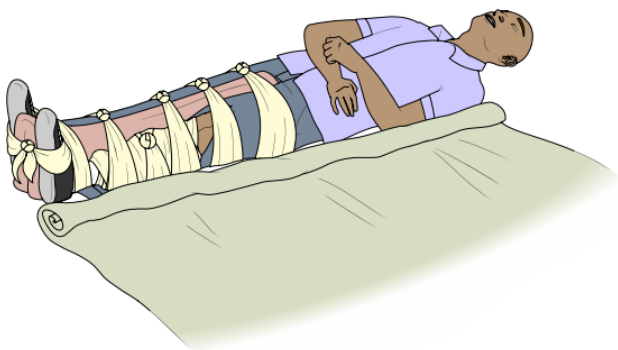


Blanket lift with four bearers

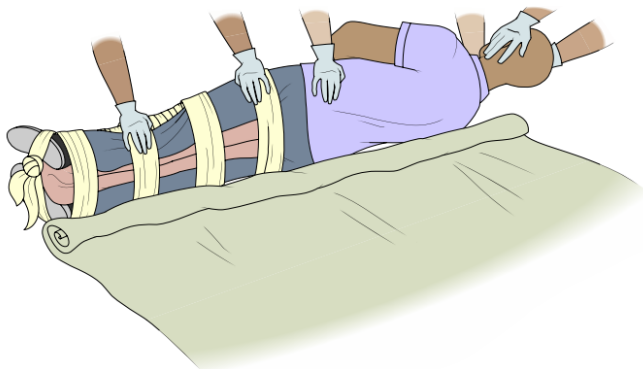
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Before using a blanket, test it to ensure that it will carry the casualty's weight. Do not use this lift if neck or back injuries are suspected.

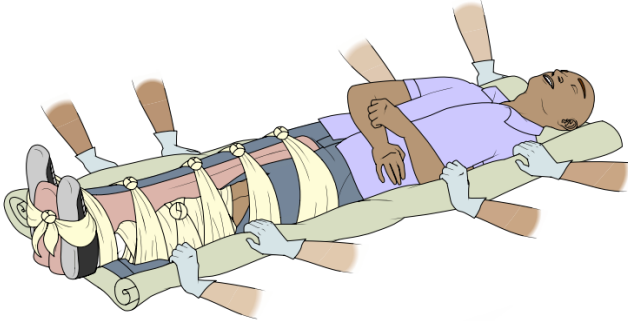
1. Roll the blanket or rug lengthwise for half its width. Position bearers at the casualty's head and feet to keep their head, neck, and body inline. Place the rolled edge along the casualty's injured side.



2. Kneel at the casualty's shoulder and position another bearer at their waist to help log-roll the casualty onto the uninjured side. Turn the casualty as a unit so the casualty's body is not twisted.



3. Roll the casualty back over the blanket roll so they are lying face up on the blanket. Unroll the blanket and then roll the edges of the blanket to each side of the casualty. Get ready to lift the casualty. Have the bearers grip the rolls at the head and shoulders, and at the hip and legs.



4. Keep the blanket tight as the casualty is lifted and placed on the stretcher.

Four-bearer lift without blanket

To perform the four-bearer lift method (without a blanket), complete the following steps:

1. All bearers kneel on their left knees, three on one side of the casualty and one on the other. Bearer 4 helps in lifting and lowering the casualty, and also places the stretcher under the casualty.
2. Bearer 4 joins hands with bearers 1 and 2. When assured that each bearer has a firm hold on the casualty, bearer 1 directs the others to Get ready to lift and then gives the command Lift. Lift the casualty smoothly to the height of the bearers raised knees.



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3. On bearer 1's command Rest, the casualty is gently placed on the raised knees of bearers 1, 2 and 3.
4. Bearer 1 tells bearer 4 to position the stretcher. Bearer 4 then resumes their position supporting the casualty by linking their hands with one hand from each of bearers 1 and 2. Position the stretcher.
5. When everyone is in position, bearer 1 instructs the team to, Get ready to lower. and then, Lower. The team lowers the casualty gently onto the stretcher. Secure the casualty to the stretcher.



Three-bearer lift - without blanket

The three-bearer method without a blanket is essentially the same as the four-bearer method, except the first aider and one bearer share the weight on one side of the casualty. The third bearer links hands with the first aider from the opposite side to take up the weight of the trunk.

The casualty is lifted and rested on the bearers knees while the stretcher is positioned and bearer 3 links hands again with the first aider to help lower the casualty onto the stretcher.

Stretchers

There may be times when medical help cannot be contacted, or for other reasons, cannot come to the scene. When this happens, transport the casualty to medical help. If the casualty can't walk, or if the injury or illness allows only the gentlest movement, a stretcher should be used.

Moving a casualty onto a stretcher

Complete all essential first aid and immobilization before moving the casualty onto a stretcher.

1. Bring the blanketed and padded stretcher to the casualty, rather than moving the casualty to the stretcher.
2. As the first aider in charge, take the position that permits you to watch and control the most sensitive area of the body, usually at the head and shoulders, or the injured part.
3. Tell the bearers what each is expected to do. If the move is difficult, and time permits, it's a good idea to practise with a simulated casualty. This reduces risks and reassures the conscious casualty.
4. Test an improvised stretcher with someone equal to or heavier than the casualty to ensure that it will hold.
5. Check the clearance of an improvised stretcher to ensure that it will pass through hallways, doors, and stairways without harm to the casualty.
6. Use clear commands to ensure smooth, coordinated movements.

Carrying a stretcher

A stretcher should be carried by four bearers. As the first aider in charge, decide on the carrying method and give clear instructions to the bearers. After the casualty has been strapped to the stretcher, position yourself so you can watch the casualty and at the same time give directions to the other bearers.

Assign the remaining bearers (depending on whether you are two or four) to respective corners or ends of the stretcher. Bearers crouch by the carrying handles of the stretcher, facing in the direction of travel.

- When the bearers have a firm footing and a good grip on the stretcher, give the command, Get ready to lift. and then, Lift.
- Ask the bearers if they are ready. When they are, give the command, Go forward.
- When it is necessary to stop, give the commands Stop, Get ready to lower. and then, Lower.

To ensure the smoothest carry for the casualty:

- Four bearers carrying a stretcher step off together on the foot nearest the stretcher and keep in step.
- Two bearers step off on opposite feet and walk out-of-step.

Head-first carry

Although stretcher casualties are usually carried feet first, the following conditions call for a head-first carry:

- Leg injuries during a long downhill carry or when descending stairs, a head-first carry decreases pressure on the lower limbs and minimizes discomfort.
- Uphill carries and going up stairs if there are no injuries to the legs. A head-first carry decreases blood flow to the casualty's head and is more comfortable.
- Loading an ambulance or transferring the casualty to a bed. It is safer to do this head first and it makes it easier to watch the casualty.

Obstacles

When crossing uneven ground, a stretcher should be carried by four bearers and kept as level as possible. Bearers must adjust the height of the stretcher to compensate for dips and rises in the terrain.

Using commercial stretchers

The most common of the commercial stretchers is the rigid-pole canvas stretcher. It has hinged bracing bars at right angles between the rigid poles at either end that must be locked in the extended position before the stretcher is used.



Using rolling cots

Some workplaces may have an adjustable rolling cot. This is the type of stretcher commonly associated with an ambulance.

Proper training in the operation of the cot is required before use to avoid injuring the first aiders and the casualty. Rolling cots are not ideal for uneven terrain and should be kept to hard surfaces.

Transporting a Workplace Casualty to the Hospital

Generally, first aid providers will not transport casualties to the hospital, leaving that to ambulances. However, there are instances where you may choose to transport a workplace casualty to the hospital yourself.

- The injuries are minor, and the casualty is stable.
- The response time for EMS to arrive is prohibitively long (e.g., in remote areas).
- If the above conditions are met, and the casualty is a family member or close friend.

Do not transport people who you do not know to the hospital in your own vehicle if possible.

Care during transport

Every effort must be taken to ensure that injuries are not made worse while transporting a casualty to a medical facility. Take steps to keep the casualty comfortable and in a position that will not cause unneeded movement of injured limbs. Have another person accompany you to monitor the casualty if possible.

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Do not drive fast. If a casualty needs to be transported quickly, an ambulance should be called. Follow all local traffic laws. Find the smoothest route possible to make the ride as comfortable as possible.

Meeting medical services (ambulance, helicopter)

Some work locations are isolated and response times of EMS are extended. In these instances, where provincial regulations permit, casualties can be transported toward medical help with the plan to meet an ambulance part way. When selecting a meeting point, be sure the location is clear to both sides, and that it is easily found. Identify any landmarks or businesses that can aid in finding the location. In the event you arrive before the ambulance, contact EMS and get an update on the ambulance location before moving the meeting location.

In some locations, a helicopter may be sent to transport an injured worker to hospital. Anyone working around helicopters should have proper training and everyone should follow these guidelines:

- Keep the area clear.
- Never approach a helicopter.
- Allow the crew to fulfill their assigned roles. Always follow directions from the pilot or crew chief.
- Know the restricted and danger areas around the aircraft and remain outside these areas.
- The tail and tail rotor of the helicopter pose a significant danger and should be avoided.

Extricating a Casualty from a Vehicle

Extrication is the process of freeing casualties who are trapped or entangled in a vehicle or collapsed structure and cannot free themselves. Provide as much support as possible to the casualty during extrication. Whenever possible, give

essential first aid and immobilize the injuries before the casualty is moved.

When there is an immediate danger and you are alone and must move a casualty from a vehicle, proceed as follows:

1. If necessary, disentangle the person's feet from the vehicle and bring the feet toward the exit. Ease your forearm under the person's armpit on the exit side, extending your hand to support the chin.
2. Ease the person's head gently backward to rest on your shoulder while keeping the neck as rigid as possible.
3. Ease your other forearm under the armpit on the opposite side and hold the wrist of the casualty's arm that is nearest the exit.
4. Establish a firm footing and swing around with the person, keeping as much rigidity in their neck as possible. Drag the casualty from the vehicle to a safe distance with as little twisting as possible.



MULTIPLE CASUALTY MANAGEMENT

Most multiple casualty situations will involve two or three casualties with only one first aider. A good example of such a situation would be a vehicle collision. There are going to be at least two casualties and possibly more. It is important that the casualties are sorted into priorities for first aid.

The process of sorting casualties at an emergency scene where multiple people are injured is called triage. In triage, first aiders quickly examine all casualties and place them in order of greatest need for first aid and for transportation. The goal is to help as many people as possible with the resources you have.

Casualties are categorized into three levels of priority:

- Highest priority Casualties who need immediate first aid and transportation to medical help.
- Medium priority Casualties who probably can wait one hour for medical help without risk to their lives.
- Lowest priority Casualties who can wait and receive first aid and transportation last, or casualties who are obviously dead.

Note: In the event of a lightning strike, where more than one person is injured, the principles of multiple casualty management are reversed. Give first aid to unresponsive, non-breathing casualties, since the casualties that are still breathing are recovering.

First Aid Priorities for Injuries		
Priority	Condition	Causes
High		
Airway	Foreign body blocking airway	Choking on food
	Tongue or fluids blocking airway	Unconscious, lying on back

	Swollen airway	Allergic reaction, airway infection
Breathing	Injured chest and/or lungs	Chest injury, broken ribs
	Brain not controlling breathing properly	Poisoning, drug poisoning, stroke, electric shock
	Not enough oxygen reaching blood	Not enough oxygen in air, carbon monoxide poisoning
Circulation	Severe bleeding	External bleeding or internal bleeding
	Severe shock	Bleeding, serious illness, poisoning
Medium		
Injuries that have potential for lifelong disability	Fractures that could affect breathing	Broken ribs, shoulder blade

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	Fractures that are open, severe or involve multiple bones	Broken upper leg, pelvis, crushed arm
	Head/spinal injuries	Fall from a six-foot ladder
	Critical burns	Any method causing a critical burn
Low		
Minor injuries or obviously dead	Minor fractures	Broken lower leg, lower arm, hand, finger, etc.
	Minor bleeding	Bleeding is not spurting or free-flowing
	Non-critical burns	Moderate degree burns to the forearms
	Behavioural problems	Grief or panic

Steps for Triage

The sequence of actions required for triage is as follows:

1. Begin ESM
 - Determine how many casualties there are in the scene survey.
2. Start with the nearest casualty, and move outward
 - Perform a primary survey.
 - Give first aid for life-threatening injuries.
3. Categorize
 - Decide which casualties have the highest priority, second priority, and lowest priority.
 - If the person is obviously dead, place in the recovery position and go to the next nearest casualty.
4. Repeat steps 2 and 3 for each casualty
 - Always move to the next nearest casualty.
5. Arrange transportation
 - Arrange for the highest priority casualties to be transported to medical help as soon as possible.
6. Perform a secondary survey
 - Begin with the highest priority. Give appropriate first aid, and move on.
7. Give ongoing care for each casualty until transported
 - In a multiple casualty situation, constantly assess the casualties and the situation and make changes to priorities.

Chapter 03

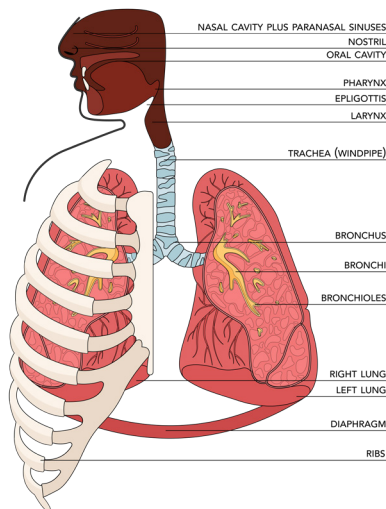
Airway and breathing
emergencies

INTRODUCTION

When a workplace casualty's breathing is affected through injury or illness, their life can be in immediate danger. As a first aider, you must be able to recognize a breathing emergency very quickly and know what first aid to give. The casualty's life may depend on it.

RESPIRATORY SYSTEM STRUCTURES

The respiratory system causes air to be drawn in and out of the lungs. The fresh air we breathe contains about 21% oxygen. In the lungs, blood picks up some of the oxygen and releases carbon dioxide. The air we breathe out has less oxygen (about 16%) and more carbon dioxide.



The respiratory system has three main parts:

- Airway
- Lungs
- Diaphragm

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The airway is the passage that air follows to flow from the nose and mouth to the lungs. With the help of the circulatory system, blood brings carbon dioxide and exchanges it for oxygen. This process is called gas exchange. The diaphragm, a smooth flat muscle below the lungs, is the main muscle used for breathing.

For more information on how the respiratory system works, refer to Respiratory system on page 352.

Hypoxia

Choking and breathing emergencies cause a lack of oxygen in the blood, a condition called hypoxia. This can damage vital tissues and eventually cause death. The causes of hypoxia are grouped under the following three headings:

- A lack of oxygen At high altitudes, confined spaces, displacement by other gases (e.g., silo gas)
- A blocked airway Choking on a foreign object, fluids or tongue, swollen airway due to allergic reaction
- Abnormal heart and lung function Heart and lungs not working due to illness, injury, or poisoning

BREATHING EMERGENCIES

The following section outlines the types of breathing emergencies.

Effective and Ineffective Breathing

The normal breathing rate varies for infants, children, and adults. A breathing rate that is too slow or too fast is a sign of a breathing emergency. Breathing rhythm refers to the interval between breaths. In normal or regular breathing, the intervals are even, and breathing is effortless. Breathing depth refers to the amount of air moved in and out of the lungs with each breath. Signs of effective breathing include:

- Breathing that is quiet
- Equal expansion of both sides of the chest when the person inhales
- The person is alert and relaxed
- Skin colour is normal
- Speaking without taking a breath every few words

When a person is not getting enough oxygen, the body responds by breathing faster and deeper. Signs of ineffective breathing include:

- The person is struggling for breath or gasping for air
- Breathing rate is too fast or too slow
- Breathing rhythm is irregular
- Breathing depth is too shallow or too deep
- Breathing is noisy or raspy
- The person is getting tired from trying to breathe
- The person is sweating
- Decreased level of consciousness
- The lips, ears, and fingernail beds turn blue (for paler skin tones) or grey (for darker skin tones), a condition called cyanosis
- Chest movement may be abnormal

First aid for ineffective breathing

Always send or go for medical help at the first sign of a breathing emergency. The first aid for ineffective breathing has two parts:

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- 1. Give first aid for the injury or condition and position the responsive casualty in the semi-sitting position if possible.
- 2. If breathing stops, the casualty will become unresponsive. Get medical help immediately and begin CPR.

The following table lists some of the causes of airway and breathing emergencies. To give first aid, first determine the cause of the breathing emergency, and then decide on the best first aid actions.

Causes of Airway and Breathing Emergencies		
Injuries	Medical Condi- tions	Poisoning
Broken ribs	Asthma	Inhaled poison e.g., carbon mon- oxide or hydrogen sulphide
Near drowning	Stroke	Swallowed poison e.g., household cleaners or medi- cation poisoning
Knife or gunshot wound	Allergic reac- tion	Injected poison e.g., bee sting
Burns to the face or airway	Pneumonia	

Head injury

Congestive
heart failureCompression of the
chest preventing
chest expansionEmphysema/
bronchitis

Chronic Obstructive Pulmonary Disease (COPD)

Chronic Obstructive Pulmonary Disease (COPD) is a term used to describe respiratory conditions such as chronic bronchitis and emphysema.

Chronic bronchitis is characterized by a productive cough that has persisted for at least 3 months out of the year over the past 2 consecutive years.

Emphysema is a progressive disease that cannot be reversed, and over time the casualty will have increased difficulty breathing.

The signs and symptoms of chronic bronchitis are:

- Gasping for air
- Sitting, leaning forward in an attempt to breathe
- Audible wheezes
- Cyanosis
- Cough

The signs and symptoms of emphysema are:

- Gasping for air
- Sitting, leaning forward in an attempt to breathe
- Audible wheezes
- Prolonged exhalation through pursed lips
- Barrel shaped chest
- Cough

First Aid for COPD

To give first aid for COPD conditions, perform the following steps:

1. Perform ESM.
2. Ensure the casualty is in a comfortable position (usually semi-sitting).
3. Loosen tight clothing at the neck, chest, and waist.
4. Perform a secondary assessment.
5. If the casualty is coughing up sputum (saliva and mucus), encourage them to do so.
6. Ensure 9-1-1 has been called.

Severe Allergic Reaction

An allergic reaction occurs when the immune system reacts to a substance the body encounters. Most allergies are not dangerous.

Anaphylaxis is a severe allergic reaction that usually happens when a substance to which the casualty is very sensitive enters the body, although it can also be caused by exercise or have no known cause. Anaphylaxis can happen within seconds, minutes, or hours of a substance entering the body. As a rule, the sooner the casualty's body reacts, the worse the reaction will be. Anaphylaxis is a serious medical emergency that needs urgent medical attention.

Common early signs and symptoms of an allergy may include:

- Itchy flushed skin
- Itchy or fuzzy tongue and mouth
- Hives
- Sneezing and a runny nose
- Coughing

If it is a severe reaction, there may be swelling of the face and neck, especially the lips and tongue. Breathing may become difficult if the swelling is also internal. There may be nausea and vomiting and the casualty may be anxious and have a sense of impending doom as their blood pressure drops and they go into shock. This is a true medical emergency and requires immediate first aid.

First aid for a severe allergic reaction

To give first aid for a severe allergic reaction, perform the following steps:

1. Perform a scene survey and a primary survey. Send for medical help.
2. Place the casualty in the most comfortable position for breathing. This is usually sitting upright.
3. Assist the casualty with their medication. Usually this is an epinephrine auto-injector.
4. Give ongoing casualty care.

There are several auto-injectors available in Canada. Each works slightly differently, but all use the same principle for operation. If you have been prescribed an auto-injector, it is important that you and your family/friends are trained on how to use it.

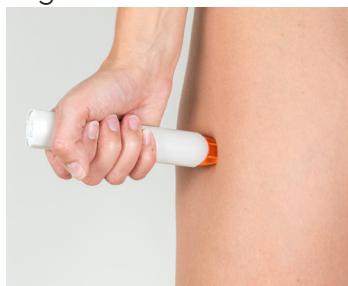
Check the expiry date. If the only auto-injector is an expired product, it may still save a life and should be administered anyway, as long as the indicated liquid remains clear.

Check with your local legislation and protocols, but an auto-injector is one of the few medications a first aider can give to another person who is unable to use it themselves.

Using an auto-injector

To use an auto-injector, perform the following steps:

1. Remove the auto-injector from its storage container.
2. Hold the auto-injector firmly, with the needle delivery end facing down.
3. Remove the safety release.
4. Use the auto-injector on only the fleshy part of the mid-outer thigh. Auto-injectors can be given through light weight clothing.
5. Press the needle end of the auto-injector firmly into the mid-outer thigh until the unit activates.
6. Hold the auto-injector in place for several seconds, then pull it straight out.
7. After the injection, keep the casualty warm and avoid any exertion.
8. Call 9-1-1 as soon as you have given the first dose.



The casualty should respond quickly to the auto-injector, and most will find a single dose will provide relief from symptoms for 10 to 20 minutes. However, some may experience a delay in the relief of symptoms, or a return of symptoms in as little as 5 minutes. First aiders should be ready to assist with a second dose from a new auto-injector.

Individuals who are feeling faint or dizzy because of impending shock should be placed flat on their back unless they are vomiting or experiencing respiratory distress. Keep the casualty at rest until medical help arrives, as sitting, standing, or moving around could cause a drop in the casualty's blood pressure, causing them to go unresponsive.

Follow the manufacturer's directions for proper care of the device used. If someone is accidentally injected with an auto-injector, seek medical attention for that person. Put the used unit back in the storage container and take it to the hospital with the casualty.

Asthma

Asthma is a reactive airway illness in which the person has repeated shortness of breath, characterized by wheezing and coughing. A mild asthma attack is not a health emergency and can be managed by the casualty. A severe asthma attack can be fatal and requires immediate first aid. In response to a trigger, the person's airway can spasm, swell, and secrete thick mucus, which narrows the airway passage.

Some common triggers that can cause asthma are:

- Colds, upper airway infections
- Pet dander
- Insect bites, stings
- Foods
- Pollen, paint, and smoke

The signs and symptoms of a severe asthmatic attack are:

- Shortness of breath with obvious trouble breathing
- Coughing or wheezing
- Fast, shallow breathing
- Casualty sitting upright trying to breathe
- Bluish (for pale skin tones) or grey (for darker skin tones) colour in the face (cyanosis)
- Anxiety, tightness in the chest
- Fast pulse rate, shock
- Restlessness at first, and then fatigue

First aid for a severe asthma attack

To give first aid for a severe asthma attack, perform the following steps:

1. Perform a scene survey and a primary survey; send for medical help.
2. Place the casualty in the most comfortable position for breathing. This is usually sitting upright with arms resting on a table.
3. Help the casualty take prescribed medication.
4. Give ongoing casualty care.
5. If the unconscious casualty stops breathing, begin CPR.

A person with asthma may carry medication in the form of a:

- Metered-dose inhaler (MDI)
- Turbuhaler
- ADVAIR DISKUS

Usually, the person can give themselves this medication without help. If the person needs help, a first aider can assist.

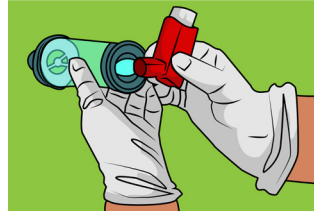
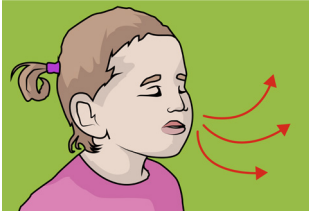
An inhaler delivers a pre-measured amount of medication. Always read and follow the manufacturer's instructions. Check the prescription label to confirm the casualty's name and expiry date.

Assisting with a Metered Dose Inhaler

The Metered Dose Inhaler (or puffer) is the more common method of delivering medication for asthma. To assist with a metered dose inhaler, perform the following steps:

1. Shake the container, then remove the cap.
2. Tell the casualty to breathe out completely.
3. Tell the casualty to breathe in slowly and deeply. As the casualty does so, the MDI will be pressed to release the medication. The MDI can be in the mouth, or just in front of the mouth.

4. Tell the casualty to hold their breath for 10 seconds so the medication can spread out in the lungs. Then tell them to breathe normally, so the medication won't be expelled. If more doses are needed, wait at least 30 to 60 seconds before repeating these steps.



Spacers (Aerochamber®)

When the medication comes out of the inhaler, it may be deposited on the back of the throat and not reach the lungs, or the casualty may be gasping for air and unable to hold their breath. To deal with this, use a spacer if available. It traps the particles of the spray, allowing the casualty to inhale more effectively over several breaths.

Spacers make it simple to inhale the medication and should always be used when available. Small children and other casualties who have difficulties coordinating proper inhalation with the release of the medication will often have spacers with them. Spacers allow the casualty to inhale two or three times before the medication is completely dispelled. A mask can be attached to the device to make taking the medication easier.

If the casualty complains of throat irritation after using the inhaler, have them gargle or rinse the mouth with water.

CHOKING

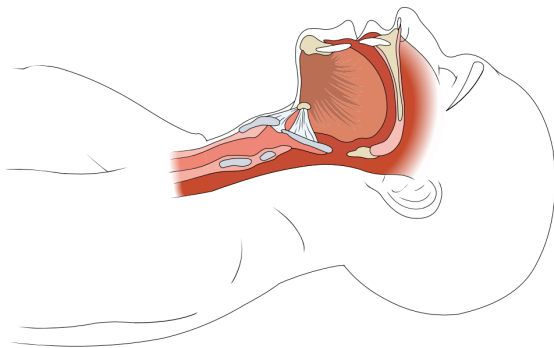
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A person chokes when the airway is partly or completely blocked and airflow to the lungs is reduced or cut off. The choking casualty either has trouble breathing or cannot breathe at all.

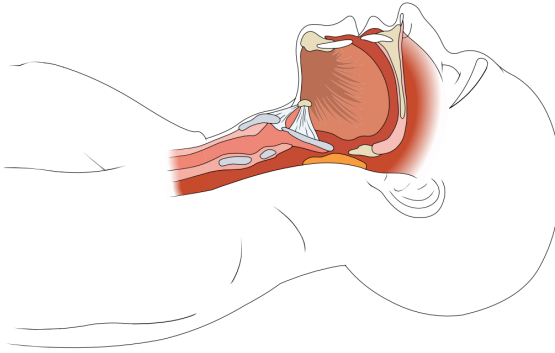
In infants and young children, choking can be caused by foreign objects, such as food, toys, buttons, coins, etc. Adults usually choke on food while eating too fast or talking while eating.

When a casualty is unresponsive and lying on their back, their tongue may relax and block their airway. As well, blood, vomit, or other fluids can pool in the back of the mouth. Severe allergic reaction, injury, or other medical conditions can cause the airway to swell.

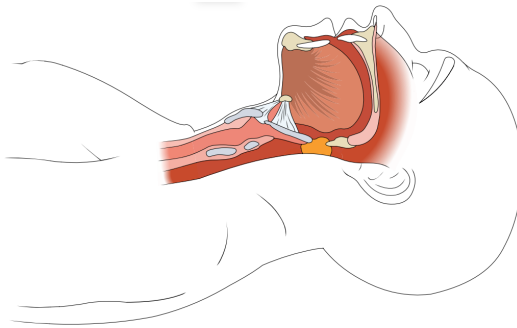
The severity of choking depends on how blocked the airway is. A person breathing normally without any obstruction will have an open and **clear airway**.



Mild choking occurs when the airway is only **partially blocked** and the casualty can still cough forcefully, breathe, and speak. The air exchange is affected, but still considered good.



Severe choking occurs when the airway is **completely blocked** and there is no air exchange.



When the air supply to the lungs is cut off, the person's face will at first have a more noticeable red undertone (flushed) before becoming grey. Their lips and ear lobes will begin to turn blue due to a lack of oxygen. If they do not receive help, they will become unconscious, and their heart will stop beating.

Signs and Symptoms of Choking

The signs and symptoms of choking are as follows.

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Signs of Choking	
Mild Obstruction	Severe Obstruction
Able to speak	Unable to speak
Signs of distress (eyes show fear)	Signs of distress (eyes show fear)
Forceful coughing	Weak or no coughing
Wheezing and gagging between coughs	High-pitched noise or no noise when trying to breathe
Red or flushed face	Grey face and blue lips and ears

Managing a Choking Emergency for Adults and Children

Choking in adults and children is managed the same way. When providing first aid to a child who is choking, keep the following in mind:

- Lower yourself down to their level. Do not put them on a chair or stool.
- Do not use the same force for thrusts as you might for an adult.
- You may only need one hand if they are unresponsive.

First aid for a responsive casualty

If the obstruction is mild and the casualty can cough forcefully, speak, or breathe, perform the following steps:

1. Perform a scene survey.
2. Tell them to try to cough up the object. If a mild obstruction lasts for a few minutes, get medical help.



If the obstruction is severe and the casualty cannot cough forcefully, speak, or breathe, perform the following steps:

3. Perform a scene survey.



4. Give 5 back blows:
 - Support the casualty by bringing your hand across the casualty's shoulders on the front of their body.
 - Give up to five blows between the shoulder blades using the heel of your hand.

5. Give 5 abdominal thrusts:

- a. If the obstruction is not cleared, step behind the casualty, preparing to support them if they become unconscious.
- b. Make a fist and place it on the casualty's abdomen at the belly button, in line with the hip bones.
- c. Grasp the fist with the other hand and give 5 forceful inward and upward abdominal thrusts.

Continue with back blows and abdominal thrusts until the object is cleared or the casualty becomes unresponsive.

If the airway is cleared, an adult casualty should seek medical attention to check for internal injury from the abdominal thrusts.

A child casualty needs to be seen by a doctor.

How abdominal thrusts work

When you choke on something, your body tries to unblock your airway by coughing. Abdominal thrusts try to do the same thing with an artificial cough. This illustration shows how an abdominal thrust creates a cough.

An abdominal thrust pushes the diaphragm up towards the lungs very quickly. This forces the air from the lungs up the airway and hopefully blows the obstruction out. For the best effect, the fist must be in the correct place. Keep your forearms off the abdomen and make each thrust a strong and sudden movement.

First aid for a casualty who is pregnant or larger than the rescuer

If a choking casualty is larger or is pregnant, give back blows as normal, followed by chest thrusts.



1. Support the casualty by bringing your hand across their shoulders on the front of their body. Give up to five back blows between the shoulder blades, using the heel of your hand.
2. If the obstruction is not cleared, stand behind the casualty.



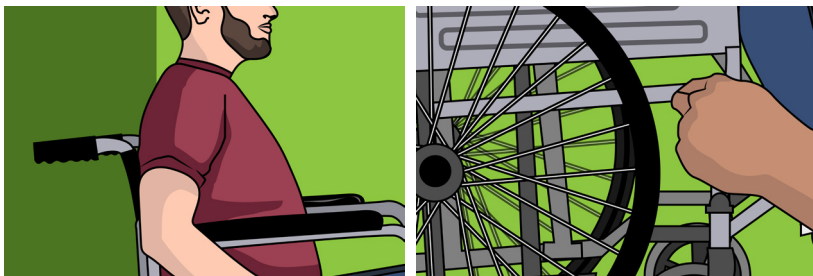
3. Keep your arms horizontal and snug up under their armpits.
4. Place your fist against the lower half of the breastbone, thumb side in.
5. Hold your fist with your other hand. Pull inward forcefully.
6. Continue giving back blows and chest thrusts until either the object is removed, or the casualty becomes unconscious.

First aid for a choking casualty in a wheelchair

Some wheelchairs will allow the first aider to provide abdominal or chest thrusts as they would for a casualty who is standing.

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If you can reach around from behind the wheelchair, give back blows as normal, and abdominal or chest thrusts.



If you cannot reach around the wheelchair, perform the following steps:

1. Position the wheelchair against a wall (if possible) and put the wheelchair brake on.
2. If possible, carefully lean the casualty forward and support their shoulders. Perform five back blows between the shoulder blades, using the heel of your hand.
3. Put the heel of one hand, with the other on top, on the centre of the breastbone and give firm chest thrusts.



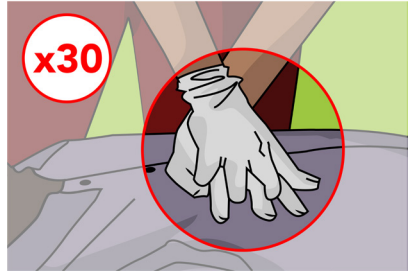
4. Continue giving back blows and chest thrusts until either the object is removed or the casualty becomes unconscious.

If a doctor, physiotherapist, or other health professional has shown you a different way of giving abdominal thrusts to a person in your care, use the recommended method.

If the casualty becomes unresponsive, you will need to take them out of the wheelchair.

First aid for a casualty who goes unresponsive

If the casualty becomes unresponsive while providing first aid for choking, use a modified CPR approach.



1. Ease the casualty to the ground if you can do so without hurting yourself. At minimum, protect their head as they collapse.
2. Call for medical help and get an AED if available.
3. Give 30 chest compressions in the centre of their chest.
4. Open their airway using the head-tilt/chin-lift and check their mouth.
5. Remove any foreign object you can see.
6. Try to give 2 ventilations even if you did not find anything in their mouth.



7. If the ventilations do not go in, readjust their head. This may be an indication that you may not have opened the airway properly the first time.
8. Attempt to give 2 ventilations.
9. If the ventilations still do not go in, resume compressions, mouth checks, and attempts to ventilate.

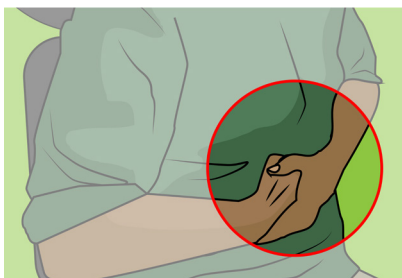
Once a ventilation is successful, deliver a second ventilation. Be ready to continue CPR if the casualty does not start breathing on their own.

If the casualty is a child, begin with one hand when giving compressions. If you are not able to compress the chest enough, use two hands.

First aid if you are alone and choking

If you begin to choke on an object, you may have to clear your own airway. If there are people around, get their attention. Do not isolate yourself from others.

Try to cough up the object. If you cannot cough, speak, or breathe, give yourself abdominal thrusts:



1. Place the fist of one hand just above your bellybutton.
2. Use your other hand to thrust inward and upward.
3. Repeat until the object is cleared or you can cough or breathe.
4. Use a solid object like the back of a chair, a table, or the edge of a counter.
5. Position yourself so the object is just above your hips.

6. Press forcefully to produce an abdominal thrust.



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Managing a Choking Emergency for Infants

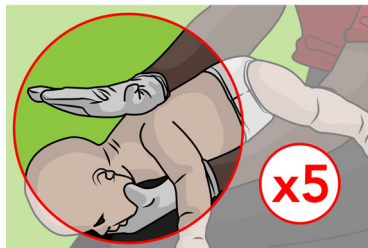
Infants are at risk for choking since they are frequently putting things into their mouths. A choking infant will show some or all of the following signs:

- High-pitched wheezing or no sound at all
- Gagging
- Appearance of crying with no sound
- Wide eyes
- Changing colour

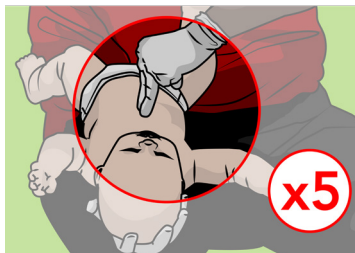
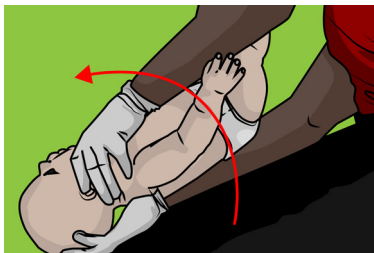
First aid for a choking infant who is responsive

To give first aid for a choking infant who is responsive, perform the following steps:

1. Perform a scene survey and primary survey.
2. Support the infant's head using a C grip around their chin.
3. Place the infant face down on your forearm with their legs on either side of your arm.



4. With the infant's head lower than their body, use the heel of your hand to give five forceful back blows between their shoulder blades.
5. Use your other arm and hold the infant between your fore arms, supporting the back of the infant's head.
6. Turn the infant face up.



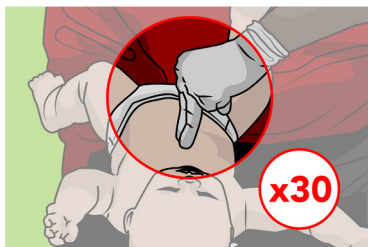
7. Give five chest thrusts using 2 fingers just below their nipple line.

Keep giving back blows and chest thrusts until their airway is cleared or the infant becomes unresponsive. An infant who chokes needs to be seen by a doctor.

First aid for a choking infant who becomes unresponsive

If the infant becomes unresponsive, place them on a firm, flat surface and perform the following steps:

1. Send someone to call 9-1-1 or call yourself and place the phone on speaker mode.



2. Using two fingers below the infant's nipple line, deliver 30 compressions. Open their airway using the head-tilt/chin-lift and check their mouth.



3. Remove any foreign object you can see.
4. Try to give 2 ventilations even if you did not find anything in their mouth.
5. If the ventilations do not go in, readjust their head. This may be an indication that you may not have opened the airway properly the first time.
6. Attempt to give 2 ventilations.
7. If the ventilations still do not go in, resume compressions, mouth checks, and attempts to ventilate.

An infant's lungs are much smaller than those of an adult. When giving ventilations, do not blow forcefully, and only give enough for the chest to rise (often described as a cheek-full of air).

Because an infant's head is larger than their body proportionally, you may need to place a folded towel or blanket under their shoulders to allow for a proper head-tilt.

Chapter 04

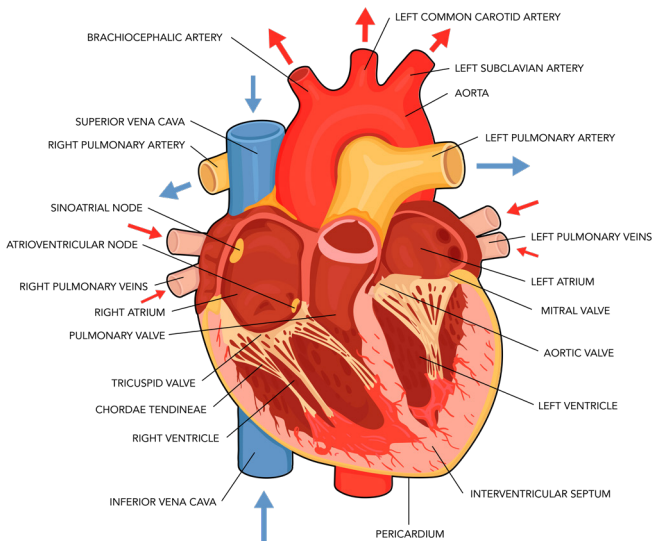
Cardiovascular emergencies

CIRCULATORY SYSTEM STRUCTURES

The circulatory system is a complex closed circuit that circulates blood throughout the body. It consists of the heart and blood vessels. Blood circulation is essential for distributing oxygen and nutrients to cells, and for collecting waste products from cells for excretion from the body.

04

Heart



The heart is a muscle located in the chest cavity behind the ribs and sternum. This muscle is a hollow organ that allows the blood in the body to circulate by contracting and pumping blood through the blood vessels.

Blood Vessels

The blood travels through blood vessels. There are three main types of blood vessels: arteries, capillaries, and veins. Generally, arteries carry oxygenated blood away from the heart and veins return deoxygenated blood back to the heart. Capillaries transport blood between cells and the arteries and veins.

04

Blood Circulation

Blood leaves the right side of the heart (right ventricle) to travel to the lungs, where carbon dioxide is released and oxygen is picked up. The blood then enters the left side of the heart (left atrium) before being pumped out to the rest of the body (left ventricle). Once used by the body, the blood returns to the right side of the heart (right atrium).

CARDIOVASCULAR DISEASE

Cardiovascular disease is one of the leading causes of death of adults in Canada. Some of these deaths can be prevented if appropriate first aid is given.

This chapter describes the workplace first aid for cardiovascular emergencies, including:

- First aid for angina/heart attack
- First aid for stroke/TIA (Transient Ischemic Attack)

High Blood Pressure

Blood pressure is the pressure of the blood against the inside walls of the blood vessels. Blood pressure goes up and down naturally. When a person is excited or emotionally stressed, blood pressure goes up, but it usually comes down once the excitement has passed. In some people, their blood pressure stays high all the time. This condition of constant high blood pressure is called hypertension.

Over time, hypertension damages the tissues of the cardiovascular system. The walls of the blood vessels become thick and lose their elasticity and the heart becomes enlarged. The changes caused by high blood pressure increase the risk of stroke, heart attack, kidney, and eye problems. Unfortunately, hypertension does not always give warning signals. Someone may feel perfectly well but still have high blood pressure. Therefore, it is often called the silent killer.

If you have concerns about your blood pressure, you should speak with your primary healthcare provider. Blood pressure machines in pharmacies can help you monitor your blood pressure but should never be used as a means of self-diagnosis.

Narrowing of the Arteries

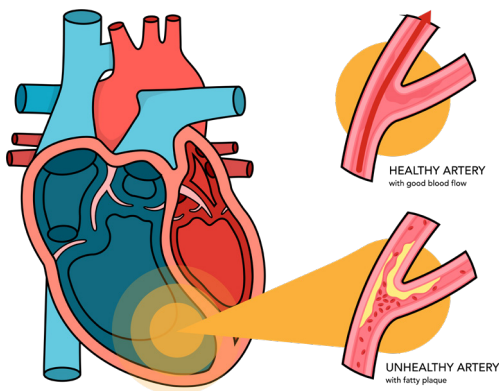
Arteries are the blood vessels that carry blood away from the heart. They become diseased when fatty deposits build up inside them, making the passage for blood narrower.

This process of depositing fat and narrowing of the arteries is called atherosclerosis. In the coronary arteries, which carry oxygenated blood to the heart, it is called coronary artery disease.

As an artery gets narrower, less and less blood can get through. When the artery gets too narrow, the tissues on the other side of the narrowing don't get enough oxygenated blood to function normally. Although the signs and symptoms of hardening of the arteries usually don't appear until middle age or later, atherosclerosis often begins in childhood.

ANGINA AND HEART ATTACK

04



Angina occurs when the heart muscle is not properly supplied with oxygenated blood due to narrowed, damaged or blocked arteries in the heart. When the heart works harder and needs more blood (e.g., when you run for a bus or shovel snow), it cannot get enough blood. This causes pain or discomfort in the chest, which may spread to the neck, jaw, shoulders, and arms. Angina pain typically doesn't last long and goes away if the person rests and takes their prescribed medication.

A heart attack (or myocardial infarction) occurs when heart muscle tissue dies because its supply of blood has been cut off. A heart attack can feel just like angina, except the pain doesn't go away with rest and medication.

If the heart attack damages the heart's electrical system, or if a lot of the heart muscle is affected, the heart may stop beating properly. This is cardiac arrest.

Risk Factors

Several factors increase the risks for cardiovascular disease, heart attack, and stroke. These can be broken down into modifiable and non-modifiable risks.

Risk Factors	
Modifiable	Non-Modifiable
Smoking	
Poor diet	
Lack of exercise	
Increased stress	
Age	
Genetic history	
Sex assigned at birth	

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The modifiable risk factors can lead to dyslipidemia (increased deposits of fats), obesity, diabetes, and high blood pressure. These modifiable risks can be reduced through lifestyle changes.

Signs and Symptoms of Angina or Heart Attack

The signs and symptoms of an angina attack and a heart attack are very similar. While the symptoms of an angina attack may go away, it can be an indication that a heart attack is close behind. It is best to suspect a heart attack in every situation.

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Not everyone will display the same signs and symptoms. Some will have mild signs and symptoms or show only one or two.

Women often have signs and symptoms that do not fit with the classic ones listed.

A heart attack will result in shock, and may display some or all the following:

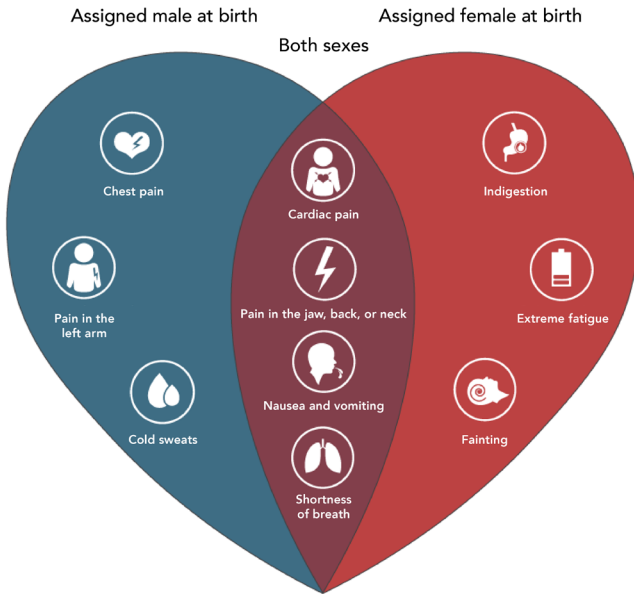
- Sweaty, cool skin that lacks colour
- Shortness of breath
- Showing obvious pain or discomfort
- Heaviness, tightness, or pressure in chest
- Indigestion, heartburn, nausea, or vomiting
- Aching jaw
- Sore shoulder or arms

Some other signs and symptoms include:

- Fatigue
- Anxiety, which produces denial
- Central back pain

It's difficult to accept that someone is having a heart attack and could die very soon, especially if the person is a family member or a close friend. The casualty also often denies that anything serious is happening, so it's easy to accept their reassurances. Denial is an important detail. If someone showing signs of shock, having trouble breathing, and experiencing pain insists there is nothing wrong, then you should be very suspicious and act.

First signs of a heart attack



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On average, casualties take several hours to get to a hospital from the time they first start feeling unwell. It is this delay that prevents many lives from being saved. Getting the casualty to the hospital quickly gives them the best chance for survival.

Chain of Survival

When people think of first aid for a heart attack or cardiac arrest, CPR often comes to mind. But CPR is only part of the picture.

The following six steps are essential when helping someone with heart problems:

1. Immediate recognition of a cardiovascular emergency and activation of the community emergency medical services (EMS) system. This means calling for help quickly.

2. Early CPR with an emphasis on chest compressions.
3. Rapid defibrillation.
4. Effective advanced life support.
5. Integrated post-cardiac arrest care.
6. Recovery (treatment, observation, rehabilitation, and psychological support).

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Each of the steps is as important as the others. Time is a vital ingredient. To give a casualty in cardiac arrest a reasonable chance of survival, CPR must be started immediately, followed by defibrillation as quickly as possible. For both procedures, the sooner they happen, the better.

You, the first trained person on the scene, are responsible for initiating the sequence. You must recognize the cardiovascular emergency, call for medical help, start CPR if needed, and apply a defibrillator if one is available. You are the crucial first three links in the Chain of Survival.¹¹
<https://cpr.heart.org/en/resources/cpr-facts-and-stats/out-of-hospital-chain-of-survival>

First Aid for Angina or Heart Attack

To give first aid for an angina or heart attack, perform the following steps:

1. Perform a scene survey.
2. Perform a primary survey. Ask the casualty questions:
 - *Can you show me where it hurts?*
 - *Have you had this pain before?*
 - *Do you have medication for this pain?*
3. Call for medical help and get a defibrillator.
4. Place the casualty at rest and reassure them. The semi-sitting position is usually best, but whatever position is most comfortable for the casualty is okay.
5. Assist a responsive casualty to take prescribed medication and/or ASA.

- Follow the Assisting with Medications in Chapter 1.
 - Assist them to take one dose of nitroglycerin if they have it.
 - Assist them to take ASA.
 - Repeat doses of nitroglycerin at five-minute intervals if the pain remains and the casualty is still responsive, up to a maximum of 3 doses.
6. If the casualty becomes unresponsive and stops breathing, start CPR.

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Assisting with Nitroglycerin

Nitroglycerin tablets or sprays are common medications for relief of chronic angina pain. A casualty in serious distress may need your help to take their medication.

Ask the casualty if they have taken any other medications that day. Drugs to treat erectile dysfunction such as Viagra or CIALIS may cause a significant decrease in the person's blood pressure if nitroglycerin is taken as well.



Have the casualty spray the medication under their tongue or place the tablets under their tongue. Ensure the casualty does not swallow the tablets.

Nitroglycerin may be repeated, if needed, every 5 to 10 minutes to relieve pain, or until a maximum of three doses have been taken. Remember that if you have to assist someone to take their

medication, you must call for medical help!

Assisting with ASA

If the casualty has no prescribed medication, or the first dose is ineffective, ask the casualty if they have any allergies to ASA, or if a doctor has ever told them not to take it. If the casualty believes they can take it, suggest they chew one regular ASA tablet (or two low-dose tablets). ASA can reduce the effects of a heart attack because of its anti-clotting properties.

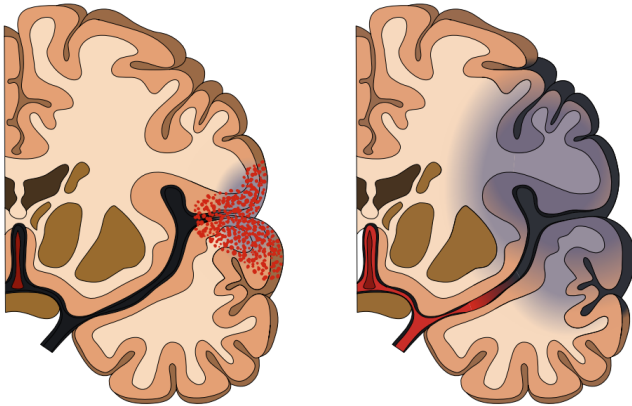
STROKE

A stroke happens when blood flow to a part of the brain is interrupted either by a blocked artery or by a ruptured blood vessel in the brain. A stroke may cause brain damage, which impairs certain body functions, depending on the part of the brain affected.

The type of stroke cannot be determined without advanced scanning at a hospital. There are two types of strokes:

- Hemorrhagic (blood loss)
- Ischemic (blood clot/blocked vessel)

A Transient Ischemic Attack (TIA) is a temporary disruption of the blood flow to the brain due to a narrowing of an artery in this area. It's typically of short duration and leaves no permanent damage, but looks exactly like a stroke. Always suspect a stroke, even if the symptoms resolve themselves, as a TIA can be an indication of a pending stroke.



Signs and Symptoms of a Stroke/TIA

Remember the mnemonic F.A.S.T to check for the signs and symptoms of a stroke and to get immediate help:

- **F Facial droop:** Ask the casualty to smile. One side of the face may not move as well as the other side.
- **A Arm drift:** Ask the casualty to hold both arms out with the palms up and close their eyes. One arm may not move, or may drift down compared to the other arm.
- **S Speech:** Ask the casualty to repeat a phrase you say. The casualty may slur words, use the incorrect words or is unable to speak.
- **T Time:** When was the onset of symptoms? Ask the casualty, or their family, friends, or bystanders when the symptoms were first noticed. Get immediate medical help; the earlier a stroke is treated the better the outcome.

Other signs and symptoms of a stroke include:

- Blurred vision
- Sudden confusion
- Dizziness
- Headache
- Loss of balance

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It is important that first aid providers do not dismiss the signs and symptoms of a stroke as intoxication.

First Aid for a Stroke

To give first aid for a stroke, perform the following steps:

1. Perform a scene survey.
2. Perform a primary survey.
3. Use F.A.S.T to assess for a stroke.
4. Call for medical help.
5. Place the casualty at rest in the semi-sitting position.
6. Do not give the casualty anything by mouth. **Do not give the casualty ASA.**
7. Give ongoing care.

If the casualty becomes unconscious, place them in the recovery position. If there is paralysis, position the casualty with the paralyzed side up. This will reduce the chance of tissue or nerve damage to the affected side.

Chapter 05

CPR and AED

CARDIAC ARREST

Sudden cardiac arrest occurs when the heart stops beating properly. With no blood flow going to the brain, the casualty becomes unresponsive and stops breathing. Cardiac arrest means the casualty is clinically dead, but if cardiopulmonary resuscitation (CPR) is started and a defibrillator is applied quickly, there is still an opportunity to restore a normal heartbeat.

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Agonal Breathing

Agonal breathing is an abnormal pattern of breathing driven by a brain-stem reflex, characterized by irregular gasping respirations at times accompanied by strange vocalizations. They can occur with cardiac arrest and lead bystanders to believe the casualty is breathing. A casualty with agonal breathing should be treated as though they are not breathing.

Common Causes of Cardiac Arrest

Common causes of cardiac arrest include:

- Heart attack
- Severe injuries
- Electrical shock
- Drug poisoning
- Drowning
- Suffocation

ADULT CPR

Cardiopulmonary Resuscitation (CPR) is artificial circulation and artificial respiration. The artificial circulation causes blood to flow through the body while the artificial respiration provides oxygen to the lungs.

The purpose of CPR is to circulate enough oxygenated blood to the brain and other organs to delay damage until either the heart starts beating again, or medical help takes over from you. CPR is most effective when interruptions to chest compressions are minimized.

Performing One-Rescuer CPR

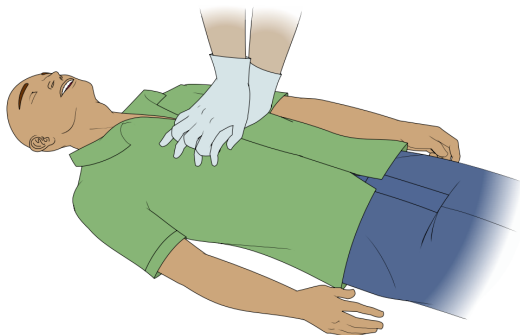
To perform one-rescuer CPR, perform the following steps:

1. Perform a scene survey.
 - a. Assess responsiveness.
 - b. Send someone to call 9-1-1 and get an AED if available.
2. Perform a primary survey.
 - a. Open the airway.
 - b. Check for breathing for at least 5 and no more than 10 seconds.
3. If the casualty is not breathing, or not breathing effectively (agonal breaths), begin compressions immediately.



4. Give 30 compressions. Push hard. Push fast.
 - a. Position your hands in the centre of the upper chest and your shoulders directly over your hands. Keep your elbows locked.

5. Press the heels of the hands straight down on the breast-bone. The depth of each compression should be at 5 to 6 cm (2 to 2.4 inches).



- a. Release pressure and completely remove your weight at the top of each compression to allow the chest to return to the resting position.
 - b. Give compressions at a rate of 100 to 120 per minute. Count compressions out loud to keep track of how many you have given, and to help keep a steady rhythm.
6. Open their airway using a head-tilt/chin-lift.
 7. Position a barrier device and give 2 ventilations.
 8. For an adult casualty, each breath should take about 1 second, with just enough air to make the chest rise.



This is one cycle of 30:2 (30 compressions to 2 ventilations).

9. Continue CPR until:
 - a. An AED is applied
 - b. The casualty begins to respond
 - c. Another first aider or medical help takes over
 - d. You are too exhausted to continue.

An AED should be applied as soon as it arrives at the scene.

Taking over CPR from another rescuer

To take over CPR from another rescuer, perform the following steps:

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1. Ensure medical help has been called.
2. Offer to help. Tell the rescuer that you are trained in CPR.
3. Give 30 compressions followed by 2 breaths. Use your own barrier device if available.



Chest-Compression-Only CPR

CPR guidelines stress early recognition of the emergency and stress the importance of calling 9-1-1 or the local emergency number if you find someone collapsed and unresponsive. If you have not been trained in CPR or are hesitant to perform ventilations for any reason, don't give up. Your actions can still save a life.

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Compression-only CPR is CPR without mouth-to-mouth breaths. Provide high quality chest compressions by pushing hard and fast on the centre of the chest, at a rate of 100 to 120 compressions per minute.



Although this does not give the casualty any oxygen, this option can be used by people not trained in conventional CPR, or those who are unsure of their ability.

Dispatcher-Assisted CPR

In many locales, the 9-1-1 dispatcher is trained to coach you through an emergency until medical help arrives. Put your phone on speaker and place it by the casualty's head and talk to the dispatcher throughout the rescue.

Performing Two-Rescuer CPR

If two trained rescuers are available, they can cooperate to perform CPR on a casualty. There are three advantages to two rescuers performing CPR as a team:

- CPR is a strenuous physical activity and as a first aider gets tired, the quality of the chest compressions will deteriorate. By sharing the task of compressing the chest, two rescuer CPR allows a team to perform effective chest compressions for a longer period.
- Two-rescuer CPR minimizes the time the compressions are interrupted for ventilations to be given.
- Two-rescuer CPR allows the rescuers to give feedback and support each other during a stressful event.

To perform two-rescuer CPR, the first aider who performs the primary survey stays at the casualty's head, keeping the airway open and ventilating after 30 compressions. The second rescuer will compress the chest.

To maintain effective compressions, it is recommended that rescuers switch roles after every 5 cycles of compressions and ventilations (approximately 2 minutes).

CHILD CPR

One-rescuer CPR for a child is the same as for an adult, except for adjusting to accommodate the smaller size. Use one hand for CPR unless you are not able to compress the chest sufficiently. The amount of air required to make the chest rise will be less than for an adult.

Two-rescuer CPR for a child changes the compression to ventilation ratio. When a child goes into cardiac arrest, typically it is due to a breathing issue, whereas for an adult it is typically a heart issue. In addition, a child requires more

oxygen on average than an adult does, and in an ideal situation, CPR for a child would have breaths delivered every 15 compressions. However, the time it takes to stop compressions, move to the head, deliver the breaths, and return to the chest is too long. When there are two rescuers, that time can be cut down significantly, by stopping at 15 compressions to give 2 breaths. This helps to deliver more oxygenated blood to the vital organs and provides the child with a better chance of survival.

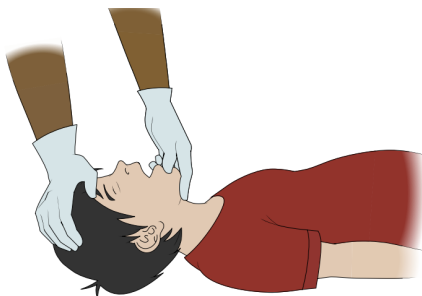
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Performing One-Rescuer Child CPR

To carry out one-rescuer child CPR, perform the following steps:

1. Perform a scene survey.
 - a. Assess responsiveness.
 - b. Send someone to call 9-1-1 and get an AED if available.
2. Perform a primary survey.
 - a. Open the airway.
 - b. Check for breathing for at least 5 and no more than 10 seconds.



3. If the casualty is not breathing, or not breathing effectively (agonal breaths), begin compressions immediately.
4. Give 30 compressions. Push hard. Push fast.
5. Position one hand in the centre of the upper chest with your shoulder directly over your hand, and keep the elbow locked.



- a. Place your other hand behind your back, or on the ground above the child's head.
- b. Press the heel of the hand straight down on the breastbone. The depth of each compression should be $\frac{1}{3}$ the depth of the chest.
- c. Release pressure and completely remove your weight at the top of each compression to allow the chest to return to the resting position.
- d. Give compressions at a rate of 100 to 120 per minute. Count compressions out loud to keep track of how many you have given, and to help keep a steady rhythm.
6. Open their airway using a head-tilt/chin-lift.
7. Position a barrier device and give 2 ventilations.
 - a. For a child casualty, each breath should take less than 1 second, with just enough air to make the chest rise.

This is one cycle of 30:2 (30 compressions to 2 ventilations).



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8. Continue CPR until:
 - a. An AED is applied.
 - b. The casualty begins to respond.
 - c. Another first aider or medical help takes over.
 - d. You are too exhausted to continue.

An AED should be applied as soon as it arrives at the scene.

Performing Two-Rescuer Child CPR

To perform two-rescuer CPR on a child, the first aider who performs the primary survey stays at the casualty's head, keeping the airway open and ventilating after 15 compressions. The second rescuer will compress the chest.

One cycle of two-rescuer CPR for a child is 15 compressions and 2 breaths.

To maintain effective compressions, it is recommended that rescuers switch roles after every 10 cycles of compressions and ventilations (approximately 2 minutes).

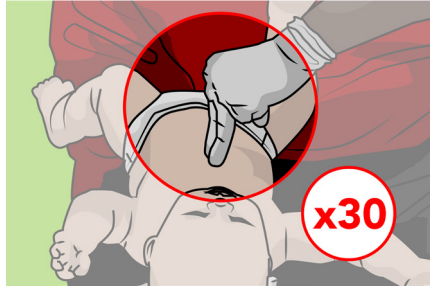
INFANT CPR

The small size of the infant casualty requires that CPR be adapted to their smaller form. Infants are more likely to experience breathing emergencies than cardiac situations; however, prolonged respiratory arrest will lead to cardiac arrest.

Performing One-Rescuer Infant CPR

To perform one-rescuer infant CPR, perform the following steps:

1. Perform a scene survey.
 - a. Assess responsiveness.
 - b. Send someone to call 9-1-1 and get an AED if available.



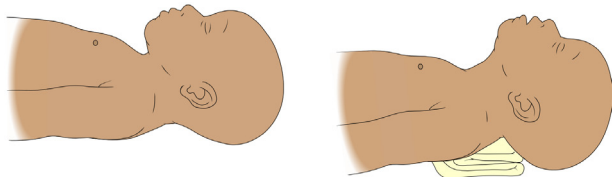
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2. Perform a primary survey:
 - a. Open the airway.
 - b. Check for breathing for at least 5 and no more than 10 seconds.
 - c. If the casualty is not breathing, or not breathing effectively (agonal breaths), begin compressions immediately.
3. Give 30 compressions. Push hard. Push fast.
 - a. Position two fingers in the centre of the chest, just below the nipple line.
 - b. Place your other hand behind your back, or on the ground above the infant's head.
 - c. Press straight down on the breastbone. The depth of each compression should be $\frac{1}{3}$ the depth of the chest.
 - d. Release pressure and completely remove your weight at the top of each compression to allow the chest to return to the resting position.

- e. Give compressions at a rate of 100 to 120 per minute. Count compressions out loud to keep track of how many you have given, and to help keep a steady rhythm.
 4. Open their airway using a head-tilt/chin-lift.
 5. Position a barrier device and give 2 ventilations.
 - a. For an infant casualty, seal the mouth and nose.
 - b. The amount of air delivered is very small compared to an adult or child. This amount of air is often described as a cheek-full of air.
- This is one cycle of 30:2 (30 compressions to 2 ventilations).*
6. Continue CPR until:
 - a. An AED is applied.
 - b. The casualty begins to respond.
 - c. Another first aider or medical help takes over.
 - d. You are too exhausted to continue.

An AED should be applied as soon as it arrives at the scene.

The back of an infant's head is quite large compared to the rest of the body, and this can cause the infant's head to flex forward while lying on their back and cut off their airway. When giving CPR, it may be helpful to put a thin pad under the shoulders to help keep the airway open, but do not spend too much time looking for a pad.

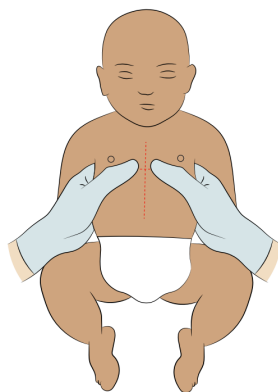


Performing Two-Rescuer Infant CPR

To perform two-rescuer CPR on an infant, the first aider who performs the primary survey stays at the casualty's head, keeping the airway open and ventilating after 15 compressions. The second rescuer will compress the chest.

One cycle of two-rescuer CPR for an infant is 15 compressions and 2 breaths.

To maintain effective compressions, it is recommended that rescuers switch roles after every 10 cycles of compressions and ventilations (approximately 2 minutes).



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When performing two-rescuer CPR on an infant, you can use the thumb-encircling method instead of two fingers if it is easier for positioning.

AED

Defibrillation is the application of an electric shock to a heart that has stopped pumping effectively. An automated external defibrillator (AED) has been proven to be one of the most important tools in saving the lives of sudden cardiac arrest casualties. It is the third link in the Chain of Survival and is the responsibility of the first aider.



An AED is an electronic device that is programmed to recognize and shock two types of heart rhythms, Ventricular Fibrillation (VF) and pulseless Ventricular Tachycardia (VT). If the machine recognizes either VT or VF in a casualty, it will charge and will indicate that a shock is advised.

The purpose of this shock is to correct the abnormal electrical disturbance and re-establish the heart rhythm.

It is important to remember that AEDs will only shock when VT or VF is present. You cannot shock a heart that is in normal rhythm, nor will the machine shock when it is not appropriate, such as when the heart is stopping (asystole) or there is pulseless electrical activity (PEA).

Time is a critical factor in determining survival from cardiac arrest; the heart will only stay in fibrillation for a short time before all electrical activity ceases. Defibrillation must be performed early to be most effective. CPR can keep oxygenated blood flowing to the brain and helps extend the length of time that the heart will remain in VT or VF, the only arrhythmias that AEDs will shock. CPR then can provide more time until the AED is attached and ready to deliver a shock.

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Using an AED for an Adult

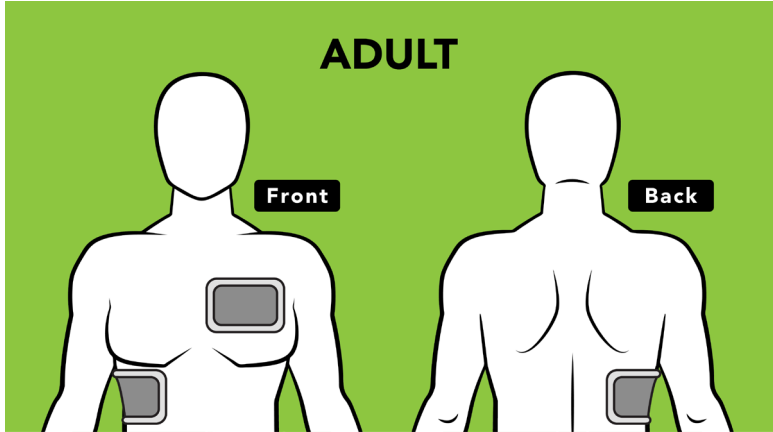


To use an AED for an adult, perform the following steps:

1. Power on the AED.
2. Follow the voice prompts.

The audio instructions will direct you to:

- Bare the chest and attach electrode pads. The pads need to stick directly to the skin, so excessive sweat, water, and chest hair need to be removed before application.



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- Stand back (or clear).
- Press the shock button and/or continue CPR as prompted by the machine.

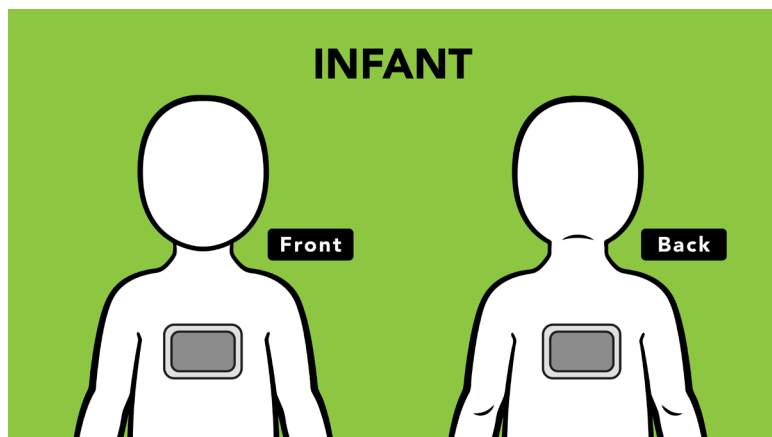
Continue with CPR and listen for the AED to give additional instructions.

Using an AED for a Child or Infant

An AED can be used on a child or an infant. An AED with child pads should be used according to the directions on the pads.

Most AEDs are stocked with pads designed for adult casualties. If an AED does not have specific pads for a child, adult pads can be used by placing them on the front and back of the child or infant.

Defibrillation Special Considerations and Circumstances



The following are special considerations and circumstances regarding defibrillation:

Pregnant women AEDs can be safely used in all stages of pregnancy.

Pacemakers or implanted defibrillators Defibrillator pads should not be placed directly over a pacemaker site but should be approximately 2.5 cm (one inch) away.

Look for scars or lumps on the chest as an indicator of implanted devices.

Patch medications Some casualties wear a patch that contains medication such as nitroglycerin for angina. If the patch is in the way of the pad placement, gently remove it from the chest with gloved hands and wipe the area clean.

Wet environment AEDs can be used in wet areas. Dry the chest to ensure good pad contact. Move the casualty to a dry area if possible. If you or the casualty is submerged in water, avoid using the AED. Generally, if the water does not splash when you tap your foot, it is safe.

Metal surfaces AEDs can be used safely with the casualty on a metal surface. A blanket can be placed between the casualty and the metal surface if you are concerned.

Jewelry and piercings Avoid placing pads over top of piercings, jewelry, or anything that would cause a gap. AED pads should adhere flat to the skin.

Environment Ensure the environment you are using an AED in does not contain explosive gases.

Post-Resuscitation Care and Handover to EMS

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If defibrillation is successful, the casualty may start breathing on their own but remain unresponsive. In this case, place the casualty into the recovery position and monitor the ABCs. Leave the AED attached. The AED will continually monitor the heart rhythm, or you may need to use the device again.

Certain information is important for emergency services personnel, such as the time of collapse, time when CPR was started, time when first shock was delivered, and number of shocks. Provide as much detail as possible and follow the directions of medical personnel once they arrive on the scene.

AED Workplace Policies and Procedures

Regulations concerning the requirement of a workplace to have an AED, and the necessary policies about AEDs, will be contained within federal, provincial, or territorial legislation. Where not specifically outlined by regulations, a workplace should have an established AED policy which outlines:

- Certification and recertification requirements
- Maintenance and inspection processes
- Post-use process (downloading information, resupplying pads and rescue pouch, etc.)
- Replacement of batteries and pads
- Replacement of unit at its end-of-life

Ensure that you are aware of where the AED is kept in your workplace so it can be quickly retrieved in the case of a cardiovascular emergency. If you are the designated attendant in a workplace, you are responsible for ensuring the AED is ready to be used in the event of an emergency. You will send or go for an AED when treating a casualty who is unconscious, having difficulty breathing, or complaining of chest pain.

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The indications to use an AED in the workplace are the same as other cardiovascular emergency incidents, and special cases should always be considered (e.g., if a casualty has a pacemaker).

If you need to use an AED to treat a casualty experiencing a cardiovascular emergency, ensure you follow your workplace/provincial procedures for reporting and documenting incidents.

AED troubleshooting and maintenance

Regular maintenance of AED units, including regular inspections, are important to ensuring the AED is available when it is needed. As part of the inspection process, assess and document the following:

- Date of inspection to track frequency of assessments and when equipment parts are replaced.
- Expiration dates of the AED equipment such as the battery and defibrillation pads.
- Physical appearance of the defibrillation pads (adult and pediatric). If they appear worn or damaged, they must be replaced.
- Overall function of the AED such as its power, that the rescue pack is present and stocked, and the indicator lights display a green status.

If you are performing an AED inspection in your workplace, ensure you follow the manufacturing guidelines and procedures outlined in your workplace's AED inspection program.

Most AEDs perform a daily system check and display in some manner that they are ready for use. Sometimes the device will display the message Check Electrodes. If this occurs, check the cable to the pads connection, the cable to machine connection, and the adherence of the pads to the casualty's chest. Machines will also advise if motion is detected or if the battery is low.

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AEDs are sold with an instruction manual that will outline troubleshooting in detail. Always follow the manufacturer's suggested guidelines and checklists for inspections and maintenance.

SHOCK

Shock is a circulation problem where the body's tissues don't get enough oxygenated blood.

Shock is a danger because any physical injury or illness can be accompanied by shock, and it can quickly progress into a life-threatening condition. Pain, anxiety, and fear do not cause shock, but they can make it worse, or make it progress faster. This is why reassuring a casualty and making them comfortable is important.

Medical shock should not be confused with electrical shock or being shocked and surprised. Medical shock is life-threatening, as the brain and other organs cannot function properly.

The following tables provide the types, causes, and the signs and symptoms of shock. Severe shock can also result from medical emergencies such as diabetes, epilepsy, infection, poisoning, or a drug poisoning.

Types and Causes of Shock	
Cause	Effect
Hypovolemic shock	
Severe bleeding - internal or external (includes major fractures)	The loss of enough blood/fluid that there is not enough blood flow through the body to fill blood vessels.
Crush injuries	Loss of blood and blood plasma into tissues. There is not enough blood to fill blood vessels.
Severe burns	Loss of blood plasma (fluid) into tissues. There is not enough blood to fill blood vessels.
Cardiogenic shock	
Heart attack/heart failure	Heart is not strong enough to pump blood effectively throughout the body.
Spinal shock	
Spinal cord or spinal nerve injuries	The brain cannot control the size of the blood vessels. The blood cannot get to the tissues properly.
Anaphylactic shock	
Severe allergic reactions	Anaphylaxis may lead to a swelling of tissues, causing respiratory failure.

Signs and Symptoms of Shock	
Signs	Symptoms
Skin lacks colour. The skin may look pale for lighter skin tones and grey for darker skin tones.	Restless
Blue-purple lips, tongue, earlobes, and fingernails.	Anxious
Cold and clammy skin.	Disoriented
Breathing is shallow and irregular. Casualty may be breathing fast or gasping for air.	Confused
Changes in level of consciousness.	Afraid
Weak, rapid pulse. Radial pulse may be absent.	Dizzy

First Aid for Shock

To minimize shock, perform the following steps:

1. Give first aid for the injury or illness that caused the shock. Reassure the casualty often.
2. Minimize pain by handling the casualty gently.
3. Loosen tight clothing at the neck, chest, and waist.
4. Keep the casualty warm, but do not overheat. Use jackets, coats, or blankets if you have them.

5. Moisten the lips if the casualty complains of thirst. Don't give anything to eat or drink.
6. Place the casualty in the best position for their condition.
7. Continue ongoing casualty care until handover.

This procedure for shock may prevent shock from becoming worse. Whenever possible, add these steps to any first aid you give.

Positioning a casualty in shock

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Putting the casualty in the right position can slow the progress of shock and make the casualty more comfortable.

The position you use depends on the casualty's condition. The casualty should be as comfortable as possible in the position you use.

No suspected head/spinal injury; fully conscious

Place the casualty on their back if injuries permit. Once the casualty is positioned, cover them to preserve body heat, but do not overheat.

No suspected head/spinal injury; less than fully conscious

Place the casualty in the recovery position. When there is decreased level of consciousness, airway and breathing are the priority. The recovery position ensures an open airway.

Conscious with a breathing emergency and/or chest pain

If a conscious casualty is experiencing chest pain or is having difficulty breathing, have them sit in a semi-sitting position, or any position that makes breathing easier for them.

Suspected head/spinal injury

If you suspect a head or spinal injury, steady and support the casualty in the position found. This protects the head and spine from further injury. Monitor the ABCs closely.

As injuries permit

A casualty's injuries may not permit you to put them into the best position. Continue to support the head and neck and, if needed, use a head-tilt/chin-lift to maintain the open airway. Always think of the casualty's comfort when choosing a position.

CONSCIOUSNESS

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Consciousness refers to the level of awareness a person has of themselves and their surroundings. There are different levels of consciousness, ranging from completely conscious to completely unconscious (or unresponsive).

Many injuries/illnesses can cause changes in a casualty's level of consciousness, including:

- A breathing emergency
- A heart attack
- A head injury
- Poisoning
- Shock
- Alcohol or drug abuse
- Medical condition (epilepsy, diabetes, etc.)

Semi-consciousness and unconsciousness are breathing emergencies for casualties lying on their back, because their tongue may fall to the back of the throat and block the airway. Saliva and other fluids can also pool at the back of the throat and choke the person.

A progressive loss of consciousness means the casualty's condition is worsening. Always monitor a casualty's level of consciousness and note any changes. A first aider can use the mnemonic A.V.P.U. (Alert, Verbal, Pain, Unresponsive) to assess and describe levels of consciousness.

Decreased consciousness is always an urgent situation. The person can quickly become unconscious, and this is a breathing emergency. Seek medical help for anyone who is not fully conscious.

First Aid for Unconsciousness

To give first aid for unconsciousness, perform the following steps:

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1. Perform a scene survey. Call or have someone call 9-1-1 as soon as unresponsiveness is determined.
2. Perform a primary survey.
3. Perform a secondary survey if necessary.
4. Turn the casualty into the recovery position if injuries permit.
5. Give ongoing care.

If injuries make it necessary for the casualty to be face up, monitor breathing continuously. If necessary, hold the airway open. Always ensure an open airway.

Loosen tight clothing at the neck, chest, and waist, and continue ongoing casualty care until handover. Record any changes in their level of consciousness and when they happen.

FAINTING

Fainting is a temporary loss of consciousness caused by a shortage of oxygenated blood to the brain. Common causes of fainting include:

- Fear or anxiety
- Lack of fresh air
- Severe pain, injury, or illness
- The sight of blood
- An underlying medical problem

- Fatigue or hunger
- Long periods of standing or sitting
- Overheating

A person who has fainted is unconscious. Place them in recovery position to protect the airway and prevent possible choking. Place the casualty in a comfortable position as they regain consciousness.

First Aid for Fainting

To give first aid for fainting, perform the following steps:

1. Ensure a supply of fresh air and loosen tight clothing at the neck, chest, and waist.
2. Make the casualty comfortable as consciousness returns and keep them lying down for 10 to 15 minutes. Continue to monitor breathing and consciousness.

Do not assume a person has just fainted, unless there is a quick recovery. If the recovery is not quick or complete, call 9-1-1 and stay with the casualty until they take over.

Feeling faint or impending faint

Sometimes when a person is about to faint, there are warning signs. The person:

- Will lack colour
- Is sweating
- Feels sick, nauseous, dizzy, or unsteady

First aid for an impending faint

To give first aid for an impending faint, perform the following steps:

1. Place the casualty on their back.
2. Ensure a supply of fresh air. Open windows or doors.
3. Loosen tight clothing at the neck, chest, and waist.
4. Stay with the casualty until they have fully recovered.

Chapter 06

First Aid tools

DRESSINGS

A dressing is a protective covering put on a wound to help control bleeding, absorb blood from the wound, and prevent further contamination. A dressing should be:

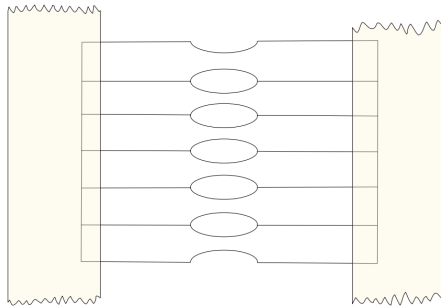
- Sterile, or as clean as possible
- Large enough to cover the wound
- Highly absorbent
- Compressible, thick, and soft
- Non-stick and lint-free to reduce the possibility of sticking to the wound

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Dressings are available in a variety of sizes and designs.

The dressings used most often in first aid are the following:

- **Adhesive dressings** Prepared sterile gauze dressings with their own adhesive strips.
- **Wound closures** Adhesive strips that bring the edges of the wound together to assist healing.



- **Gauze dressings** Packaged gauze available as sterile single packs or in bulk packaging
- **Pressure dressings** Large sterile dressings of gauze and other absorbent material, usually with an attached roller bandage. They are used to apply pressure to a wound with severe bleeding

- **Hemostatic dressings** Pressure dressings impregnated with clot promoting agents, used to stop serious bleeding. These dressings are not designed for all wound types. Check with your local protocols for more information.

Follow these guidelines for applying dressings:

- Prevent further contamination.
- Extend the dressing beyond the edges of the wound.
- If blood soaks through a dressing, leave it in place and cover with more dressings.
- Secure a dressing with tape or bandages.

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Improvised Dressings

When commercially-prepared dressings are not available, they can be improvised from materials readily available. An improvised dressing should be:

- Clean, preferably sterile
- Non-adherent
- Lint-free
- Absorbent

Some examples of improvised dressings are cotton clothing, towels, paper towels, sanitary pads, and diapers.

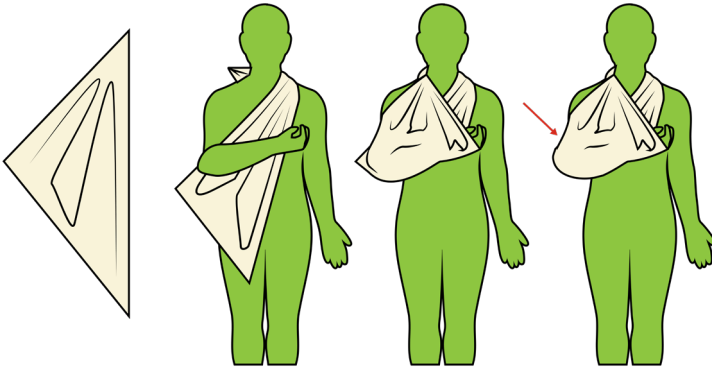
BANDAGES

A bandage is any material that is used to hold a dressing in place, maintain pressure over a wound, support a limb or joint, immobilize parts of the body, or secure a splint.

When using bandages, remember to:

- Apply firmly to make sure bleeding is controlled or immobilization is achieved
- Check the circulation below the injury before and after applying a bandage, you may have applied it too tightly or swelling may have made it too tight.

Triangular Bandage



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A triangular bandage is a versatile item in a first aid kit. It can be used fully opened to create a sling or hold a large dressing in place. It can be folded into a broad or narrow bandage to hold splints, apply pressure, or to immobilize parts of the body.

Broad and Narrow Bandage

A broad bandage is used to apply pressure over a wide area, and to immobilize the body to itself. To form a broad bandage:

1. Fold the point to the centre of the base with the point slightly beyond the base.



2. Fold in half again from the top to the base.

A narrow bandage is a better option for securing splints and dressings as it allows more focused pressure.

To form a narrow bandage, fold a broad bandage in half again from the top to the base to form a narrow bandage.



Reef Knot

The reef knot is the best, and preferred, knot for tying bandages and slings. The reef knot lies flat, making it more comfortable than other knots; it does not slip and is easy to untie to adjust the bandage.

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To tie a reef knot, perform the following steps:

1. Take one end of a bandage in each hand.
2. Lay the end from the right hand over the one from the left hand and pass it under to form a half-knot. This will transfer the ends from one hand to the other.
3. The end now in the left hand should be laid over the one from the right and passed under to form another half-knot. The finished knot looks like two intertwined loops.
4. Tighten by pulling one loop against the other or by pulling only on the ends.
5. Place knots so they do not cause discomfort by pressing on skin or bone, particularly at the site of a fracture or, when tying a sling, place knot at the neck.
6. If the knot is uncomfortable, place soft material underneath as padding.

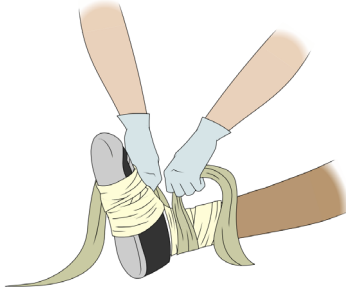


Figure 8 Knot

A figure 8 knot may be used to tie the ankles and feet, to secure a splint to the ankles/feet, or to support an injured ankle.

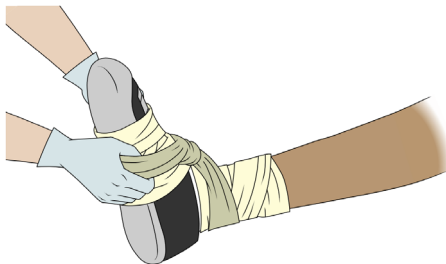
To tie a figure 8 knot, perform the following steps:

1. Position the centre of a narrow or broad triangular bandage under the ankle (or both ankles if tying the feet together).



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2. Cross the ends over top the ankles and bring the ends around the feet and tie off.

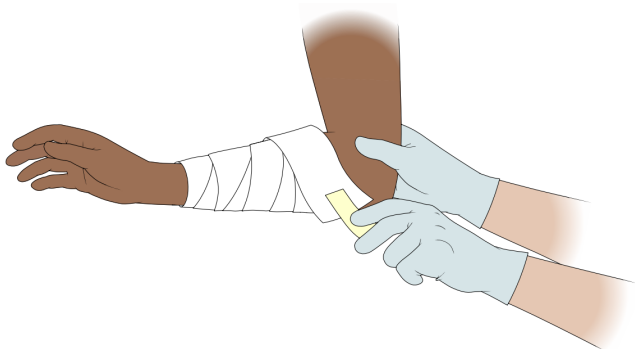


Roller Bandage

Roller bandages, usually made of gauze-like elastic material, are used to hold dressings in place or to secure splints.

Put on a roller bandage in a simple spiral. Starting at the narrow part of the limb, anchor the bandage with a few turns and continue wrapping the bandage, overlapping each turn by one quarter to one third of the bandage's width. Make full-width overlaps with the final two or three turns and secure with a safety pin, adhesive tape, or by cutting and tying the bandage as shown. Always check circulation below the wound before and after applying a bandage, as you may have applied it too tightly, or swelling may have made it too tight.

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SLINGS

A sling can be easily improvised with a scarf, belt, tie, or other item that can go around the casualty's neck. You can also support the arm by placing the hand inside a buttoned jacket or by pinning the sleeve of a shirt or jacket to the clothing in the proper position.

An arm sling is used to support the arm and provide some elevation for injuries affecting the lower arm, wrist, and hand.

A tubular sling is used to transfer the weight of an arm to the opposite shoulder, and to provide more elevation to the hand.

A cuff-and-collar sling can support the weight of an arm when the shoulder will not allow the arm to move. The weight is supported by the neck more than the shoulder of the injured arm.

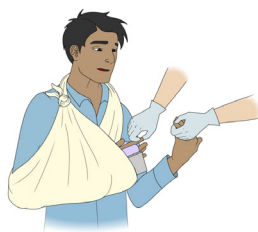
Applying an Arm Sling

To apply an arm sling, perform the following steps:

1. Ask the casualty to support the fore arm of their injured arm horizontally across their body.
2. Place an open triangular bandage between the forearm and the chest so the triangle's top point is supporting the elbow.
3. With the casualty still supporting their injured arm, bring the remaining two free points of the bandage over the hand and forearm, and join them around the back of the neck on the injured side.
4. Tie off the sling on the injured side with a reef knot positioned in the hollow above the collar bones.
5. Place padding under the knot for comfort.
6. At the elbow, twist the top point of the triangular bandage into a pigtail and tuck it inside the sling.
7. Adjust the sling as necessary to maintain access to the fingers to check circulation.



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Applying a Tubular Sling

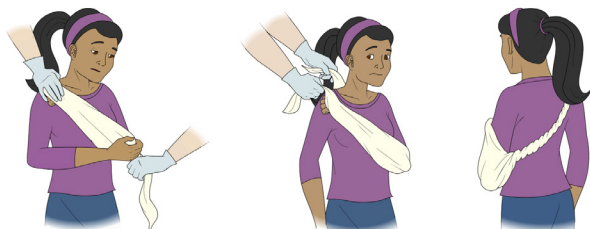
To apply a tubular sling, perform the following steps:

1. Support the forearm of the injured side diagonally across the chest, with the fingers pointing toward the opposite shoulder.
2. Place an open triangular bandage over the forearm with the base facing down and following the forearm about 10 cm (3 inches) below the arm. The point should extend beyond the injured arm.

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3. Ease the base of the bandage under the hand, forearm, and elbow and tuck the base of the bandage under the injured arm to make a pocket that runs the full length of the arm.
4. Gather the bandage at the elbow by twisting it toward the back.
5. Bring the lower end around the back and between the shoulder blades, then over the shoulder on the uninjured side. This closes the pocket at the elbow.
6. Gently adjust the height of the arm as you tie off the ends of the bandage so the knot rests in the natural hollow above the collarbone.
7. Place padding under knot, if available. Tie the sling tightly enough to support the weight of the injured arm.



Applying a Cuff and Collar Sling

To apply a cuff-and-collar sling, perform the following steps:

1. Fold a triangular bandage into a narrow bandage.
2. Centre the bandage at the wrist and bring both ends up on either side, tying a half-knot.
3. Bring the ends of the bandage up to the neck and tie off.

SPLINTS

Splints are a very important tool in caring for muscle and bone injuries. A good splint can prevent further injury by preventing fractured bones from moving unnecessarily, promote recovery, and help with pain management. All splints need to be rigid and well padded. Although a splint should never be painful once positioned, they are also not always comfortable, especially when worn for extended periods of time.

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A splint may be commercially prepared, improvised, or may be anatomical (using the body for support).



Commercial splints may be made of wood, flexible metal covered in foam, or corrugated plastic. They will come in different sizes and may have instructions on how to reshape them for specific injuries.

An **improvised splint** is created out of materials available at the emergency site. Pieces of wood, cardboard, books and magazines, pillows, rulers, and coat hangers can all be used as an improvised splint.

A good splint is:

- Rigid enough to support the injured limb.
- Well padded for support and comfort.
- Long enough to fully immobilize the injured bone or joint by extending above and below the injury.
- Lightweight so it does not add to the discomfort.

An anatomical splint uses the body to support a limb. Fingers, shoulders, upper arms, and upper legs are often immobilized using anatomical splints due to the difficulty of putting a rigid splint onto these parts.

Other Materials Needed for Splinting

In addition to the splint itself, padding and bandages are needed to properly secure a splint to the body.

Padding does two things:

- It fills in the natural hollows between the body and the splint, ensuring the injured limb is properly supported.
- It makes the splint more comfortable.

Always pad between a splint and the injured limb, and between two body parts to be bandaged together.

When using bandages:

- Make sure they are wide enough to provide firm support without discomfort.
- Pass the bandages under the natural hollows of the body. Pass the bandages between the elbow and the side, under the knee, the small of the back, the hollow behind the ankles.
- Tie them tightly enough to prevent movement, but not so tight they cut off circulation. Check circulation every 15 minutes below any bandages you have already tied.

Chapter 07

Major wound care

SEVERE EXTERNAL BLEEDING

Severe external bleeding (also referred to as external hemorrhages) is the escape of blood from the blood vessels. In external bleeding, blood escapes the body through a surface wound. In internal bleeding, blood escapes from tissues inside the body.

In arterial bleeding, the blood is bright red and spurts with each heartbeat.



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In venous bleeding, the blood is dark red and flows more steadily.

Severe blood loss will result in the following signs and symptoms of shock:

- Cool, clammy skin that lacks colour
- Rapid pulse that gradually becomes weaker
- Faintness, dizziness, thirst, and nausea
- Restlessness and apprehension
- Shallow breathing, yawning, sighing, or gasping for air

First Aid for Severe External Bleeding

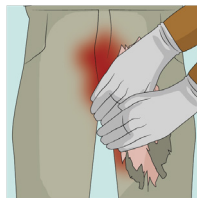
When caring for any wounds involving bleeding, check the circulation before and after you bandage the injury.

To check for circulation, perform the following steps:

1. Check the temperature of the skin below the injury.
2. Depress the fingernail or toenail until the nail bed turns white. Release the pressure and note how quickly the colour returns. This can be used anywhere on the body if the nails are not easily accessible.

To give first aid for severe external bleeding, perform the following steps:

1. Perform a scene survey, then perform a primary survey.
2. To control severe bleeding, apply direct pressure to the wound.
3. Place the casualty at rest.
4. Once bleeding is under control, continue the primary survey, looking for other life-threatening injuries.
5. Before bandaging the wound, check circulation below the injury.
6. Bandage the dressing in place.
7. Check the circulation below the injury and compare it with the other side. If it is worse than it was before the injury was bandaged, loosen the bandage just enough to improve circulation if possible.
8. Give ongoing casualty care.



If the dressings become blood-soaked, do not remove them. Add more dressings and continue pressure. Removing the blood-soaked dressings may disturb blood clots and expose the wound to further contamination.

Tourniquets

A tourniquet is a device designed to stop bleeding by compressing an artery or vein against the bone of a limb. Often considered a tool of last resort, experience and research from Afghanistan and Iraq have demonstrated the life-saving benefits of a tourniquet in traumatic bleed situations.

When to use a tourniquet

Tourniquets are an available tool, and their use depends on the situation and the injuries presented.



Two situations where a tourniquet will almost always be needed are:

- Severe amputations where the injury is not clean and not controllable with direct pressure. Amputations caused by shearing forces (such as a motor vehicle collision (MVC)), explosions, or other amputations that result in a mangled wound.
- Gunshot wounds that hit major blood vessels deeper in the limb. These are identified by either spurting bright blood or rapid loss of dark blood.

There are different types of tourniquets available. However, the most common that a first aider will encounter is the windlass tourniquet. The windlass tourniquet consists of a band, a rod (the windlass), and a locking clip.

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When not to use a tourniquet

Tourniquets should not be used in the following situations:

- **Minor bleeding** should be treated with direct pressure and placing the casualty at rest. Applying a tourniquet in this instance will provide no more benefit than conventional bleeding controls and increases the risk of tissue damage and limb loss.
- **Non-severe amputations** are amputations that result in a relatively clean cut (e.g., from a saw). These amputations can usually be controlled by direct pressure over the end of the injured limb. However, if direct pressure does not work, a tourniquet can be used.
- **Small gunshot wounds**, such as those from small-calibre bullets, tend to bleed less and are often controllable with direct pressure.

07 Applying a windlass tourniquet

Since a tourniquet stops all blood flow below the application site, there is a risk that tissue below the site will die.

Tourniquets should be placed as close to the wound as possible. When possible, the tourniquet should be placed on the lower or mid-long bone (femur or humerus). The exception to this rule is amputations where the placement should be 5-6cm or 2-3 in. above the wound. The tourniquet should not be placed over a joint and never over an embedded object.

To apply a windlass tourniquet, perform the following steps:

1. Wrap the band around the limb and feed it through the tourniquet.
2. Secure the band so it is snug against the skin you should not be able to get two fingers under the band.



3. Twist the windlass rod until the tourniquet is tight enough to stop the bleeding.



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4. Secure the windlass rod.
5. Record the time the tourniquet was applied.

A tourniquet is not comfortable. The casualty will likely complain that the tourniquet hurts when it is properly applied.

Once applied, a tourniquet should not be loosened unless you are properly trained and in an extended care situation.

Complications of tourniquets

Tissue death is possible when using a tourniquet. A casualty who has had a tourniquet applied needs medical attention as soon as possible.

It is possible that a single tourniquet will not be enough to stop bleeding. In that situation, a second tourniquet should be applied 5 cm above the first.

Improvising a tourniquet

Overall, an improvised tourniquet is not recommended. Ideally, a tourniquet should be commercially made, as it will provide the best results. However, in cases where a commercial tourniquet is not available, and because first aid is about providing care to the best of your abilities with readily available materials, a tourniquet can be improvised with readily available materials.

To improvise a tourniquet, you will need a band and a windlass.

- **Band:** A narrow bandage works well, as would any piece of cloth that is reasonably narrow (about 7.5 cm or 3 inches wide) and can be easily twisted.
- **Windlass:** A sturdy rod that will not bend or break under pressure. It should be about 15 cm or 6 inches long.

A second bandage will be needed to secure the ends of the windlass once the tourniquet has been tightened.

An improvised tourniquet should only be used when the time between application and care at a hospital is short, as there is a greatly increased risk of damaging tissues with an improvised tourniquet.

Note: *Items such as belts do not make good tourniquets as they cannot be tightened enough to control bleeding. Also, a towel or t-shirt is not the best approach to control bleeding, but may be used as a last resort. Any improvised*

tourniquet will be replaced by something more appropriate when the paramedics arrive.

Haemostatic Dressings

Another option for controlling bleeding is a haemostatic dressing. These dressings are impregnated with agents designed to make clotting easier and faster. Injuries where a tourniquet may be considered are also candidates for a haemostatic dressing. As well, severe bleeding on the core of the body (where a tourniquet cannot be used) may do well with this type of dressing.

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A haemostatic dressing is applied the same way a pressure dressing is applied.

SEVERE INTERNAL BLEEDING

Severe internal bleeding (also referred to as internal hemorrhages) is the result of an injury that causes bleeding but does not break the skin. The simplest and most common form of internal bleeding will result in a bruise (such as from bumping into a table). A more serious case of internal bleeding requires immediate medical attention, since the bleeding cannot be easily controlled. These injuries usually require surgery.

Severe internal bleeding should be suspected when:

- The casualty receives a severe blow or penetrating injury to the chest, neck, abdomen, or groin.
- There are major limb fractures, such as an upper leg or pelvis injury.
- There was an impact or a fall that is also a concern for a head and spinal injury.

Signs and Symptoms of Severe Internal Bleeding

The following are the signs and symptoms of severe internal bleeding:

- Bleeding from the ear canal or the nose
- Bloodshot or black eye (bleeding inside the head)
- Large area of bruising and swelling
- Coughing up blood that is bright red and frothy (bleeding into the lungs)
- Vomiting bright red blood, or brown blood that looks like coffee grounds
- Blood in the stool that looks either red or black and tarry
- Red or smoky brown blood in the urine
- Signs of shock with no signs of external injury

First Aid for Severe Internal Bleeding

To give first aid for severe internal bleeding, perform the following steps:

1. Perform a scene survey.
2. Send or go for medical help.
3. Perform a primary survey.
4. Position the casualty appropriately on their back if responsive, in recovery position if unresponsive, or in the position found if head and spinal injuries are suspected.
5. Give ongoing casualty care and give first aid for shock.

You can do very little to control internal bleeding. Give first aid to minimize shock and get medical help as quickly as you can.

Contusions

Contusions (the medical term for bruises) are caused when small blood vessels are torn and the blood leaks and then collects in a localized area. As there is no external bleeding to control, first aiders are unable to manage an internal bleed, but should note it as a sign of a potentially severe internal injury.

Contusions could be anything from a minor soft tissue injury such as sprains or strains (ligament damage) with associated swelling, etc., to something much more dangerous, such as bruising around the eyes or behind the ears (skull fracture).

Treatment for a major contusion will usually require medical referral and possibly treatment in an emergency room setting, so recognition is the most essential treatment for this type of injury.

It is important for the first aider to consider the possibility of contusions during their follow-up care. For example, a worker slips and falls, but denies any injuries. They return to work, but return to the first aid later experiencing other symptoms of concussion, such as headache, nausea, and difficulty recalling information. The first aider may see bruising around the casualty's eyes or bruising behind the ears, indicating a severe head and neck injury, and should immediately call 9-1-1.

AMPUTATIONS

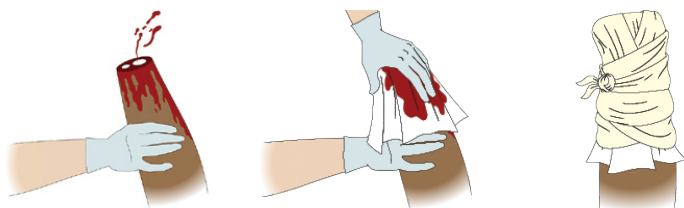
An amputation is when a part of the body has been partly or completely cut off. You must control the bleeding from the wound, care for the amputated tissue, and get medical help.

First Aid for a Complete Amputation

To give first aid for a complete amputation, perform the following steps:

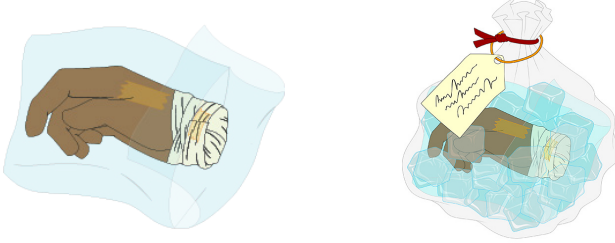
1. Perform a scene survey, then perform a primary survey.
2. Send for medical help.
3. Control bleeding by applying direct pressure to the wound.
4. Maintain pressure by bandaging the dressings in place.
5. Care for the amputated part by wrapping it in a clean, moist dressing (if clean water is available).

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6. Put the amputated part in a clean, watertight plastic bag and seal it.
7. Put this bag in a second plastic bag or container partly filled with crushed ice.

8. Attach a record of the date and time this was done and send this package with the casualty to medical help.



First Aid for a Partial Amputation of a Finger

To give first aid for a partial amputation of a finger, perform the following steps:

1. Reposition a partly amputated part to its normal position and cover with a dressing.
2. Send for medical help and continue ongoing casualty care to the casualty.
3. Using a roller bandage, start by securing at the wrist, and then wrap up to the amputated part, applying pressure to the dressing.
4. Splint the partially amputated finger to fingers on either side to provide stabilization.
5. Complete bandaging and secure.
6. Consider a tubular sling to provide support and elevation to the hand.

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Partial amputations to other parts of the body can be treated in a similar fashion. Use a rigid splint to provide stability to a partially amputated limb.

CHEST INJURIES

Wounds to the chest can cause breathing problems and require immediate medical help. Chest injuries can include fractured ribs, a more serious flail chest, penetrating injuries, and air getting trapped outside the lungs in the chest cavity.

Pneumothorax

A penetrating chest injury can lead to a condition known as a **pneumothorax**, which occurs when air is trapped in the chest cavity, but outside of the lungs. A similar condition is a **hemothorax**, where instead of air, blood is trapped. The air can become trapped either due to an opening in the chest wall, or damage to the lungs.

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A pneumothorax needs immediate attention, as the trapped air can build up and put pressure on the lungs. If too much pressure builds up, the lung will collapse. A collapsed lung severely impairs breathing and can be difficult to re-inflate later.

The best way to give first aid for a pneumothorax is by preventing the build-up of air through a penetrating chest wound.

First aid for a penetrating chest wound

To give first aid for a penetrating chest wound, perform the following steps:

1. Perform a scene survey and call 9-1-1.
2. Perform a primary survey.



3. If the open chest wound has significant bleeding, cover it by pressing the casualty's hand, a bystander's hand, or your own hand over the wound (preferably a gloved hand). If there is no significant bleeding, the first aider may leave the wound exposed, or use a dressing that will allow air to pass (non-occlusive). If the dressing becomes saturated, it must be changed.
4. Place the casualty in the position that makes breathing easiest. This position is usually semi-sitting, leaning slightly towards the injured side. This position keeps the uninjured side of the chest upward so it can be used most effectively for breathing.
5. Do not seal the wound with an airtight dressing, but cover the wound to prevent further contamination. If the dressing becomes wet, replace it with a dry dressing.
6. Give ongoing casualty care, monitoring breathing often.

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Gunshot Wounds

A specific penetrating injury that requires immediate attention is a gunshot wound. First aid for a gunshot wound will depend on where on the body the injury is.

First aid for gunshot wounds to the body

Gunshot wounds to the body are dangerous in two ways. First is the direct damage to the organs the bullet encounters. Secondary to that is the pressure wave that accompanies a bullet wound. This wave will spread out from the bullet's route as it is slowed by the body, causing additional injury to surrounding tissues and hollow organs.

1. Ensure your own safety on the scene. Based on your risk assessment, you may need to wait to enter the scene until professional response is available.
2. Call 9-1-1.
3. Follow the steps above for a penetrating chest injury.

First aid for gunshot wounds to the extremities

A gunshot wound to the extremities can range from superficial to life-threatening. A bullet that grazes the skin or stays close to the surface will hurt and bleed a lot but is generally not life-threatening. Treat as you would for a bleeding wound.

If a bullet goes deeper into the extremity, in particular in the upper arm or upper leg, it can hit major arteries and/or fracture bones. In these cases, treat as you would for severe bleeding. Consider a tourniquet for gunshot wounds to the upper leg. A bullet that hits the major artery in the upper leg can cause a person to bleed to death very quickly.

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Flail Chest

A flail chest occurs when several ribs in the same area are broken in more than one place. The flail segment moves opposite to the rest of the chest while breathing, which causes pain for the casualty.

Signs and symptoms of a flail chest include:

- Paradoxical chest movement
- Breathing is very painful, and the casualty may support the injured area
- Bruising at the injury site

First aid for a flail chest

To give first aid for a flail chest, perform the following steps:

1. Steady and support the head and neck.
2. Perform a primary survey. If the casualty complains of difficulty breathing and pain in the chest, expose and examine the injury.
3. Support the injured area with your hand, which may make breathing easier. Give first aid for ineffective breathing if needed.

4. Secure the arm to the chest wall with a broad bandage to prevent movement of the arm.
5. Give ongoing casualty care until medical help takes over.

BLAST INJURIES

For Canadians working in the mining and construction industries, explosives are a workplace hazard. There are three mechanisms of injury from an explosion:

- Injuries from being struck by material thrown by the blast
- Injuries from being thrown by the blast
- Injuries to hollow organs, including the lungs, caused by the shock wave from the blast

Signs and symptoms of a blast injury include:

- Difficulty breathing
- Headache and/or ringing ears
- Coughing up frothy blood
- Chest pain
- Superficial wounds from flying debris
- Blood in urine or stools

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Note that the signs and symptoms of a blast injury may show up a few hours later if there is only internal injury and/or the casualty did not realize the severity of their injuries.

First Aid for a Blast Injury

To give first aid for a blast injury, perform the following steps:

1. Perform a scene survey. If the casualty was thrown by the blast, suspect a head or spinal injury and prevent any unnecessary movement.
2. Send for medical help.
3. Perform a primary survey.
4. Place the casualty in a semi-sitting position if there is no suspected head or spinal injury.

5. Monitor breathing closely.
6. Give ongoing casualty care.

ABDOMINAL INJURIES

Abdominal wounds may be closed or open. Closed wounds occur when internal abdominal tissues are damaged, but the skin is intact. An open abdominal wound has a break in the skin where internal organs may protrude. Complications from abdominal wounds may include severe bleeding (either internal or external) and contamination from the contents of ruptured abdominal organs.

To assess an abdominal injury, expose the injured area and look for open wounds. Consider the history of the incident, especially the mechanism of injury. Observe the casualty's position. Are they guarding their abdomen? Gently feel for swelling, rigidity, and pain.

If you suspect an abdominal injury, you should also suspect internal bleeding that may be severe. Give first aid for severe internal bleeding.

First Aid for an Open Abdominal Injury

To give first aid for an open abdominal injury, perform the following steps:

1. Perform a scene survey and a primary survey.
2. If you find an open abdominal wound, you must prevent it from opening wider. The internal organs may be displaced. Position the casualty in the semi-sitting position with the knees raised and supported.

3. Dress the wound. The method of dressing a wound of the abdominal wall depends on whether or not internal organs are protruding:
 - a. If the organs are not protruding, apply a dry dressing to the wound and bandage firmly.
 - b. If the organs are protruding, do not try to put them back into the abdomen. Put on a moist dressing to stop the organs from drying out and bandage loosely with two broad bandages.
 - c. Give ongoing casualty care.

CRUSH INJURIES

A crushing force can cause extensive bruising of the parts of the body affected. There also may be other complications, including fractures or ruptured organs. When the crushed area is limited to a smaller body area, such as a hand or foot, the injury is considered serious, but is not usually life-threatening. However, a major crush injury may cause compartment syndrome which requires medical help immediately. Compartment syndrome occurs when excessive pressure builds up inside the body, usually from bleeding or swelling after an injury. The dangerously high pressure in compartment syndrome can cut off the flow of blood through the affected body area.

Severe shock can develop after a casualty is released from the weight that caused the crush injury. When the crushing force is removed, fluids from the crushed tissues leak into surrounding tissues. This causes shock.

When muscle is crushed, it releases the contents of muscle cells into the blood. Therefore, if the injury is large, it can cause kidney failure. This is called crush syndrome, which is also known as post-traumatic acute renal (kidney) failure.

First Aid for Crush Injuries

To give first aid for crush injuries, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Give first aid for shock right away. Even if there are no signs, shock will probably develop.
3. Call for medical help and give ongoing casualty care.



Chapter 08

Minor wound care

TYPES OF MINOR WOUNDS

A wound is any damage to the soft tissues of the body. It usually results in the escape of blood from the blood vessels into surrounding tissues, body cavities, or out of the body.

A wound can be either open or closed:

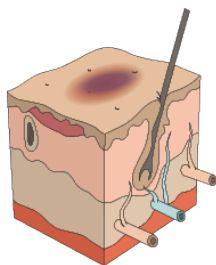
- **Open wound** A break in the outer layer of the skin.
- **Closed wound** No break in the outer layer of skin but there is internal bleeding.

The aim in the care of wounds is to stop the bleeding and prevent infection. Although some bleeding may help to wash contamination from the wound, excessive blood flow must be stopped quickly to minimize shock.

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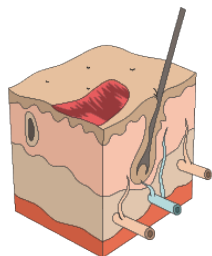
Contusions or Bruises

Contusions or bruises are closed wounds. The tissues under the skin are damaged and bleed into surrounding tissues, causing discolouration. A bruise may be a sign of a deeper, more serious injury or illness.



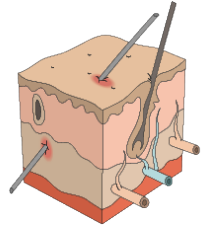
Abrasions or Scrapes

Abrasions or scrapes are open wounds where the outer protective layer of skin and the tiny underlying blood vessels are damaged. The deeper layer of the skin is still intact. Abrasions are often referred to as road rash.



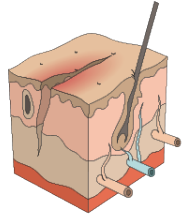
Puncture Wounds

Puncture wounds are open wounds caused by blunt or pointed instruments that may have a small opening, but often penetrate deep into the tissue.



Incisions

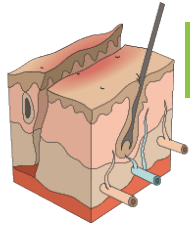
Incisions are deep, clean cuts caused by something sharp such as a knife.



Lacerations

Lacerations are tears in the skin and underlying tissue with jagged and irregular edges.

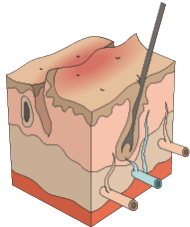
This type of wound can be caused by an item with rough edges, such as a dull paring knife.



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Avulsions

Avulsions are injuries that leave a piece of skin or other tissue either partially or completely torn away from the body.



WOUND CLEANING AND PREVENTING INFECTION

All open wounds are contaminated to some degree. Tell the casualty to seek medical help if signs of infection appear later.

The mnemonic **S.H.A.R.P** identifies the signs and symptoms of infection.

S Swollen

H Hot, feels warmer than the surrounding area

A Aches, a dull pain

R Red

P Pus may leak from the wound

Cleaning a Wound

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To reduce the risk of a wound becoming infected, it should be cleaned properly. Abrasions that have a lot of dirt on the surrounding skin can benefit from soap and water; however, anything deeper should be washed using only water. Adhere to the following to clean a wound:

- Wash your hands with soap and water and put on gloves if available.
- Do not cough or breathe directly over the wound.
- Fully expose the wound but don't touch it.
- Allowing some bleeding can help flush contaminants out of the wound.
- Gently wash loose material from the surface of the wound.
- Wash and dry the surrounding skin with clean dressings, wiping away from the wound.
- Avoid washing materials from the wound into other nearby wounds.
- An antibiotic cream can be used on superficial wounds and abrasions.
- Cover the wound with a sterile dressing.

Tetanus

Any wound, including burns, may be contaminated by spores that cause tetanus, a potentially fatal bacterial disease characterized by muscle spasms. Tetanus is commonly referred to as lockjaw.

Deep wounds are at especially high risk of tetanus infection. Advise a casualty with this type of wound to get medical help as soon as they can. Symptoms may not appear immediately.

MANAGING MINOR WOUND EMERGENCIES

Most wounds encountered day-to-day that require first aid are minor. They usually bleed very little, result in some minor pain, and generally heal quickly. A minor wound is rarely serious if properly cleaned and protected with dressings and bandages.

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Some minor wounds do require medical attention for stitches or wound closures.

First Aid for Bleeding from the Palm

Wounds to the palm of the hand can bleed a lot and can be potentially serious due to the number of nerves and ligaments found in the hand. The palm of the hand is often injured by improper knife use in the kitchen, or moving items with sharp edges.



Minor wound care

1. Perform a scene survey.
2. Perform a primary survey and expose the wound.
3. Control the bleeding with direct pressure using a bulky pad over sterile dressings.
4. Check the circulation in the fingers and compare it with the other hand.



5. Bend the fingers over the pad to make a fist and bandage the hand so the fist is held firmly closed.
6. Place the middle of a narrow triangular bandage on the inside of the wrist and bring the ends around the back of the hand, or start wrapping with a roller bandage at the wrist, and continue wrapping around the back of the hand.
7. Wrap the bandage tightly over the fingers and then down around the wrist.
8. Leave the thumb exposed, if possible, to check circulation.



9. Tie the bandage off at the wrist and tuck in the ends.

10. Give ongoing casualty care, recheck the circulation below the injury, and get medical help.
11. Use a sling to support the arm and hand if you are transporting the casualty.



First Aid for a Pinched Fingernail

When a finger or toenail has been pinched, sometimes called a nail bruise, the pressure from the blood under the nail can cause great pain. You can relieve this pain as follows:

1. Place the injured part under cool running water to reduce pain and swelling.
2. If the pain is severe, and you can see pooled blood under the nail, release the pressure under the nail as follows:
3. Straighten a paper clip or blunt wire and heat one end to red-hot, using a stove element or the flame from a lighter. Don't use a needle, the hole it makes is too small to release the pooled blood effectively.
4. Place the heated end of the paper clip on top of the nail and let it melt a hole just deep enough to release the pooled blood.
5. Once the pressure has been released, wash the area with water and put on an adhesive dressing.
6. Advise the casualty to seek medical help if signs and symptoms of an infection develop.

First Aid for Splinters and Slivers

Slivers are small, embedded objects, such as wood, thorns, glass, or metal. This type of injury is common in the hands and feet. Although slivers may cause discomfort and pain, in most cases they can be removed easily without complications. In serious cases, slivers can be disabling and cause infection. Do not remove a sliver if it:

- Lies over a joint
- Is deeply embedded into the flesh
- Is in or close to the eye
- Has a barb (e.g., metal slivers and fishhooks)
- Cannot be removed easily

In these cases, give first aid for an embedded object.

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Removing slivers

To remove a sliver, perform the following steps:

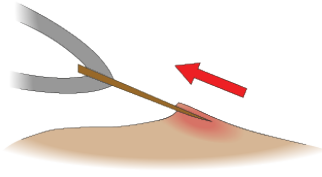
1. Clean the area with water.
2. With sterile tweezers, grip the sliver as close to the skin as possible.
3. Pull the sliver in a straight line in the opposite direction to the angle of entry.
4. Get medical help if some of the sliver was not removed, there is more tissue damage than a simple, small puncture wound, or if an infection develops.

First Aid for Puncture Wounds

Puncture wounds are serious because of the possibility of serious internal damage and contamination carried deep inside the wound.

To give first aid for a puncture wound, perform the following steps:

1. Perform a scene survey. The mechanism of injury is important.
2. Perform a primary survey.
3. Expose the wound. Although there may not be much external bleeding, you should suspect internal bleeding, especially if the wound is in the chest or abdomen.



4. Control bleeding with direct pressure on the wound.
5. Get medical help.
6. Give ongoing casualty care until handover.

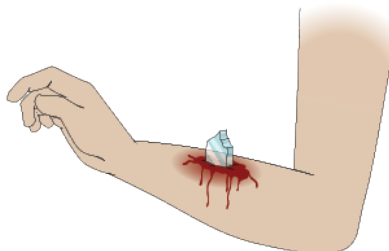
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First Aid for Embedded Objects

If possible, do not remove an object embedded in a wound. Removing the object will probably result in heavier bleeding, as the object can help stop bleeding.

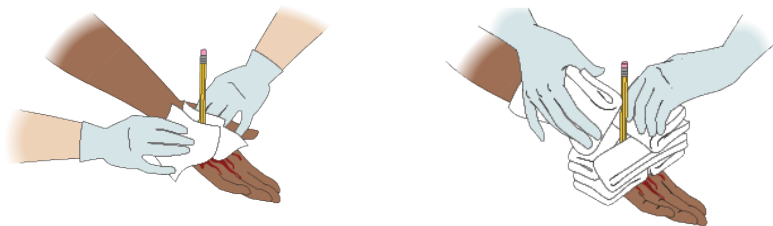
Removing it could also cause further tissue damage, for example, a barb on a fishhook.

To give first aid for an embedded object, perform the following steps:

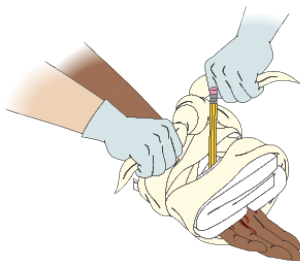


1. Expose the injured area and assess the wound.
2. Check the circulation below the injury.
3. To stop the bleeding, put pressure around the embedded object. If the embedded object is short, tent a clean dressing loosely over the object to keep the wound clean, then place bulky dressings around the object to keep it from moving. This will apply pressure around the wound.
4. Secure the bulky material (dressings) in place with a narrow bandage, taking care not to exert pressure on the embedded object.
5. Check the circulation below the injury again.

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6. Give ongoing casualty care and get medical help.



First Aid for a Nosebleed

A nosebleed may start for no obvious reason, or may be caused by blowing the nose, an injury to the nose, or by an indirect injury, such as a fractured skull.

To give first aid for a nosebleed, perform the following steps:



1. Perform a scene survey and assess the mechanism of injury. If you suspect a head or spinal injury, tell the casualty not to move. Perform a primary survey.
2. Assess the bleeding from the nose. If the blood from the nose is mixed with straw-coloured fluid, suspect a skull fracture. Allow the nose to bleed and give first aid for a skull fracture (refer to Skull Fractures on page 225).
3. If a head or spinal injury is not suspected, place the casualty in a sitting position with the head slightly forward. Leaning forward allows blood to drain from the nose and mouth instead of back into the throat and stomach, where it will cause vomiting.
4. Tell the casualty to compress the entire fleshy part below the bridge of the nose firmly with the thumb and index finger for about 10 minutes or until bleeding stops.
5. Tell the casualty to breathe through the mouth and not blow their nose for at least a few hours, preferably 48 hours. This will help with healing and keep blood clots from being disturbed.

If bleeding does not stop with this first aid, or if it starts again, get medical help.

First Aid for Bleeding from the Scalp

Bleeding from the scalp is often severe and may be complicated by a fracture of the skull or an embedded object. Avoid direct pressure, probing, and contaminating the wound.

To give first aid for bleeding from the scalp, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Apply a thick, sterile dressing and bandage it firmly in place with a head bandage.
3. If there is a suspected underlying skull fracture, give first aid for a fracture of the skull.
4. If there is an embedded object, apply dressings around the object to maintain pressure around but away from the wound.
5. Give ongoing casualty care.

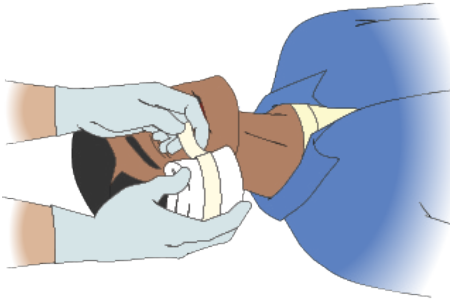


First Aid for Bleeding from the Ear

Do not try to stop the bleeding from the ear canal by placing pressure on the ear or by packing it with dressings. To reduce the risk of infection inside the ear, it is best to let the blood drain away.

To give first aid for bleeding from the ear, perform the following steps:

1. Perform a scene survey and assess the mechanism of injury. If you suspect a head or spinal injury, tell the casualty not to move. Perform a primary survey.
2. Assess the bleeding from the ear. If the blood from the ear is mixed with straw-coloured fluid, suspect a skull fracture. Steady and support the head and neck. Place a dressing lightly over the ear and give first aid for a skull fracture. The dressing will absorb the blood and protect the wound.



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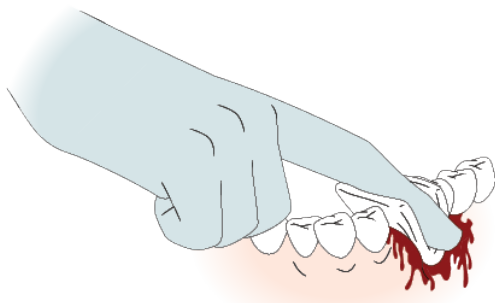
3. If a head or spinal injury is not suspected, lightly tape a dressing over the ear. Position the casualty to allow the blood to drain from the ear if injuries permit. If the casualty is unconscious and injuries permit, put dressings over the ear and place them in the recovery position with the injured side down.
4. Give ongoing casualty care.

First Aid for a Knocked-Out Tooth

A knocked-out tooth can be re-implanted if the casualty receives medical/dental help quickly.

To give first aid for a knocked-out tooth, perform the following:

1. Perform a scene survey and assess the mechanism of injury. If you suspect a head or spinal injury, tell the casualty not to move. Perform a primary survey.
2. Apply direct pressure to stop the bleeding from the socket of the tooth. Seat the casualty with their head forward so blood can drain out of their mouth.



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3. Give ongoing casualty care.

Place the knocked-out tooth into one of the following (listed from most preferred to least preferred) to protect the tooth and root until it can be re-implanted:

- Balanced salt solution (such as oral rehydration salt solutions (ORS) available from pharmacies and is used to treat dehydration due to diarrhea, Hank's Balanced Salt Solution (HBSS) available through medical supply companies. Consider having this substance on hand if you are involved with an activity where there is a high chance of a knocked-out tooth.
- Propolis, also known as bee glue. Usually available in health food stores. The concentration should be 0.04 to 2.5 mg of 0.4% ethanol per ml.
- Egg white
- Coconut Milk
- Ricetral
- Whole Milk
- Saline

- Phosphate buffered saline
- The casualty's own saliva

Do not use tap water, coconut water, skim milk, buttermilk, castor oil, or turmeric extract. These do not provide suitable protection for the tooth and may cause damage.

For reimplantation of a knocked out tooth, the casualty must seek urgent care from a dentist, not an emergency room. However, if the injury is an isolated dental injury and there are no concerns about brain, facial, neck or other injuries, seek the care of a dentist.

First Aid for Bleeding from the Mouth

When there is bleeding from the gums or mouth, first assess the mechanism of injury to determine if there is a chance of a serious head and/or spinal injury. Make sure the bleeding in the mouth doesn't block the airway.

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Control the bleeding in the mouth using direct pressure over a clean, preferably sterile, dressing. Do not wash out the mouth after bleeding has stopped, as this may dislodge clots and cause bleeding to start again.

The casualty may suck on an ice cube or a Popsicle to help control swelling.

MANAGING EYE INJURY EMERGENCIES

The eye can be injured very easily; proper first aid given right away may prevent partial or complete loss of eyesight. Tears may not be enough to loosen and wash away irritating particles on the eye.

Some signs and symptoms that will indicate an injury to the eye include:

- Pain (mild to severe) usually starting a few hours after the incident
- Redness to the eyes
- Blurred or double vision
- Photosensitivity
- Watery eyes
- Excessive tearing
- Feelings of grit or a particle under the lid
- Broken blood vessels or red spots
- Bleeding
- Clear, thick fluid coming from the eye
- Deformities to the eyes (lacerations, abrasions, or broken bones around the eye)
- Loss of vision

Examining the Eye to Assess Injury

To examine the eye to determine the extent and nature of injury, consider and perform the following as required:

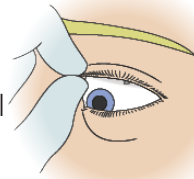
- Assess the injured eye(s) for equal gaze (eyes appear the same and move in the same direction) equal pupil shape and response, presence of a foreign body, fluid/blood draining from the eye, swollen or lacerated eyelids, bright red conjunctiva, etc.
- If the injury is the result of an Arc flash, protect the eyes from light. For example, eye patches may be used or cool wet (saline solution) compresses for pain relief.

- Do not delay care to remove contact lenses.
- Transport the casualty to medical care for further assessment and treatment or call.
- Call 9-1-1 for help.

Examining the Eye for Loose Particles

To examine the eye to determine the extent and nature of injury, perform the following steps:

1. Seat the casualty facing a good light and steady their head.
2. Instruct the casualty to look to the left, right, up, and down. A penlight (or cell phone flashlight) directed across the eye will cause a shadow to appear if the particle is in the path of the light, making it easier to see.
3. To examine under the upper and lower lids, gently pull down on the lower lid and ask the casualty to look up. To examine under the upper lid, gently pull up on the lashes and ask the casualty to look down. Use your penlight (or cell phone flashlight) to check under the lids.
4. If you locate the particle, remove it gently using the moist corner of a facial tissue, clean cloth, or cotton-tipped applicator. Do not try to remove a particle that is stuck to the eye or is located on the coloured part of the eye.
5. If the casualty is wearing contact lenses, have them remove the lens before trying to remove a particle from the eye.
6. Do not attempt to examine the eye if there are burns or injuries to the eyelid.



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Removing a Loose Foreign Particle

To remove a loose foreign particle from the eye, perform the following steps:

1. Begin by asking the casualty where they feel the particle is located.
2. If it feels like the particle is under the upper lid, instruct the casualty to grasp the upper eyelashes and pull the lid straight out and then down over the lower eyelashes to try to sweep the particle away.
3. Try this several times. Remember to remove excess eye makeup before attempting this procedure.
4. If the particle is still in the eye, try flushing it out using clean running water from a tap, an eye cup, or eye wash bottle.
5. If the above methods have not been successful, you will need to examine the surface of the eye and under the lids.

If removing the particle is unsuccessful, perform the following steps:

1. Warn the casualty not to rub their eye because this may cause pain and tissue damage.
2. Close the casualty's eye and cover the affected eye with an eye or gauze pad. Extend the covering to the forehead and cheek to avoid pressure on the eye.
3. Secure lightly in place with a bandage or adhesive strips. Make sure there is no pressure on the eyeball.
4. Give ongoing casualty care and get medical help.

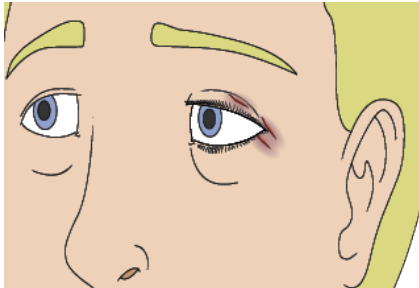
First Aid for Injuries to the Soft Tissues Around the Eye

Wounds to the eyelid and soft tissue around the eye are serious because there may be injury to the eyeball. Blows from blunt objects may cause bruises and damage the bones that surround and protect the eyes.

Cover only the most seriously injured eye to avoid the increased anxiety that the casualty may experience if both eyes are covered. This leaves the casualty able to walk on their own. If both eyes must be covered due to serious injury (e.g., intense light burn from arc welding), reassure the casualty often by explaining what is being done and why. This casualty must be carried.

First Aid for Lacerations and Bruises Around the Eye

Lacerated eyelids usually bleed profusely because of their rich blood supply. A dressing on the area will usually control bleeding.



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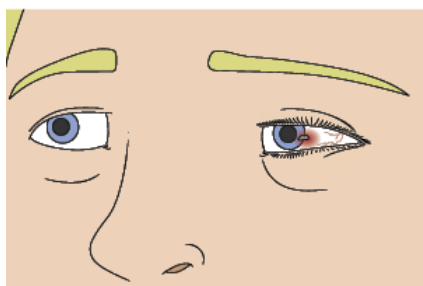
Never apply pressure to the eyeball, as this may force fluid out of the eyeball and cause permanent damage to the eye.

First Aid for an Embedded Object in or Near the Eyeball

Give first aid for an embedded object in or near the eyeball. As for any embedded object, prevent the embedded object from moving, since movement could cause further damage to the eye-ball.

To give first aid for an embedded object in or near the eyeball, perform the following steps:

1. Perform a scene survey and call 9-1-1.
2. Perform a primary survey.
3. Have a bystander support the head.
4. Place dressings, preferably sterile, around the embedded object.
5. Place padding or dressings around the object in a log cabin fashion, to stabilize the object.



6. Make sure there is no pressure on the eyeball.

First Aid for an Extruded Eyeball

An extruded eyeball has been thrust out of its socket. Do not try to put the eye back into position.

To give first aid for an extruded eyeball, perform the following steps:

1. Perform a scene survey and primary survey.
2. Have a bystander support the head.
3. Gently cover the eyeball and socket with a moist dressing. Hold this in place with tape and more dressings.
4. Give ongoing casualty care until handover.

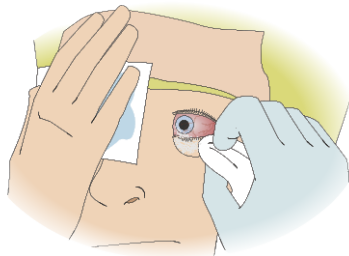


First Aid for a Chemical Burn to the Eye

The eyes can be permanently injured by corrosive chemicals in either solid or liquid form. Casualties normally suffer intense pain and are very sensitive to light.

To give first aid for a chemical burn to the eye, perform the following steps:

1. Perform a scene survey and have a bystander support the head.
2. Perform a primary survey.
3. Sit or lay the casualty down. If only one eye is injured, protect the uninjured eye.
4. If the chemical is a dry powder, brush away any excess off the casualty's face with a gloved hand or cloth and remove contaminated clothing.
5. Flush the injured eye with cool water or sterile saline solution for at least 15 minutes. Since pain may make it hard for the casualty to keep the eye open, gently open the eye with your fingers.
6. Cover the injured eye with dressings. If both eyes are injured, cover the more seriously injured eye. Only cover both eyes if the casualty is more comfortable that way. Covering both eyes blinds the casualty and adds to their stress. If you do cover both eyes, keep the casualty lying down.



7. Give ongoing casualty care.
8. Transport the casualty to medical care for further assessment.

When working with chemicals, know where to find Safety Data Sheets (SDS) and refer to them for guidance with first aid.

Considerations for when the casualty is wearing contact lenses

Do not waste time trying to remove contact lenses. Flush the eyes for 15 minutes. This may wash out any debris from the lenses. If not, have the casualty remove them. Lenses exposed to chemicals should be thrown away (so it does not matter if they are washed away during flushing).



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When there is a risk of eye injury from chemicals, proper eye wash equipment should be kept nearby.

First Aid for Intense Light Burns to the Eye

Burns to the eyes may be caused by prolonged exposure to intense light, such as direct or reflected sunlight, or a short duration event, like the flash from an arc welder. Snow blindness is a common injury of this kind. As with a sunburn, the casualty may not feel the tissue damage happening but will develop symptoms several hours after exposure. Signs and symptoms include:

- Sensitivity to light
- Pain
- Redness
- Watery eyes
- Blurred vision
- A gritty feeling in the eyes

To give first aid for intense light burns to the eye, perform the following steps:

1. Perform a scene survey.
2. Perform a primary survey.
3. Cover the eyes to cool them and keep the light out. The casualty will be temporarily blinded, so reassure them often.
4. Give ongoing casualty care.
5. Transport the casualty to medical care for further assessment.

MANAGING BURN EMERGENCIES

Burns are injuries to the skin and other tissues caused by heat, radiation, or chemicals. They are a leading cause of injury in the home. Young children and elderly people are especially at risk of being burned, and at these ages, burn injuries can be serious.

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Heat burns (also called thermal burns)

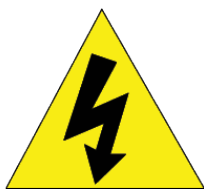
Burns from heat applied to the body are the most common of burns. A scald is a heat burn caused by hot liquid or steam.

Heat burns can also be caused by friction.



Chemical burns

Chemical burns are often serious because the chemicals continue to burn while they remain on the skin. Examples of chemicals that can burn include acids or alkali metals.



Electrical burns

Electrical burns result from contact with an electric current. Although it is heat that causes these burns, electrical burns are considered separately because of the complications caused by the electricity.

Radiation burns

Most people have experienced a radiation burn in the form of sunburn, where the sun is the source of radiant energy.

Other types of radiant energy that can cause burns include X-rays, arc welder s flash, and radiation from radioactive material.

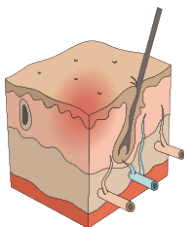
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Burn Severity and Depth

Burns are classified as critical (full thickness), moderate (partial thickness), or mild (superficial) depending on:

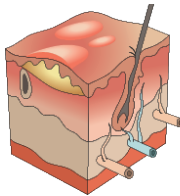
- The depth of the burn
- The amount of body surface that is burned
- The part(s) of the body that is/are burned
- The age and physical condition of the casualty

For a mild or superficial burn, only the top layer of the skin is damaged. Signs include:



- Skin colour is pink to red
- Slight swelling
- Skin is dry
- Tenderness to severe pain in the injured area

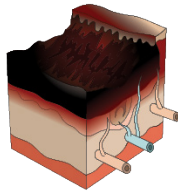
For a moderate or a partial thickness burn, the top two layers of the skin are damaged. Signs include:



- Skin looks raw and is mottled red
- Skin is moist and ranges in colour from white to cherry red
- Blisters containing clear fluid
- Extreme pain

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For a critical or full thickness burn, the full thickness of the skin, including tissues under the skin, is damaged. Signs include:



- Skin is pearly white, tan-coloured or charred black
- Skin is dry and leathery
- You may see blood vessels and bones under the skin
- Little or no pain (nerves are destroyed)

A first aider can quickly estimate how much body surface area has been burned using the rule of nines. The body is divided into areas of either nine or eighteen percent of total body area. Add these areas to quickly calculate the percentage of the body that is affected. The percentages change slightly for a child's body.



The rule of nines for an adult is as follows:

- 9% Head and neck together
- 9% Each arm
- 18% Front surfaces of the trunk
- 18% Rear surfaces of the trunk
- 1% Genitalia
- 18% Each leg

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The rule of nines for a child is as follows:

- 18% Head and neck together
- 9% Each arm
- 18% Front surfaces of the trunk
- 18% Rear surfaces of the trunk
- 14% Each leg



Another way to estimate burned area is using the casualty's palm. The area of the casualty's palm equals one percent of the casualty's body surface area. With this information, you can estimate the percentage of the body that is burned.

Critical Burns

The burns that are critical, that may be life-threatening, or can cause lifelong disability or disfigurement include:

- Any burn that interferes with breathing, inhalation injuries.
- Any burn where there is also a serious soft tissue injury or fracture.

- Any burn where the skin bends, including the hands, elbows, knees, etc.
- All electrical burns, because of internal injuries or cardiac compromise.
- Most chemical burns.
- Burns to casualties under two or over fifty years of age, as they do not tolerate burns well.
- Burns to casualties who have serious underlying medical conditions including diabetes, seizure disorders, hypertension, respiratory difficulties, or mental illness.

Complications of Burns

Common complications of burns include:

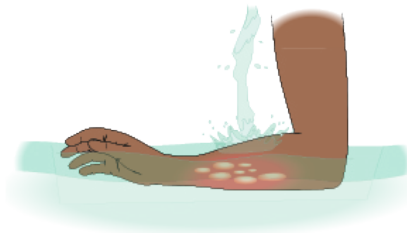
- Shock caused by the loss of blood or blood plasma to the surrounding tissues.
- Infection, because burned skin is not a good barrier to bacteria.
- Breathing problems if the face or throat is burned, or the casualty has inhaled smoke, fumes, or steam.
- Swelling, as clothing and jewelry will cut off circulation when the area swells.

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First Aid for General Thermal (Heat) Burns

To give first aid for a thermal (heat) burn, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Cool the burn right away by immersing it in cool water if possible.
3. If you are unable to immerse the burn in cool water, pour cool water on the area, or cover it with a clean, wet cloth.



4. Cool the burn until the pain has lessened. This will reduce the temperature of the burned area, and reduce tissue damage, swelling, blistering, and relieve the pain.
5. Remove jewelry and tight clothing before the injury swells. Don't remove anything that is stuck.
6. When the pain has lessened, loosely cover the burn with a clean, lint-free dressing. If the area is large, use a sheet.
7. Give ongoing casualty care.

First Aid for Chemical Burns

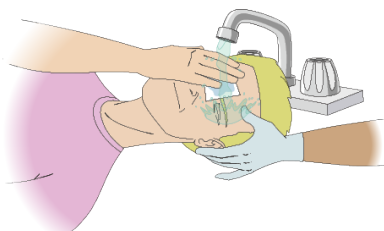
A corrosive chemical will keep burning as long as it is on the skin.

The faster you get the chemical off the skin, the less tissue damage there will be.

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To give first aid for chemical burns, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Flush the area with large amounts of cool water. Remove contaminated clothing while flushing. If the chemical is a dry powder, quickly brush off any loose chemical with a cloth before flushing.



3. Continue flushing the area with water for 15 to 20 minutes.
4. When the pain has lessened, loosely cover the burn with a clean, lint-free dressing.

5. Give ongoing casualty care.
6. Transport the casualty to medical care for further assessment.

If you work with chemicals, make sure you know the specific first aid for the chemicals in your workplace. The safety data sheet (SDS) for each chemical contains this information.

Have a copy of the SDS to send to the hospital with the injured worker if possible. If you work with chemicals at your place of employment, you must be certified in WHMIS/GHS.

A corrosive chemical will keep burning as long as it is on the skin.

The faster you get the chemical off the skin, the less tissue damage there will be.

In some workplaces that regularly work with dangerous materials, there should be shower access so it's important to know these locations.

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First Aid for Electrical Burns

Electrical burns can be either flash burns or contact burns.

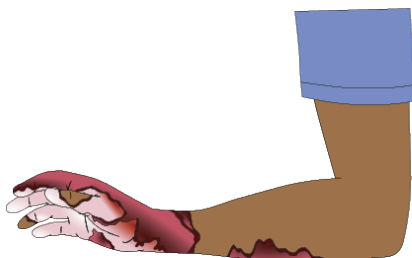
A flash burn results when high-voltage electricity arcs (jumps) from the electric source to the casualty. When the electricity arcs, it produces intense heat for a very short time and this heat causes burns, which can be very deep. The force can throw the casualty as well. Head/spinal injuries, fractures or dislocations may be present.

In a contact burn, electricity travels through the body. The body may be burned at both the point where the electricity entered the body and where it exited. There may also be severe tissue damage inside the body, along the path the electricity followed.

An electrical current going through the body can cause breathing to stop and/or the heart to stop. There is also the danger of electrical injury to the first aider.

To give first aid for an electrical burn, perform the following steps:

1. Perform a scene survey, then a primary survey. Make sure there is no further danger from electricity; call the power company or other officials to make the scene safe. If high voltages are involved, all you can do is keep others out of the area until the power is shut off.
2. Does it look like the casualty was thrown? If so, suspect a head or spinal injury.



3. Perform a secondary survey to locate burns and any fractures, dislocations, etc. Look for both entry and exit burns.
4. Give first aid for the burns by covering them with clean, dry dressings.
5. Give first aid for any fractures or dislocations.
6. Give ongoing casualty care.

Consideration for when power lines are down

In a case where power lines are down, adhere to the following:

- If there is a possibility of a downed power line or a weakened pole, do not leave your vehicle until you have inspected the surrounding area for downed power lines.

- Stay inside your vehicle if it is touching power lines. Wait for authorities to arrive, then follow their instructions.
- If you suspect or see any downed power lines, do not allow anyone to enter the area. When you secure the area from anyone entering, notify the power company. Downed power lines pose a significant invisible hazard for which you must be aware.
- With high voltages, electricity can travel through the ground, energizing the area around the power lines. If the soles of your feet tingle as you enter an area, you have gone too far. Get back! A technique is to shuffle your feet as you move away from the source.¹¹ Voltage decreases as distance from the wire touching the ground in creases. If you run or take large steps, you could conduct electricity from one leg at one voltage to another leg at another voltage, which increases the potential for severe injury or even death.
- Assume all downed power lines are live. A high voltage wire may be unpredictable. It may jump to an object for a better ground. Stay well away from any wires.
- Remember that vehicles, guardrails, metal fences, etc., conduct electricity.

First Aid for Radiation Burns

Radiation burns can come from a radioactive source, such as in a lab or nuclear power plant; from X-rays or other radiation-based medical equipment; or, most commonly, from the sun. A sunburn is the most likely radiation burn a casualty will experience.

Sunburns can range in severity from those that are mildly uncomfortable to those that are serious because they cover a large area of the body and can be complicated by heatstroke.

To give first aid for a minor sunburn, perform the following steps:

1. Get the casualty out of the sun.
2. Perform a scene survey and primary survey.
3. Gently sponge the burned area with cool water or cover with a wet towel to relieve the pain. Repeat this step as needed to relieve pain.
4. Pat the skin dry and apply a medicated sunburn ointment if available. Apply the lotion according to directions on the package.
5. Protect burned areas from further exposure to the sun.
6. Don't break any blisters, as doing so may promote infection. If large areas of the skin begin to blister, get medical help.
7. If the casualty begins to vomit, or develops a fever, give first aid for heat injuries and get medical help.

First aid for burns from X-rays and nuclear radiation There is no specific first aid for radiation burns from X-rays or radioactive material. Give first aid following the guidelines for first aid for heat burns. In an environment where there is radioactive material, protect yourself accordingly.

How to put out a fire on your clothes

If your clothing catches fire:

1. Stop moving. Don't run. This will only fan the flames.
2. Drop to the ground.
3. Roll several times to put the flames out.

How to extinguish a clothing fire:

If your clothes catch fire:

1. **Stop** moving.



2. **Lower your body** to the ground.



3. **Roll** on the ground until the flames are extinguished.



Chapter 09

Bone, joint, and
muscle injuries

INTRODUCTION

Injuries to bones, joints, and muscles are common and, although they are usually not life threatening, they can be painful and debilitating. Appropriate first aid for these injuries can reduce the pain and prevent further injury.

THE SKELETAL SYSTEM

The musculoskeletal system is made of up bones, ligaments, tendons, and muscles. These parts work together to keep us upright and allow us to move around.

Bones come in various shapes and sizes and provide the structure for the body. Where two bones come together, it is called a joint.

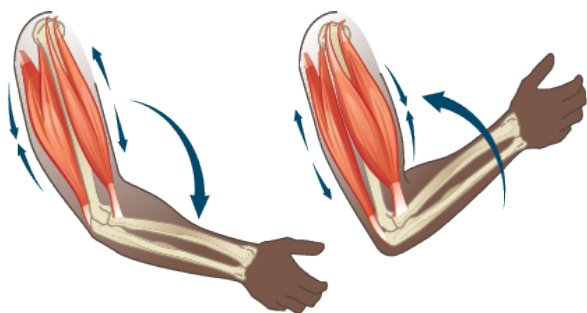
Joints are either movable (such as your arm) or fused (such as your skull). Bones at a joint may move like a hinge (such as the elbow), or by sliding past each other (such as the wrist), or rotate like a ball in a socket (such as the hip).

Ligaments hold bones together at joints and can stretch and retract as we move.

Tendons attach muscles to the bones and aid in movement.

Muscles are fibrous tissue that work in pairs to move the body through contraction and relaxation. For example, to flex your arm (bend at the elbow), your bicep will contract while the triceps relax. To extend your arm (straighten the elbow), the bicep relaxes and the triceps contract.

A diagram of the major bones and muscles is available in the Appendix, "Main Bones of the Skeleton".

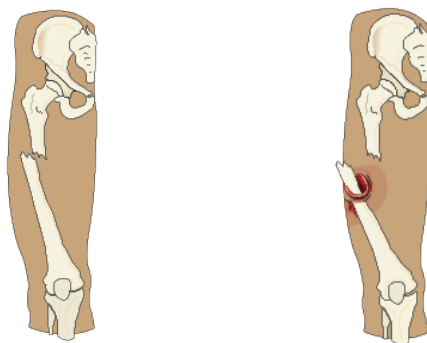


FRACTURES

A break or crack in a bone is called a fracture. A fracture is either closed or open:

- A closed fracture is where the skin over the fracture is not broken.
- An open fracture is where the skin over the fracture is broken. This could lead to a serious infection, even if the wound is very small.

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- A fracture can be caused by a direct force (e.g., a punch or kick), an indirect force (e.g., a fall), or by a twisting force. Certain bone diseases, such as osteoporosis, make bones very brittle and they can break without much force.

One or more of the following signs and symptoms will be present when a bone is fractured:

- Pain and tenderness - This becomes worse when the injury is touched or moved
- Loss of function – The casualty cannot use the injured part
- A wound – The bone ends may be sticking out
- Deformity – Any unnatural shape or unnatural position of a bone or joint
- Unnatural movement
- Shock – This increases with the severity of the injury
- Crepitus – A grating sensation or sound that can often be felt or heard when the broken ends of bone rub together
- Swelling and bruising – Fluid accumulates in the tissues around the fracture

DISLOCATIONS AND SPRAINS

Ligaments connect bones to other bones to form joints, while tendons connect muscles to bones. Ligaments limit the range of movement, support the joint in motion, or prevent certain movements altogether. Joints may be injured when the bones and surrounding tissues are forced to move beyond their normal range. When that happens:

- The bones may break, resulting in a fracture
- The ligaments may stretch or tear, resulting in a sprain
- The bone ends may move out of proper position, resulting in a dislocation



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Sprains

A sprain is an injury to a ligament and can range from a stretched to a completely torn ligament. Be cautious and give first aid as if the injury is serious to avoid further damage and pain. Sprains of the wrist, ankle, knee, and shoulder are most common.

The signs and symptoms of sprains may include:

- Pain that may be severe and increase with movement of the joint
- Loss of function
- Swelling and discolouration

Dislocations

A dislocation is when the bones of a joint are not in proper contact. A force stretches and tears the joint capsule, causing the dislocation. Once this occurs, the bones can put pressure on blood vessels and nerves, causing circulation and sensation impairments below the injury. The most commonly dislocated joints are the shoulder, elbow, thumb, fingers, jaw, and knee.

The signs and symptoms of a dislocation are similar to those of a fracture, and may include:

- Deformity or abnormal appearance (a dislocated shoulder may make the arm look longer.)
- Pain and tenderness aggravated by movement
- Loss of normal function; the joint may be locked in one position
- Swelling of the joint

General first aid for injuries to bones and joints

The aim of first aid for bone and joint injuries is to prevent further tissue damage and to reduce pain.

To give general first aid for injuries to bones and joints, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Steady and support any obvious fractures or dislocations found in the primary survey (during the rapid body survey).
3. Perform a secondary survey as needed and gently expose the injured area. You may have to cut clothing to do this without moving the injured part. Examine the entire injured area to determine the extent of the injury.
4. Check the circulation below the injury. If circulation is impaired, medical help is needed urgently.
5. Steady and support the injured part and maintain support until medical help takes over, or the injury is immobilized. Protect protruding bones. Do not push the bone ends back in. Do not attempt to pull on a limb (apply traction) or manipulate it in any way.

If medical help is on the way and will arrive soon, steady and support the injury with your hands until they arrive.

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If medical help will be delayed, or if the casualty needs to be transported, immobilize the injury. Consider the following when making your decision:

- Are there other risks to the casualty? Are there risks to yourself or others?
- If medical help can get to the scene, how long will it take?
- Do you have materials to immobilize the injury properly?
- How long will it take to immobilize the injury compared to how long it will take medical help to arrive?
- Apply cold to the injury, as appropriate.
- Give ongoing casualty care until medical help arrives. Monitor circulation below the injury site.



Use R.I.C.E for injuries to bones, joints and muscles

Most injuries to bones, joints and muscles benefit from

R.I.C.E., a mnemonic for:

- **R** Rest
- **I** Immobilize
- **C** Cold
- **E** Elevate

Use R.I.C.E while waiting for medical help to arrive or while transporting a casualty to medical help. Even minor injuries will benefit from R.I.C.E.

Rest means stopping the activity that caused the injury.

Most casualties will do this themselves due to the pain from movement. Casualties should be assessed and follow their doctor's directions for recovery.

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Immobilize means suspecting a fracture whenever there is an injury to an arm or a leg and taking steps to prevent movement of the injured limb. Immobilization may mean using a sling for a shoulder joint injury or a splint to immobilize the joint above and below the injury.

Cold means applying cold to the injury as soon as you can once the injury has been immobilized. The cold narrows the blood vessels, reducing pain, swelling and bruising.

Use a commercial cold pack, an improvised ice pack, or a cold compress. Apply cold over the entire injured area for approximately 15 minutes at a time, with a break of 15 minutes. Monitor the area to avoid causing frostbite from the ice.

Elevate means raising the injured part if possible. Only elevate if it will not cause more pain or harm to the casualty. Elevation helps to reduce swelling and makes it easier for fluids to drain away from the injury. This in turn, helps reduce swelling. Do not elevate a locked joint.



FIRST AID FOR SPECIFIC BONE AND JOINT INJURIES

The following section outlines the first aid procedures for collarbone, shoulder, arm, elbow, leg, knee, ankle, and foot or toe bone and joint injuries.

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Collarbone/Shoulder Blade and Arm Fractures

Signs and symptoms of a collarbone/shoulder blade fracture include:

- Pain at injury site
- Swelling and deformity
- Loss of function of the arm on the side of the injury
- Casualty holds and protects the arm if they can, and may tilt the head to the injured side



A possible complication is that circulation to the arm below the injury may be impaired or cut off.

First aid for a fractured collarbone or shoulder blade

Check circulation below the injury. If circulation is impaired, get medical help quickly. To give first aid for a fractured collarbone or shoulder blade, perform the following steps:

1. Immobilize the arm in the position that is most comfortable. A St. John tubular sling may work.
2. Secure the arm to the chest with a broad bandage to prevent movement of the arm. Place padding under the elbow, if necessary, to keep the arm in the most comfortable position. Tie the bandage on the uninjured side. Do not tie it so tightly that the arm is pulled out of position. Place padding under the knots for comfort.
3. Check circulation below the injury. If circulation is impaired, and it was not before, loosen the sling and bandage.

09 First aid for a dislocated shoulder

Immobilize the limb in the position that is most comfortable. This is usually in the position found.

To immobilize a dislocated shoulder, if the arm will bend, perform the following steps:

1. Use a St. John tubular sling to transfer the weight of the arm to the other side.
2. Use broad bandages to prevent movement.
3. Place a pad under the elbow for support.

To immobilize a dislocated shoulder, if the arm will not bend, perform the following steps:

1. Support the weight of the arm with a cuff and collar sling. Bandage the arm to the body to prevent movement.
2. Place padding under the elbow, if necessary, to keep the arm in the most comfortable position.
3. The casualty may want to hold the injured arm.

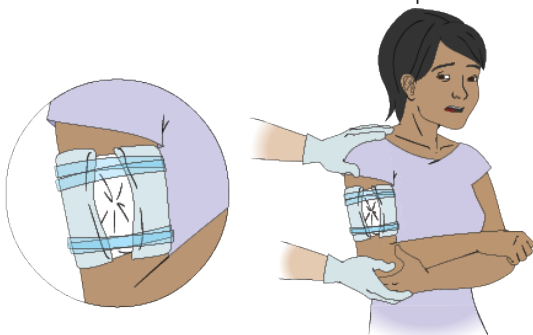
The success of the method you use depends on whether it stops the injured limb from moving, as movement could cause pain and further injury. Once the injury is immobilized, apply cold to help reduce pain and swelling, provided the casualty can tolerate the added weight.

Monitor circulation below the injury frequently by checking the skin colour and temperature, using a nail bed test, and checking for a pulse. Compare the injured side with the uninjured side. If circulation becomes impaired after immobilizing the injury, loosen the bandages. If circulation remains impaired, get medical help quickly.

First aid for a fractured upper arm

To immobilize an open fracture of the upper arm (humerus), perform the following steps:

1. Expose the injury site. Cover the wound with a sterile dressing and check circulation.
2. Pad and bandage the dressings. Place padding lengthwise on both sides of the fracture site. Padding should be bulky enough to protect any protruding bone ends. Hold the padding in place with tape and then bandage dressings tightly enough to hold padding and dressings in place.
3. An arm sling provides full support for the arm. Broad bandages above and below the fracture site prevent arm movement. Place padding under the elbow as needed to hold the arm in the most comfortable position.



First aid for an injured elbow

The elbow can be severely sprained, fractured, or dislocated. Immobilize the injury in the position found, if possible, or in the position that is most comfortable.

To give first aid for an injured elbow, perform the following steps:

1. Expose the injury and look for any open wounds. Check circulation below the injury and compare it with the other side. If circulation is impaired, get medical help quickly.
2. If the elbow is bent so the arm is in front of the chest, immobilize the arm in an arm sling. Leave the sling loose at the elbow. Place a pad under the elbow, if necessary, to keep the arm in the most comfortable position and use a broad bandage to limit movement.
3. If the elbow will not bend, support the arm at the wrist and use broad bandages and padding to immobilize the arm. Check circulation below the injury and compare it with the other side. If it is impaired, and it was not before, adjust the sling and/or bandages.



First aid for a fracture of the forearm or wrist

To give first aid for a fracture of the forearm or wrist, perform the following steps:

1. Examine the injury and decide the best position for splinting. This is usually in the position found. Have the casualty or a bystander steady and support the injured arm.

2. Measure the splint against the uninjured arm to make sure it is the right size. Pad the splint for comfort and to support the fracture. Position the arm on the splint with as little movement as possible.
3. Once the splint is in position, have the casualty or bystander support it while you secure the splint.
4. Start above the injury and bandage the splint and the arm snugly, but not too tightly. Leave the fingertips visible so you can check circulation below the injury and bandages.
5. Use an arm sling to support the arm and hand, and prevent movement of the elbow with the fingertips exposed so you can check circulation.



First aid for an injured hand

When you suspect bones in the hand are fractured, perform the following steps:

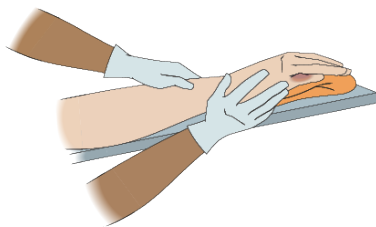
1. Examine the injured hand and decide the best position for splinting. This is usually in the position of function. Have the casualty or a bystander steady and support the injury. If there are open wounds, place non-stick sterile dressings between the fingers to prevent the fingers from sticking together.
2. Measure the splint against the uninjured hand and arm to make sure it is the right size.



3. Position the arm on the splint with as little movement as possible.

Using a cushion or a pillow as a splint

Using a cushion or pillow as a splint works well because it lets the hand rest in the position of function and it is padded but also firm. It fully supports the wrist and lower arm.



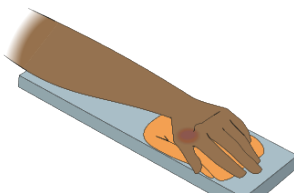
To use a cushion or a pillow as a splint, perform the following steps:

1. Secure the pillow with 2 broad bandages, making sure there is no pressure on the hand.
2. Leave fingertips visible to check for circulation.

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Using a board as a splint

A board works well because it is rigid, but you must use padding to keep the hand in the position of function.



To use a board as a splint, perform the following steps:

1. Secure the splint with a roller bandage. Leave fingertips visible to check for circulation.
2. Immobilize the arm in an arm sling tied to keep the lower arm and hand supported.

Position of function

The position of function is the position the uninjured hand naturally takes which is palm down and fingers slightly curled. This position is safer and more comfortable than trying to flatten the hand against a flat surface.

First aid for an injured finger or thumb

To give first aid for an injured finger or thumb, perform the following steps:

1. Immobilize a fractured or dislocated finger or thumb in the position found.
2. Expose the injury. Check the circulation below the injury.
3. Immobilize the finger or thumb in the most comfortable position, which is usually the position of function. Use a splint, or if a splint is not available, secure the injured finger or thumb to the uninjured finger beside it. Use padding to provide extra support.
4. Put on a St. John tubular sling to keep the injury elevated. Be careful not to put pressure on the injury. Check circulation below the injury.
5. Give ongoing casualty care and get medical help.

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Leg Fractures

The signs and symptoms of a leg fracture include:

- Pain, perhaps severe
- The foot and leg may roll outward
- Deformity and shortening of the leg

A possible complication is internal bleeding, causing severe shock.

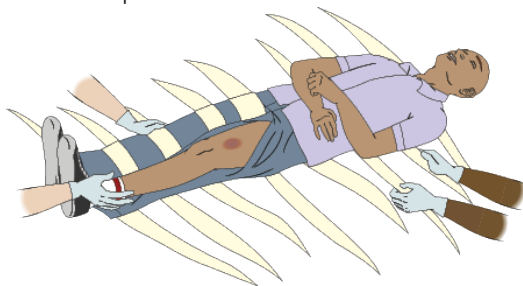


First aid for a fractured upper leg (femur)

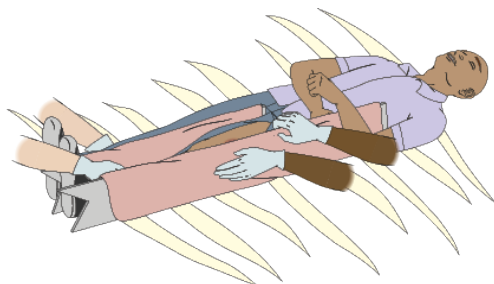
A common fracture of the upper leg is a break at the neck of the femur. This is often referred to as a broken hip, and most commonly happens to elderly people. In a younger, healthy person, great force is needed to fracture the upper leg. Always assess for a head or spinal injury.

To immobilize an injured upper leg (femur), perform the following steps:

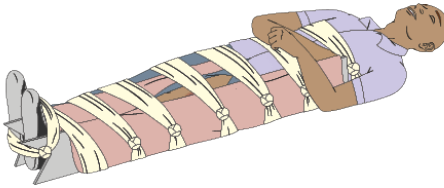
1. If necessary, call 9-1-1.
2. Have a bystander steady and support the injured limb.
3. Gather the splinting materials. Measure the splint(s) against the uninjured leg. Put bandages into position. Pad the splints and position them as shown.



4. Tie the bandages from chest to ankle, from the stable end to the unstable end.
5. Give ongoing casualty care. Get medical help.
6. If you are using a long and a short splint, place bandages at the ankles, calves, knees, above and below the fracture, hips, and chest.



7. Push bandages under the natural hollows of the body and position as shown above.
8. Place splints just below the armpit and just below the groin.
9. Extend both splints below the foot.
10. Tie off all bandages on the splint.



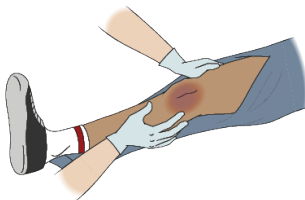
First aid for an injured knee

Have a bystander steady and support the injured leg. Expose and assess the injury. If the leg is bent, keep it in the position of comfort. Depending on the injury, the casualty may be able to straighten the leg with your help. Do not try to straighten the leg if the pain increases or the leg does not move easily. If the leg will not straighten easily or without increased pain, splint in the position found.

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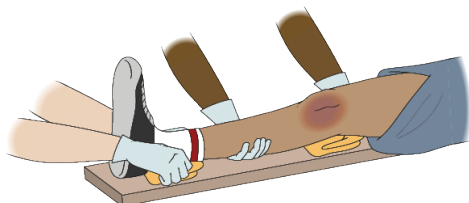
To give first aid for an injured knee, if the leg is straight, perform the following steps:

1. Expose and assess the injury.

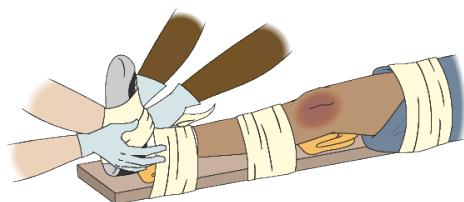


Bone, joint, and muscle injuries

2. Carefully lift the injured leg and position a padded splint.
3. Adjust the padding to fit the natural hollows of the leg.

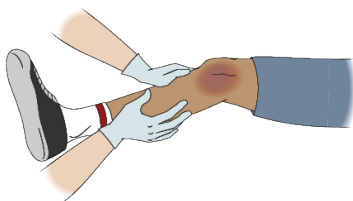


4. Position 2 broad bandages and secure the splint to the leg. Use a third broad bandage to tie a figure 8 knot at the ankle.

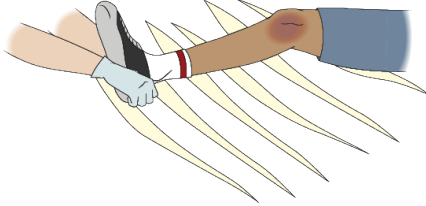


To give first aid for an injured knee, if the leg is bent, perform the following steps:

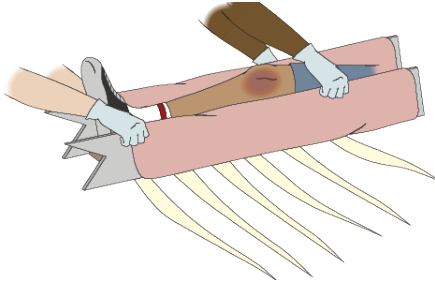
1. Expose and assess the injury.



2. Position five broad bandages under the leg: two above the knee and three below. You will use a sixth broad bandage to tie a figure 8 knot at the ankle.

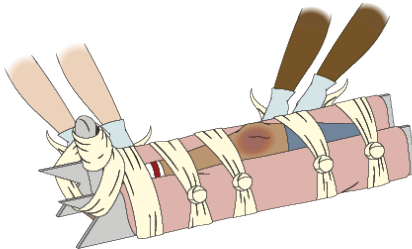


3. Position padded splints on the inside and outside of the leg.



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4. Secure the splint with the bandages, keeping the leg in the bent position.



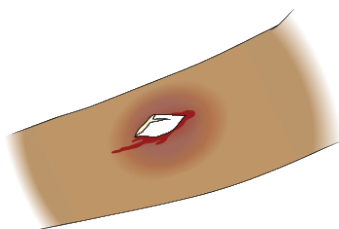
First aid for an open fracture of the lower leg (tibia and/or fibula)

When there is an open fracture, give first aid for the wound first and then immobilize the fracture. For the wound, apply a sterile dressing to prevent further contamination. To stop bleeding from the wound, apply pressure around the fracture, but not on it. Apply a dressing with padding on both sides of the fracture site. Secure this with a broad bandage tied tightly enough to put pressure on the padding. Always check circulation before and after dressing a wound of this type.

A fractured lower leg is a common sports injury and open fractures are common. Immobilize a closed fracture the same way but without the dressings and bandages over the wound.

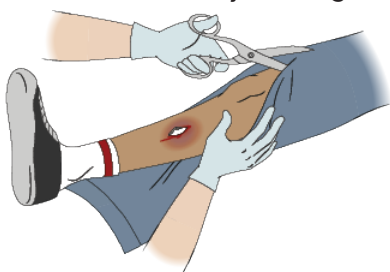
A fracture is open when the skin is broken. The bone may stick out.

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To give first aid for an open fracture of the lower leg, perform the following steps:

1. If necessary, call 9-1-1.
2. Expose the injury. Clothing is removed by cutting to minimize movement of the injured leg.



3. Show a bystander how to steady and support the leg. Check the circulation below the injury. Give first aid for the open fracture wound. Leave the shoe on unless there is a wound to be examined.



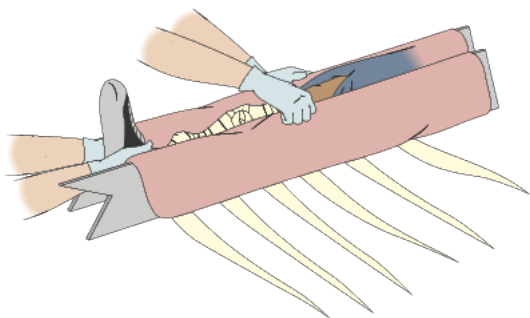
4. Cover the wound with a sterile dressing.
5. The dressing should extend well beyond the edges of the wound. Put bulky padding lengthwise on both sides of the fracture, over the dressing, to protect the bone end, and tape the padding in place.



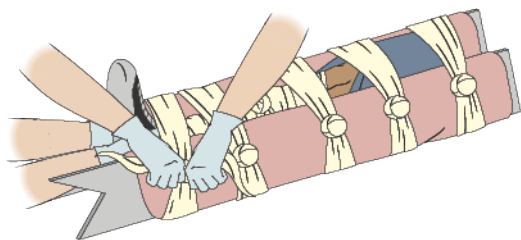
6. Tie a bandage over the padding and dressing tightly enough to put pressure on the padding, but not tightly enough to cut off circulation. Check circulation below the injury once the bandage is tied. Make sure there is no pressure on the bone ends.

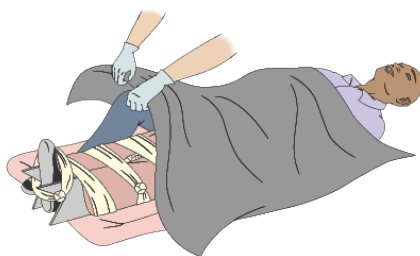
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7. Immobilize the lower leg. Position the bandages and splints. Use splints long enough to extend from the groin to below the foot. The bystander does not let go of the leg until the first aider tells them to, which is after the last bandage is tied. Tie all knots on the splint for comfort. Position broad bandages to be tied at the thigh, knee, above and below the fracture, and at the ankle. Tie the bandages starting at the thigh (the stable end) and working down. The bandage at the ankle is tied as a figure 8.



8. Check the circulation below the injury; give ongoing casualty care. Get medical help.





Providing first aid if you DO NOT have splints

If you do not have splints, perform the following steps:

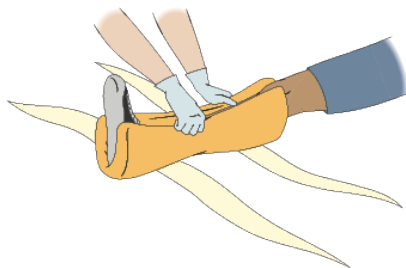
1. Use the uninjured leg as an anatomical splint by tying the legs together.
2. Position padding between the legs (e.g. a rolled-up blanket).
3. Position and tie broad bandages at the thighs, knees, above the injury, below the injury, and at the ankles. Tie a figure 8 at the ankles.
4. Tie knots on the padding for comfort.

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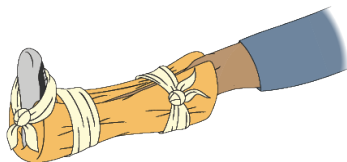
First aid for an injured ankle

The ankle should be immobilized whenever you suspect a sprain or a fracture. If the injury does not seem serious, or if the journey to medical help will be smooth, use a blanket splint or pillow splint to immobilize the ankle:

1. Check circulation below the injury.
2. Loosen footwear and immobilize the ankle with a pillow or rolled-up blanket and two broad bandages. Make sure the splint extends beyond the ankle.



3. Secure the pillow with two broad bandages. Use a figure 8 knot at the ankle.



4. Check circulation below the injury. Give ongoing casualty care and get medical help.

First aid for an injured foot or toe

To give first aid for an injured foot or toe, perform the following steps:

1. Check circulation below the injury.
2. Immobilize the ankle using a double figure 8:
 - Untie shoelaces and tie the first figure 8 beginning at the sole of the foot and tying toward the leg.
 - Tie the second figure 8 by wrapping the ends around the leg, crossing in front of the ankle, and tying off on the sole of the foot. Tie off at the sole.



3. Immobilize a fractured toe by taping it to the uninjured toe beside it. Keep checking circulation, as the injured area may swell.

STRAINS

When a muscle or tendon is moved beyond its normal range, it results in a strain, which is a stretch or tear injury.

The signs and symptoms of a strain often show up many hours after the injury.

- Sudden sharp pain in the strained muscle
- Swelling of the muscles, causing severe cramps
- Bruising and muscle stiffness
- Casualty may not be able to use the affected body part (loss of function)

First aid for strains

To give first aid for strains, perform the following steps:

1. Perform a scene survey and a primary survey. Have the casualty stop the activity that caused the injury.
2. Place the casualty in a position that is comfortable and assess the injury. If there is loss of function, immobilize the injury as for a fracture. Manage with R.I.C.E.
3. Give ongoing casualty care. Get medical help. Position the casualty on their back with knees raised, or any preferable comfortable position at rest.



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Chapter 10

Head and spinal injuries

HEAD INJURIES

The following signs and symptoms indicate a possible fracture of the skull or facial bones, concussion, or compression:

- Deformed skull
- Swollen, bruised, or bleeding scalp
- Straw-coloured fluid or blood coming from the nose or ear(s)
- Bruising around the eyes (black eye) or behind the ears
- Nausea, vomiting, especially in children
- Confused, dazed, possibly combative
- Semi-conscious or unconscious
- Breathing has stopped or respiration is irregular
- Very slow pulse rate
- Pupils are of unequal size
- Pain at the injury site
- Weakened or paralyzed arms and/or legs
- Pain when swallowing or moving the jaw
- Wounds in the mouth
- Knocked-out teeth
- Shock
- Convulsions

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An unconscious casualty with a head injury may vomit. Be ready to turn the casualty to their side (as a unit if possible) and clear the airway quickly.

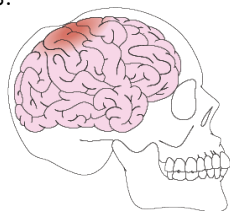
Helmets

Helmets are designed to protect the wearer from fractures. They are not actually designed to protect against concussion or compression injury, but they do reduce the intensity of both conditions. If you see damage to the helmet, you should suspect a concussion or compression injury.

Skull Fractures

Fractures of the skull may be the result of direct force or an indirect force that is transmitted through the bones.

Fractures may occur in the cranium, at the base of the skull, or in the face. Facial fractures include the nose, the bones around the eyes, the upper jaw, and the lower jaw. Fractures of the jaw are often complicated by wounds inside the mouth.



First aid for a head injury

First aid for fractures of the skull depends on the fracture site and the signs. Whenever there is a skull fracture, a spinal injury should be suspected. Give first aid as if there was a neck injury. The head and neck should be immobilized accordingly.

To give first aid for a head injury, perform the following steps:

1. Perform a scene survey. Assess the mechanism of injury. If you suspect that there may be a head injury, tell the casualty not to move and get medical help. Steady and support the head with your hands as soon as possible. Perform a primary survey.
2. If blood or fluid is coming from the ear canal, secure a sterile dressing lightly over the ear, making sure fluids can drain.
3. Protect areas of depression, lumps, bumps, or scalp wounds where an underlying skull fracture is suspected. Avoid pressure on the fracture site.
4. Warn the casualty not to blow their nose if there is blood or fluid coming from it. Do not restrict blood flow. Wipe away any trickling blood to prevent it from entering the mouth, as this could cause breathing difficulties.
5. Give ongoing casualty care until medical help takes over.

First aid for fractures of the facial bones and jaw

To give first aid for fractures of the facial bones and jaw, perform the following steps:

1. Perform a scene survey. If you suspect a head injury, tell the casualty not to move and get medical help. Steady and support the head with your hands as soon as possible. Perform a primary survey. Check the airway and make sure there is nothing in the mouth.
 2. Remove any knocked-out teeth or loose dentures and maintain drainage for blood and saliva.
 3. If there is a suspected head or spinal injury, steady and support the casualty in the position found until medical help takes over.
 4. If there is no suspected head or spinal injury:
 - Place the conscious casualty in a sitting position with their head well forward to allow any fluids to drain freely
 - If the casualty cannot sit comfortably, place them in the recovery position.
 - Place the unconscious breathing casualty in the recovery position.
 5. Get medical help and give ongoing casualty care.
- If transporting the casualty on a stretcher, ensure good drainage from the mouth and nose so that breathing will not be impaired.

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Compression Injuries

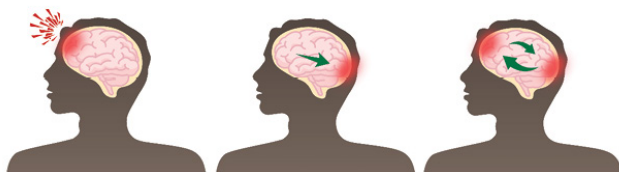
A compression injury occurs when there is a build-up of fluid or blood between the skull and the brain. This build-up puts pressure on the brain, since there is nowhere for the fluid to go. Signs and symptoms will worsen over time as more pressure builds up. It is very important to monitor a casualty after a blow to the head for signs and symptoms of a compression injury, even if the initial injury is minor.

- Loss of consciousness
- Decreasing level of consciousness
- Nausea and vomiting
- Unequal size of pupils
- One or both pupils do not respond to light

CONCUSSION

A concussion is a temporary disturbance of brain function, usually caused by a blow to the head or neck. The casualty may become unconscious but usually for only a few moments. The casualty usually recovers quickly, but there is a chance of serious brain injury.

When the head is in motion and stops suddenly (such as hitting the ground or another person), the brain inside continues to move for a moment and then hits the inside



of the skull. It is possible the brain will even bounce off the inside of the skull and then hit another part of the skull.

When assessing for signs and symptoms of a concussion, it is important to remember that they may not appear right away and could be harder to identify. The signs and symptoms of a milder concussion may be dismissed as another problem.

Signs and Symptoms of a Concussion

Mild Concussion

Severe Concussion

Note: These signs and symptoms may appear several hours after the incident.

Slight headache

Partial or complete loss of consciousness, usually of short duration

Signs and Symptoms of a Concussion

Mild sensitivity to light or sounds

Slow to get up and/or looks confused immediately after the incident

Appears confused or dazed

Shallow breathing

Moves slowly or clumsily

Nausea and vomiting when regaining consciousness

Feels like they re in a fog

Casualty'says they are (or were) seeing stars

Confusion or concentration problems

Loss of memory of events immediately preceding and following the injury

Severe overall headache (not localized scalp pain)

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First Aid for a Concussion

Consider the mechanism of injury and whether spinal immobilization precautions should be taken. Assess the casualty to determine the possible severity. A casualty who has lost consciousness needs medical attention. Call 9-1-1.

For a mild concussion with no loss of consciousness and only mild signs and symptoms (slight memory loss, headache, slight dizziness), the casualty should be seen by a doctor as soon as possible, within 24 hours of the injury.

For a moderate concussion without a loss of consciousness, and demonstrating moderate signs and symptoms (difficulty remembering, headache, blurred vision, etc.), the casualty should be seen by a doctor within a few hours of the injury.

For a severe concussion with any loss of consciousness, or demonstrating severe signs and symptoms (confusion, nausea and vomiting, sensitivity to light, very slow to get up), call 9-1-1 to have the casualty taken to hospital by EMS.

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SPINAL INJURIES

Injury to the spine threatens the spinal cord that runs through it and the nerves that branch out from the cord.

Damage to the spinal cord or nerves can result in complete and permanent loss of feeling and paralysis below the point of injury. In every emergency situation, assess the possibility of a spinal injury. If any possibility exists, give first aid for a spinal injury and get medical help as soon as possible.

Use the history of the scene, especially the mechanism of injury, to decide if there is a chance of a spinal injury. If the history of the scene suggests a spinal injury, give first aid for a spinal injury, even if the signs and symptoms listed below are not present.



- Swelling and/or bruising at the site of the injury
- Numbness, tingling or a loss of feeling in the arms and legs on one or both sides of the body
- Unable to move arms and/or legs on one or both sides of the body
- Pain at the injury site
- Signs of shock

First Aid for a Spinal Injury

The aim of first aid for spinal injuries is to prevent further injury by preventing movement of the injured area. When moving the casualty is necessary, support them in a way that minimizes movement of the head and spine.

To give first aid for a spinal injury, perform the following steps:

1. As soon as you suspect a head or spinal injury, tell the casualty not to move. Steady and support the casualty's head and neck as soon as you can.
2. Show a bystander how they can help support you by:
 - Keeping their elbows on the ground to keep their arms steady.
 - Firmly holding the casualty's head with their fingers along the line of the jaw.
 - Not covering the casualty's ears, as this prevents them from hearing you.

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3. Show a second bystander how to steady and support the feet. The head and feet should be continuously supported until either the casualty is fully immobilized or medical help takes over.



4. Perform a primary survey. If the casualty is unresponsive, check for breathing before opening the airway.
5. Perform a secondary survey as needed.
6. If medical help is going to arrive at the scene, steady and support the casualty in the position found and give on going casualty care. Continue to steady and support the head and feet until help arrives.

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Turning a casualty face up when a head or spinal injury is suspected

To the extent possible, you should give first aid in the position in which the casualty is found. But sometimes you have to turn a casualty over to assess for life-threatening injuries or give lifesaving first aid.

When you suspect a head or spinal injury, turn the casualty as a unit so the head and spine stay in the same relative position.

To turn a casualty face up, perform the following steps:

1. The first aider at the head supports the casualty's head by placing their right hand along the right side of the casualty's head and their left hand along the casualty's left side.
2. The other first aider extends the arm of the casualty that is closest to them over the casualty's head and gets a good grip on the casualty at the shoulder and waist.



3. The two first aiders work together to roll the casualty. The first aider at the casualty's head keeps the head in line with its original position while the second first aider rolls the casualty so that there is no twisting of the body.

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4. If extra help is available, have the third first aider support the legs to prevent twisting of the neck and spine. If a fourth first aider is present, position one first aider at the shoulders and another at the casualty's waist.



PELVIC INJURIES

Signs and symptoms of a pelvic injury include:

- Signs of shock (casualty could be bleeding internally)
- Casualty cannot stand or walk
- Urge to urinate
- Casualty cannot urinate or there is blood in the urine
- Sharp pain in the groin and small of the back
- Increased pain when moving

First Aid for a Pelvic Injury

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Give first aid as you would for a spinal injury. Steady and support the casualty in the position found while waiting for medical help. Stabilize the pelvic area with heavy padding such as blankets on either side.

Following this treatment, due to the risk of aggravating the injury, keep the casualty in the current position, unless immediate intervention is required. When possible, the casualty should not be moved until EMS personnel arrive or as directed by the 9-1-1 operator.

Chapter 11

Mental health awareness

INTRODUCTION

As a first aider, it is likely you may have the opportunity to recognize and respond to a mental health injury. Information in this chapter will assist first aiders and is not intended to provide a solution or diagnosis for a mental health injury.

The key to helping someone with a mental health injury is to be empathetic and patient. First aiders can work collaboratively with the person in need, by changing judgment to curiosity.

WHAT IS MENTAL HEALTH?

The World Health Organization (WHO) defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

Mental health has been defined by the Public Health Agency of Canada as the capacity of each and all of us to feel, think, and act in ways that enhance our ability to enjoy life and deal with the challenges we face. It is a positive sense of emotional and spiritual wellbeing that respects the importance of culture, equity, social justice, interconnections, and personal dignity.

Mental health injuries can be related to the health of a whole person.

STIGMA

Stigma can be defined as a set of negative beliefs and prejudices about a group of people, as well as negative behaviours towards groups of people.

It is important to be aware of stigma and challenge it because according to the Mental Health Commission, 60% of people

with a mental health injury won't seek out the help they need due to the stigma associated with being labelled mentally ill. 22 Mental Health Commission of Canada. 2023. Anti-

If we are going to better understand those with mental health injuries, we need to transform our thinking from:

What is wrong with this person? to What has happened to this person and how can I be of help?

MENTAL HEALTH AND AWARENESS GUIDE

The Mental Health and Wellness Awareness Guide outlines four mental health and wellness phases an individual may experience in the workplace. It looks at specific signs and symptoms (characteristics) along the spectrum from wellness (resilient phase) to mental health difficulties (distress phase) and the two phases in between (struggling and worrisome phase). In addition, this guide offers suggested strategies to improve mental health and wellness. The purpose of this guide is to assist individuals to better understand their own mental health and wellness and to appreciate the challenges of others.

This guide in no way identifies every possible sign or symptom one might show, and it is also not to be used as a tool to diagnose someone. It is simply a guide that can help identify sources of stress in peoples lives; encourage mental and physical resilience; encourage healthy discussions about mental health and wellness; help each of us to keep an eye on one another; and to be proactive in creating a healthy and supportive environment in which we live and work. It is the responsibility of each of us to maintain a healthy environment, support recovery, and reach out to those at risk of mental health injury. For suggestions on how to reach out, refer to the TEMA Model of Support.

Table 11.1 Mental Health and Wellness Phases (Copyright The TEMA Foundation 2019, 2021). All Rights Reserved.

Characteristics Signs and Symptoms (Body, mind, emotions, behaviours)	Suggested Strategies to Improve Mental Health and Wellness
Resilient Phase High level of wellness and resilience and good life and/or work balance	
Physically and emotionally healthy	Maintain good life and/or work balance
Enthusiastic, engaged with others, participates in home, community and/or workplace activities	Stay connected with others
Good presence in life (e.g., school, work, family, social, community, etc.)	Surround yourself with things you enjoy, love, and are compassionate about
Readily shows happiness, and excite- ment, good motivation and energy	Be mindful of what you are doing to be resilient
Good use of coping skills, positive ways to deal with feelings and emo- tions	Have fun
Satisfaction in life and/or work	Put yourself first, take time for you
	Exercise
	Rest, relax, and eat well

	Reflect on what is going well and build on that
	Surround yourself with good people, good activity, and a good environment
	Create a self-care plan

Characteristics Signs and Symptoms (Body, mind, emotions, behaviours)	Suggested Strategies to Improve Mental Health and Wellness
Struggling Phase Struggling but maintaining some balance in life.	
Irritable, forgetful, more fatigued than usual	Be mindful of yourself and what is going on around you
Some absence from commitments (e.g., school, work, family, community, etc.)	Increase your rest and relaxation time
Less engaged with others, not socializing as much, loss of motivation	Set small, manageable goals so you feel you are accomplishing something
Completing tasks but limited enthusiasm	Ask for help from others
Increase in stress levels	Focus on your strengths

Less active	Focus on what you need from others
Struggling to keep life's commitments in balance	Try to not avoid contact with others; strive to engage with others daily
	Surround yourself with good people
	Become more active to decrease stress
	Focus on healthier coping strategies
	Stop and reflect on how you are doing and what you need
	Be kind to yourself. Focus on finding more balance in your life.

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Characteristics Signs and Symptoms (Body, mind, emotions, behaviours)	Suggested Strategies to Improve Mental Health and Wellness
	Create a self-care plan
Worrisome Phase Challenges with one's mental health and wellness begin to surface, and life balance is limited.	
Emotionally withdrawn from others	Be aware of your limitations and struggles

Feelings of hopelessness and helplessness	Ask for professional help
Increase in substance use/misuse	Accept help from others
Low activity level, low level of mental wellbeing	Keep connected with supportive people
Poor physical and/or mental health	Avoid isolation
Apathetic	Acknowledge you are struggling
More missed commitments in life (e.g., school, work, family, social, etc.)	Find time to focus on yourself
Lacks motivation or overworks, struggling to complete tasks	Reflect on what may have gotten you to this point
Less tolerant, easily frustrated, agitation, accident-prone	Seek medical support to assist in better understanding your mental health and wellness challenges
Negativity is predominant	Surround yourself with supportive people, activities, and resources
Unkempt appearance	Create a self-care plan

Mental health awareness

Characteristics Signs and Symptoms (Body, mind, emotions, behaviours)	Suggested Strategies to Improve Mental Health and Wellness
Distress Phase Mental health distress: Severe change in thinking, behaviour and actions	
Unhealthy mentally and physically, poor self-care	Seek professional and medical help
Exhausted, anxious, panicky, depressed, sleep deprivation	Stay connected with support- ive people. Avoid isolation
Easily frustrated, angry outbursts	Focus on getting better physically and emotionally
Lots of absences and/or lateness (e.g., work, school, family, social, etc.)	Keep yourself safe
Withdrawn from others, not engaged	Follow through with recommended supports from professional and/or medical helpers
Avoidance of people	Develop a self-care plan to get better
Impaired judgment, distorted thinking	Create a safety plan
Low to no motivation or productivity	
I don't care attitude	
Suicidality, substance misuse and/or mental health breakdown	

RESPONDING TO A MENTAL HEALTH INJURY USING THE TEMA MODEL

Supporting someone through a difficult time or helping navigate a mental health injury can be overwhelming, but it is extremely important. We can no longer just talk about mental health and mental injury; we need to act and find effective ways to provide support. We all play a role in ensuring mental health is balanced with physical health.

Take Action

Take action with the following steps:

1. Observe behaviour.
2. Recognize the need.
3. Assess the situation.
4. Process what you are going to do.

Changing our approach to mental health and wellness makes a difference for everyone. We can all play a role in having a meaningful impact on someone with a mental health injury. The first step in the TEMA model is Take Action.

Taking action could mean a direct discussion, texting, emailing, a phone call, or reaching out through another source (colleague or friend). To take action means having the confidence to approach someone after observing something you see that is different or worrisome, recognizing the need to approach, assessing the needs of this individual, and finally, processing what you are going to do to help.

Engage in Conversation

After taking action, a first aider must be able to confidently engage in a safe, healthy, and respectful conversation. Sometimes the biggest challenge is starting that courageous conversation.

Having a difficult conversation is never easy, but it can be done in a way that is productive, respectful, and helpful for everyone.

Some things to keep in mind when starting a difficult conversation are:

Be direct, sincere and honest. Be respectful.

- Remember to use both verbal and non-verbal engagement skills.
- Be culturally sensitive.
- Avoid stigmatizing language.
- Be sensitive and empathetic.
- Keep the focus strength-based (positive).
- Choose the right time and the right location for this discussion.
- Stay focused on the worries you have for the other person by using I messages (e.g., I noticed..., I am worried about..., I've seen..., I have heard..., etc.).

The language we use matters and makes a difference if we want to engage in meaningful conversations. We need to make sure that we shift from judgment to concern.

Make Meaningful Connections

Humans need connections. Connecting in a meaningful way looks different for everyone, especially those with mental health injuries. In general, meaningful connections are about giving and not expecting anything in return; they are about opening yourself up and being vulnerable; they are about being respectful and a good listener; they are about being genuine and empathetic.

Below is a list of tips to remember when connecting with someone during a conversation about their mental health and wellness. It is certainly not a comprehensive list, but hopefully a starting point for understanding.

- Value the person you are talking with.
- Make the most of your connection: don't give up.
- Genuinely inquire with empathy.
- Reach out of your comfort zone.
- Invest in the connection: seek similarities rather than differences.
- Make the environment safe, welcoming, and conducive for conversations.
- Enhance your awareness of this person and the struggles they may be having.
- Use the **L.U.V** model:
 - **Listen** to them.
 - Try to **understand** them, or their situation.
 - **Validate** their struggles.
- Take interest in the person.
- Ask open-ended questions.
- Be aware of your body language. Ensure it is inviting and conveys care and concern.
- Remember that agreeing with them and understanding them are different: You don't have to agree, but as a first aider, work to understand them and their situation.

Access Help

Once you have a sense of what is going on with the other person, you want to begin to think about how to help them from a mental health and wellness perspective.

Potential avenues for help

The resources you connect someone to will depend on the nature of their situation and the resources available in your region.

Immediate Resources

Immediate resources include:

- Suicide Crisis Helpline 9-8-8
- Crisis or distress line
- Local emergency room
- 9-1-1

Professional Resources

Professional resources include:

- Medical professionals: Doctor, nurse, counsellor, etc.
- Employee Assistance Program (EAP)
- 2-1-1 is a source for government and community-based resources, available 24 hours a day in 150 languages by phone, text, chat, and online
- Kids Help Phone 1-800-668-6868 (age 20 and under)
- www.crisisservicescanada.ca
- www.thelifelinecanada.ca
- www.suicideprevention.ca This resource has listings for Mental Health Crisis and Suicide help by province

Additional Resources

Additional resources include:

- Family, friends, pets, or previous supporters who may have helped in the past
- Spiritual leader

Further Educational Resources

Further educational resources include:

- Mental Health and Wellness for the Workplace: A one-day program at St. John Ambulance, developed in collaboration with the TEMA Foundation.
- Mental Health First Aid: A two-day program by the Mental Health Commission of Canada.

PHYSICAL VERSUS MENTAL HEALTH INJURIES

Our body only has so many ways to signal something is wrong, and therefore many of the signs and symptoms of mental health injuries are the same or similar to physical health conditions. This is something a first aider must always be aware of. Some physical conditions that have similar signs and symptoms include, but are not limited to:

- Diabetic emergencies
- Drug reactions
- Environmental emergencies (heat and cold injuries)
- Head injuries
- Infections/fever
- Lack of oxygen
- Shock

If you are concerned for a casualty's well-being, assist them in seeking appropriate mental health help. It is more important to focus on getting the appropriate help than trying to determine a cause of the emergency.

PANIC ATTACKS

A panic attack is both a mental health and a physical health problem. A panic attack has similar signs and symptoms to a heart attack and a first aider might not be able to differentiate between them. The panic attack can be serious and if left untreated, can lead to a more serious physical condition. Therefore, it is always recommended to call 9-1-1.

Signs and symptoms of a panic attack may include some or all of the following:

- Intense fear, inappropriate for the circumstances
- Feeling of choking
- Tremors or restlessness
- Feeling of unreality or detachment from oneself or from one's surroundings
- Feeling dizzy, unsteady, light-headed or faint
- Feeling of losing control or going crazy
- Fear of dying
- A sense of impending doom or death
- Increased heart rate
- Nausea and/or vomiting

First aid for a panic attack

To give first aid for a panic attack, perform the following steps:

1. Call 9-1-1.
2. Sit the casualty down in a comfortable position, preferably in a quiet area if possible.
3. While waiting for medical help, and if the casualty is hyperventilating, attempt to slow down the casualty's breathing. Examples that can help someone focus on their breathing include:
 - Box breaths: Breathe in for 4 seconds, hold for 4 seconds, exhale for 4 seconds and hold for 4 seconds. Note: Box breaths do not always need to be in 4-second intervals.

Start with something reasonable for the casualty and increase the breath intervals as they calm down.

- Ask them to breathe in through the nose and out through the mouth.

Do not have the casualty breathe into a paper bag. This is not effective and can lead to further complications.

OCCUPATIONAL STRESS INJURY (OSI)

Occupational stress refers to stress related to one's job. It can be related to added responsibilities or workload without corresponding supports, role conflict, and working hour changes. In more extreme cases, it can be related to harassment, bullying, and a toxic work environment.

An occupational stress injury occurs when mild stressors have reached a crisis point.

Signs and Symptoms of OSI

The signs and symptoms of OSI are:

- Disruption in sleep patterns and fatigue
- Irritability
- Lack of interest in food
- Anxiety or panic, particularly relating to work
- Lack of interest in work
- Increased risk-taking at work
- Isolation from co-workers
- Aggressive behaviour

Steps to Care for OSI

As with many first aid situations, the best care is prevention. If you recognize some of the symptoms listed above, examine ways to reduce the occupational stressors in your life.

- Make use of available vacation and mental health days
- Set aside time each day and each week for personal interests (even 15 minutes a day can help)
- Talk with family and friends about your struggles at work
- Strive to get more sleep
- Regular exercise
- Eat well and avoid skipping meals
- Leave work at work. Home is for family and personal time

If you recognize that a co-worker may be facing an occupational stress injury, employ the steps of TEMA, engage human resources, an ombudsperson, or governmental agencies if needed (e.g., Ministry of Labour).

Chapter 12

Medical emergencies

DIABETIC EMERGENCIES

Diabetes is a condition in which there is either not enough insulin in the blood or there is enough insulin, but the cells cannot use the insulin properly. Produced in the pancreas, insulin is a hormone that regulates the amount of glucose in the blood. With diabetes, sugar builds up in the blood and the cells don't get the energy they need, or the blood sugar levels can go abnormally low.

A person with diabetes may take medication by mouth or injection, and carefully controls what they eat (the source of energy) and their level of exercise (the use of energy). A diabetic emergency occurs when there is too much or too little insulin in the blood.



- **Hypoglycemia** Not enough sugar, too much insulin
- **Hyperglycemia** Too much sugar, not enough insulin

Signs and Symptoms of Hypo- and Hyperglycemia

Hypoglycemia	Hyperglycemia
Strong and rapid pulse	Weak and rapid pulse
Shallow breathing	Deep, sighing breathing
Skin is sweaty, cool, lacking colour	Skin is dry, warm, flushed
Fainting or unconscious state	Drowsiness, becoming unconscious

Headache	Thirst
Confused, irritable, aggressive	Nausea and vomiting
Trembling, staggering	Frequent urination
Difficulty speaking	Breath may have an acetone (nail polish remover) odour

First Aid for a Diabetic Emergency

The aim of first aid in a diabetic emergency is to keep the casualty's condition from worsening.

If the casualty is conscious, ask what is wrong. If they identify that they are having a hyperglycemic emergency, monitor and call

9-1-1. They require hospital care.

If they say they are having a hypoglycemic emergency, or cannot tell you, provide food or drinks containing sugar. They must be conscious enough to swallow the sugar without choking.

A diabetic casualty may have glucose tablets for treating hypoglycemia. Help them take their tablets if they are able to respond and swallow; repeat if symptoms persist after 15 minutes.

Good Sugar Sources

If glucose tablets are not available, use other types of dietary sugars such as:

- Soft candies
- Chocolate
- Orange juice (add sugar if needed)
- Non-diet pop
- Tubes of icing sugar
- Sugar packets

SEIZURE EMERGENCIES

A seizure is caused by abnormal electrical activity in the brain. Seizures fall into two types: focal (partial) seizures and generalized seizures. The type of seizure will influence the casualty's signs and symptoms.

Types of Seizures

There are two types of seizures: focal and generalized.

Focal seizures

Focal seizures occur when seizure activity is limited to one area of the brain. Casualties may or may not lose awareness during their seizure and can be seen exhibiting these signs:

- Confusion
- Repetitive gestures (e.g., picking at a button)
- Wandering aimlessly in a specific area
- Smacking their lips

Generalized seizures

When there is widespread seizure activity in the brain, it is called a generalized seizure. There are several different types of generalized seizures, but two of the most common are absence seizures and convulsive seizures.

Absence Seizures are common in children through to adolescence, though they sometimes persist into adulthood. They are often mistaken for daydreaming. Casualties may blink rapidly and smack their lips.

Convulsive Seizures are what most people think of in terms of a seizure. Someone experiencing a convulsive seizure will often tense up, lose consciousness, and fall. Their body will remain rigid for a short time. This is followed by convulsions a rapid contraction and relaxation of the muscles in an uncoordinated fashion.

During a convulsive seizure, the casualty may turn blue, froth at the mouth, and grind their teeth.

The seizure may come on very quickly, and usually lasts only a few minutes. Once the seizure has ended, the muscles will relax, and the casualty will start to regain consciousness.

COMMON CAUSES OF A SEIZURE

Epilepsy is a disorder of the nervous system and is characterized by seizures. Many people with seizure disorders like epilepsy take medication to control the condition. With epilepsy, the person may know that a seizure is about to occur because of a brief sensation they experience, called an aura. An aura, which is often felt just before a seizure, may be a hallucination in the form of a sound, a smell, or a feeling of movement in the body.

Other causes of seizures include:

- Head or brain injury
- Stroke
- Brain infection
- Drug poisoning
- A high fever in infants and children

First Aid for a Seizure Emergency

Call 9-1-1 unless the casualty is known to you and has a history of seizures. Call when:

- The seizure lasts for more than 4 to 5 minutes.
- A second seizure follows the first without the casualty regaining consciousness.
- There are any injuries because of the seizure.
- The seizure takes place in water.

During a seizure, first aid is limited to protecting the casualty from additional injury. If there are hazards around the casualty, move them away. If possible, place a pillow, sweater, or other padding under their head.

Some people experience a seizure with little movement of the limbs. For these seizures, if possible, place the casualty on their side to help keep the airway open. If you cannot roll the casualty safely, allow the seizure to occur in the position you found them in.

Never attempt to place anything in the casualty's mouth. While it is possible for the casualty to bite their tongue during the seizure, placing something to protect it (a spoon for example) increases the risk of damage to the teeth, and also places the first aider at risk of being bitten.

If the seizure occurs in water (e.g., a bathtub), first aiders should try to hold the casualty's head above the water.

Postictal State

Following a seizure, a casualty may be confused, and not recall what happened. They may be aggressive or combative, or they may be scared. Take steps to protect yourself and others on the scene. The postictal state usually lasts for only a few minutes, after which the casualty will often become quite drowsy.

Post-Seizure Care

Once a seizure has ended, perform the following steps to care for the casualty until EMS arrives:

1. Place the unconscious casualty into the recovery position and clear any fluids from their mouth or nose.
2. Perform a secondary survey to see if the casualty was injured during the seizure; give first aid for any injuries.
3. Give ongoing casualty care, monitoring breathing, keeping the casualty warm, and allowing them to rest.
4. Do not give the casualty any liquids during or immediately after a seizure.

FEVER EMERGENCIES IN CHILDREN

A rapid rise in temperature to 40°C (104°F) or higher can cause convulsions in infants and children. A fever becomes a concern when the temperature is:

- 38°C (100.5°F) or higher for an infant
- 40°C (104°F) or higher for a child

A fever in a child or infant is not an emergency on its own. A child or infant who has a fever but is otherwise happy and not troubled by the situation should be monitored. Care is appropriate when the condition is causing the child discomfort.

First Aid for a Fever in an Infant or Child

If the child or infant is showing signs of discomfort and they are generally miserable, give the child medicine such as ibuprofen (Advil , Motrin) or acetaminophen (Tylenol , Tempra), according to the directions on the label.

The medicine may help reduce the fever, but more importantly, it will help the child feel better. Monitor and re-administer the medicine according to the directions on the label.

Dress the child lightly in a single layer of clothing to further help reduce discomfort. Encourage them to drink clear fluids (but do not force them), and seek medical attention if you are concerned about dehydration.

Seek immediate medical care when the child:

- Is under 3 months of age.
- Is very irritable or sleepy and the fever does not improve with medicine.
- Has trouble breathing.
- Has signs of dehydration dry mouth, not urinating at least every 8 hours.
- Has a headache or sore neck that does not subside with medicine.

If the child has a convulsion:

- Call for EMS to transport the child to hospital.
- Do not restrain the child, but protect them from injury.
- Loosen constrictive clothing.
- When the convulsions stop, perform a primary survey.
- Give ongoing care. Place the child into the best recovery position for their age.

Do not give ASA (e.g., Aspirin) to children or adolescents because it may cause Reye's syndrome, which is a life-threatening condition.

Chapter 13

Environmental injuries and illnesses

INTRODUCTION

Environmental injuries or illnesses are sustained as a result of extreme temperature and/or prolonged exposure to heat or cold (hot- or cold-related injury or illness). The body does not function well when it is too hot or too cold. These conditions cause heat-related illnesses such as heat exhaustion and heat stroke, as well as cold-related injuries and illnesses such as hypothermia and frostbite. In all environmental injuries and illnesses, the focus is to return the casualty's body temperature to a normal range.

HEAT-RELATED INJURIES AND ILLNESSES

Prolonged exposure to extreme heat or heavy exertion in a hot environment can cause heat illnesses (*hyperthermia*).

Factors that can contribute to heat-related illnesses include the age of the casualty, their level of fitness, health condition, medications or other drugs, and occupation.

Heat Cramps

Heat cramps are painful muscle cramps, usually in the legs and abdomen, caused by losing too much water and electrolytes through sweating. Heat cramps are usually caused by heavy exercise or physical work in a hot environment. The casualty will complain of cramps and show signs of excessive sweating, though in a dry environment the casualty may not seem to be sweating because the sweat evaporates so quickly.

First aid for heat cramps

To give first aid for heat cramps, perform the following steps:

1. Place the casualty at rest in a cool place.
2. Give the conscious casualty water or drinks with electrolytes and carbohydrates, as much as they want.
3. Gentle massage can provide relief for cramps.
4. If the cramps do not go away, get medical help.



Heat Exhaustion

Heat exhaustion is more serious than heat cramps. The casualty has lost a lot of fluids through sweating. Circulation is affected as the blood flows away from the major organs and pools in the blood vessels just below the skin.

Signs and symptoms of heat exhaustion

The following are signs and symptoms of heat exhaustion:

- Excessive sweating and dilated pupils
- Casualty may complain of dizziness, blurred vision, headaches, or cramps
- Signs of shock, including cold, clammy skin; weak, rapid pulse; rapid, shallow breathing; vomiting; and unconsciousness
- Dry mouth and thirst (signs of dehydration)
- Irritability or aggressive behaviour

First aid for heat exhaustion

First aid for heat exhaustion combines first aid for heat cramps with first aid for shock.

If the casualty is conscious, perform the following steps:

1. Give the conscious casualty water or drinks with electrolytes and carbohydrates; if the casualty vomits, don't give anything by mouth and get medical help right away.
2. Place them at rest on their back in a cool place.
3. Remove excessive clothing and loosen tight clothing at the neck and waist.
4. Apply cool wet towels or cold packs to the body core, around the head, and under the arms.

If the casualty is unconscious, perform the following steps:

1. Place them in the recovery position.
2. Get medical help right away.
3. Give ongoing casualty care until medical help takes over.

Heat Stroke

Heat stroke is a life-threatening condition that occurs when the body's temperature rises above normal ranges. This condition usually happens due to prolonged exposure to high temperatures, especially if the exposure is in a poorly ventilated area. Heat stroke occurs when the body is unable to cool itself down due to the high temperatures. At this point the casualty will stop sweating, which allows the body's core temperature to keep rising.

Exertional heat stroke is another life-threatening condition which occurs when the body's core temperature rises above normal ranges due to heavy physical activity in humid and warm climates. Often casualties with this type of heat stroke will continue to sweat. Heat stroke can cause permanent brain damage or even death if proper first aid steps are not taken. The elderly, small children and casualties in poor health are at a higher risk of suffering from heat stroke.

Signs and symptoms of heat stroke

The following are signs and symptoms of heat stroke:

- Body temperature rapidly rises to 40 C or higher and the casualty is hot to the touch
- The pulse is rapid and full but gets weaker in later stages
- Breathing is noisy
- Skin is flushed, hot and dry in classic heat stroke, and flushed, hot and sweaty in exertional heat stroke
- Casualty is restless and may complain of headaches, fatigue, dizziness, and nausea
- Vomiting, convulsions, unconsciousness may occur

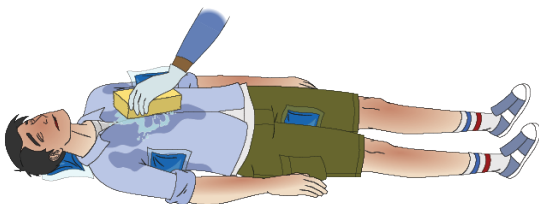
You can tell the difference between heat exhaustion and heat stroke by the condition of the skin. In heat exhaustion, the skin is moist and cold. In heat stroke, the skin is hot, flushed, and may be dry or wet.

First aid for heat stroke

Perform a scene survey and a primary survey. Lowering body temperature is the most urgent first aid for heat stroke.

To give first aid for heat stroke, perform the following steps:

1. Move the casualty to a cool, shaded place.
2. Call 9-1-1.
3. Cool the casualty. Remove the casualty's outer clothing and immerse the casualty in cool water (if possible) up to their chin. Watch them closely.
4. If cooling the casualty with water is not possible, cover them with wet sheets and fan the sheets to increase cooling. Sponge the casualty with cool water.
5. Place cold packs in the armpits, neck, and groin areas.



6. When their body feels cool to touch, cover them with a dry sheet. Put the conscious casualty into the shock position and the unconscious casualty into the recovery position. If their temperature begins to rise again, repeat the cooling process.
7. Give ongoing casualty care until handover to medical help.

Lightning Injuries

Electrical storms occur throughout most of Canada. Although the chance of being struck by lightning is very low, there are many injuries and deaths each year from lightning strikes.

Lightning often does strike the same place twice. Assess the risk of another strike, and move to a safer location if needed.

Give first aid at the scene of a lightning strike as you would any other emergency scene, keeping the following in mind:

- A person struck by lightning does not hold an electrical charge, you can touch the casualty without fear of electric shock.
- The casualty may have been thrown, therefore, you should suspect a head or spinal injury.
- If more than one person is injured, the principles of multiple casualty management are reversed: give first aid to unresponsive, non-breathing casualties first since the casualties who are still breathing can recover.
- Advise all casualties of a lightning strike to seek medical help to ensure a full evaluation of any injuries.

COLD-RELATED INJURIES AND ILLNESSES

Core body temperature drops when the body loses more heat than it produces. In an outdoor emergency, heat loss by conduction and convection (wet and windy) are often the main contributors to hypothermia.



The body has several ways to minimize heat loss and keep the body core warm.

One of the first things the body does when it is losing heat is start shivering. If the body keeps getting colder, the blood vessels in the arms, legs and at the skin surface get smaller. This keeps the blood in the core, where it is warmest.

If heat loss continues, the body processes get slower, including thinking, muscular action, and the senses. Shivering will become uncontrollable and then will slow down and eventually stop. The muscles get stiff, and movements become jerky. Thinking is confused, speech difficult and the senses dulled. The heart and breathing rates slow down and the person eventually loses consciousness. At this point, the condition is very serious. The heartbeat becomes unsteady and faint, and finally the heart stops.

When the heart stops beating, the person is considered dead. However, when body tissues are cold, they aren't damaged as easily by a lack of oxygen. For this reason, there is often a chance of resuscitating a hypothermic person who doesn't show any signs of life. This means that if you aren't putting yourself or others at risk, you should continue your rescue efforts to get a hypothermic casualty to medical help.

How the Body Loses Heat			
Heat Loss	Explanation	Example	Prevention
Radiation	Heat radiates from the body into the air around it.	A lot of heat radiates from the skin.	Wear warm clothes.
Breathing	Cold air is inhaled, warmed by the body and exhaled, causing heat loss.	The steam you see when you exhale on a cold day is cold air that your body has just warmed, and lost heat in doing so.	Wear a parka with a tunnel hood or ski tube. This layer will warm the air you breathe
Evaporation	Body heat is used to evaporate liquid on the skin.	Sweating is how your body tries to keep cool on a hot day.	Keep your skin as dry as possible.
Conduction	Heat moves directly from the body to a cold object that the body is touching.	Sitting on the cold ground or wearing wet clothing as your heat moves from you into the ground or wet clothing.	Do not get wet. Wear fabric next to your skin that wicks the moisture away.

Convection
(wind chill)

The thin layer of warm air around the body is replaced by cooler air, which the body must now heat.

The wind blows through openings in your clothing and blows away the warm air against your skin

Wear windproof clothing with snug cuffs and collars to keep the wind out.

Hypothermia

A state of generalized cooling is called hypothermia and occurs when the body temperature has dropped. Hypothermia kills many Canadians each year but it is a condition that can be detected and corrected by a first aider if recognized early.

Anyone can become hypothermic, but the following groups are especially prone:

- Elderly people: They often have poor circulation, less ability to sense the cold, and may be on medication that promotes heat loss.
- Babies: They have less ability to recover from mild and moderate hypothermia because they lose heat more quickly and their bodies do not control body heat as well.
- People who are already weakened due to illness, injury, lack of food, fatigue, or by alcohol or drugs.
- Those who are under-dressed for the weather.

13

Signs of hypothermia

There are three stages of hypothermia: mild, moderate, and severe, but it may be hard to tell exactly when one stage ends and another begins.

Mild hypothermia

The signs and symptoms of mild hypothermia may include:

- Pulse and breathing are normal
- Shivering present
- Conscious but withdrawn or disinterested

Moderate hypothermia

The signs and symptoms of moderate hypothermia may include:

- Slower pulse
- Slow, shallow breathing
- Shivering violently
- Clumsiness or stumbling around
- Confusion, sleepiness
- Irrationality

Severe hypothermia

The signs and symptoms of severe hypothermia may include:

- Weak to absent pulse
- Shallow to absent breathing
- Shivering has stopped
- Unresponsiveness

Note: *The signs and symptoms of moderate hypothermia can be mistaken for intoxication.*

First aid for hypothermia

First aid for hypothermia aims to prevent further heat loss and get medical help.

To give first aid for hypothermia, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Move the casualty out of the cold environment. If you can not move indoors, protect the casualty from the wind.
3. Cover exposed skin with suitable clothing or covers.
4. Insulate the casualty from cold objects. Have them sit on a rolled-up jacket or lie on a blanket.

5. Give the casualty warm sweet drinks if they are conscious.
6. If you are in a shelter and have a dry change of clothes, gently replace wet clothes with dry ones. If you are not sheltered, put the dry clothes over the wet clothes.
7. If you don't have dry clothes, press as much water out of the wet clothes as possible and wrap the casualty with something windproof.
8. Give ongoing casualty care and get medical help.

Cautions in first aid for hypothermia

Adhere to the following cautions when giving first aid for hypothermia:

- Handle the casualty very gently and keep them horizontal if possible. Cold affects the electrical impulses that make the heartbeat. As a result, the hypothermic casualty's heartbeat is very delicate. The heart can stop with rough handling of the casualty.
- Do not give the casualty any alcohol, caffeine, or let them smoke. These can all increase heat loss.
- Do not rub the casualty's body to improve circulation. This will cause cold blood to flow back to the body core and cool the body further.

Immersion hypothermia

Immersion hypothermia refers to hypothermia caused by being in cold water. A person loses heat 25 to 30 times faster in water than in air of the same temperature. Immersion hypothermia can happen very quickly if a person falls into cold water. Suspect hypothermia whenever someone accidentally falls into water, even in the summer. Immersion hypothermia can also happen more slowly, for instance, while swimming or scuba diving in a lake. In these cases, hypothermia creeps up on the casualty, and may not be suspected right away.



Do the following when a hypothermic casualty is in the water:

- Tell the casualty not to take off any clothing. Clothes help keep heat in.
- Tell the casualty to move as little as possible. Moving around causes more heat loss (by convection).

When taking a casualty out of the water, keep them in a horizontal position, and handle them as gently as possible. Give first aid for hypothermia to prevent further heat loss and get medical help.

If you are the casualty, use the heat escape lessening position (HELP) to preserve body heat (cross your arms across your chest and pull your knees up to your chest, as if hugging yourself).

Rewarming a casualty

There are two types of rewarming: passive rewarming and active rewarming.

Passive rewarming means preventing further heat loss and letting the casualty's body rewarm itself; this usually works well for mild and moderate hypothermia.

Active rewarming means adding heat to the casualty's body to warm it up. Active rewarming can cause complications and should only be done at a hospital. Active rewarming is what a casualty in severe hypothermia needs: therefore, in severe hypothermia, the first aid is to prevent further heat loss and get medical help.

In mild hypothermia, you can give the fully conscious casualty something warm and sweet to drink.

The sweetened drink will provide energy to the muscles and help the body to continue shivering.



Don't give a casualty in moderate hypothermia anything to drink. Their muscles that allow them to swallow may not be functioning well and they could choke. You should actively rewarm the casualty only if you are far from medical aid. To rewarm the casualty, place them near a heat source and place containers of warm, but not hot, water in contact with their skin (neck, armpits, groin). Prevent further heat loss and get medical help as soon as possible.

Frostbite

Frostbite refers to the freezing of tissues when exposed to temperatures below zero. It is a progressive injury with two stages: **superficial frostbite** and **deep frostbite**.

Signs and Symptoms of Frostbite

13

Stage	Description	Signs and Symptoms
Superficial frostbite	The full thickness of the skin is frozen.	White, waxy-looking skin Skin is firm to touch, but tissue underneath is soft May feel pain at first, followed by numbness

Deep frostbite

The skin and the tissues underneath the skin are frozen, sometimes to the bone. A serious condition, often involving an entire hand or foot.

White, waxy-looking skin that turns greyish-blue as frostbite progresses, or yellow patches of skin
Skin feels cold and hard
There is little or no feeling in the affected area as the frostbite develops

First aid for superficial frostbite

To give first aid for superficial frostbite, perform the following steps:

1. Gradually rewarm the frostbitten part with body heat (if possible).
2. Cover frostbitten toes, ears, etc. with warm hands.
3. Warm up frostbitten fingers by placing them in a warm area of the body like the armpit, abdomen, or groin.
4. Take measures to prevent these areas from freezing again. Either stop the activity or dress more appropriately.

First aid for deep frostbite

Deep frostbite needs medical help as soon as possible.

To give first aid for deep frostbite, perform the following steps:

1. Prevent further heat loss from the frozen part and the rest of the body. Handle the frozen tissue gently to prevent tissue damage.
2. Get medical help. If the feet or legs are frozen, transport using a rescue carry or stretcher if possible.
3. If medical help is not available, you are in a safe, warm place, and there is no danger of the part refreezing, then thaw the frozen part.
4. Gently remove the clothing from the affected part.
5. Find a container that is large enough to hold the entire frozen part and fill this with water that feels warm when you put your elbow in it (about 40 C).

6. Remove any jewelry and put the whole frozen part in the water. Keep adding warm water to keep the water in the container at a constant temperature.
7. Keep the part in the water until it is pink or does not improve any more. This can take up to 40 minutes and may be painful.
8. Gently dry the affected part. Put sterile dressings over wounds and between fingers or toes.
9. Keep the part elevated and warm. Do not break any blisters that form.



A deeply frostbitten extremity will be very painful as it defrosts. There will be swelling and perhaps tissue loss. For that reason, it is best done at a medical facility. If the casualty must walk out or be transported, do not thaw the frozen part. There will be less tissue damage and pain if the part is left frozen. Make sure the rest of the body is well protected from the cold and the casualty has plenty of food and water during the journey to safety.

Cautions in first aid for frostbite

Adhere to the following cautions when giving first aid for frostbite:

- Do not rub the area. The tiny ice crystals in the tissues may cause more tissue damage.
- Do not rub snow on the area. This may cause further freezing and tissue damage from the rubbing.
- Do not apply direct heat. This may rewarm the area too quickly.

Trench Foot

Trench foot (also known as immersion foot) is a condition caused by prolonged exposure to cold, but not freezing temperatures, usually along with wet conditions. Trench foot earned its name from the First World War when soldiers fought for long periods of time in waterlogged trenches.

Trench foot has been identified more recently at events where poor foot hygiene may be present:

- Multi-day music festivals
- Long-distance or multi-day races
- Hiking in cooler, wet conditions
- Prolonged work in cool and wet conditions

Signs and symptoms of trench foot

The following are signs and symptoms of trench foot:

- Numbness or burning pain
- Discoloured skin that turns pale
- Swelling
- Leg cramps
- Development of blisters or ulcers after 2 to 7 days
- Odour in later stages due to dead tissue (necrosis)

First aid for trench foot

First aid for trench foot requires medical intervention and usually involves the removal of damaged skin (or debridement of the wounds). Perform the following to prevent trench foot from setting in:

- Keep feet dry: Change socks and footwear when wet.
- Keep feet warm: Temperatures of 16 Celsius or lower increase the risk of trench foot.
- Wash feet regularly and allow them to air dry.
- Avoid sleeping with socks on, particularly if they are wet or dirty.
- Use heat packs to help rewarm cold feet that are showing early symptoms.

Frozen State

When the temperature is below zero, it is possible to discover someone who is completely frozen. This is called a frozen state. Recognize a frozen state when:

- The casualty is found in a cold location and is unresponsive.
- The joints of the jaw and neck are rigid when you try to open the airway.
- The skin and deeper tissues are cold and cannot be depressed.
- The entire body moves as a solid unit.

If the casualty is in a frozen state, do not attempt to perform the ABCs of a primary survey. If it does not pose a risk to the rescuers, transport the casualty to medical help. Otherwise, record the location of the body, get yourself to safety, and make arrangements for future retrieval.

DROWNING EMERGENCIES

Drowning emergencies can happen very quickly and are common in the summer months when people like to go swimming. Drowning happens when a casualty who is submerged under water attempts to breathe through their nose or their mouth. If water enters the lungs this can prevent a casualty from being able to exchange gas in the lungs which then impact their ability to breathe efficiently. This is a medical emergency what requires you to call 9-1-1 immediately. These types of emergencies often go undetected as the casualty might not have the ability or energy to call out for help.

Managing a Drowning Emergency

If you encounter a casualty who is drowning, perform the following steps:

1. Perform a scene survey. Ensure you do not place yourself into danger when rescuing a casualty. Often times the casualties are desperate for air and may cling to you accidentally causing you to drown as well.
2. Once the casualty is out of the water perform a primary survey and determine if the casualty is alert and breathing.
3. If the casualty is not alert nor breathing, call 9-1-1 immediately and start CPR.
4. Have a bystander get an AED, first aid kit, and/or call 911 if you have not already done so. Record at what time CPR started.
5. Due to the complications with drowning, always start with five rescue breaths before starting chest compressions. Be aware that the casualty may vomit the contents from their lungs or stomach so be ready to turn the casualty over to clear the airway. Do not delay CPR if a barrier device for administering breaths is not available.
6. Provide 30 compressions at the rate of 100-120 beats per minute, with a depth of 1-2 inches or about one third of the chest, followed by 2 rescue breaths.
7. Continue CPR until:
 - An AED arrives
 - Someone else takes over
 - Medical help arrives and they ask you to stop
 - The person shows signs of life
 - You are physically unable to continue

After a drowning experience a casualty may experience signs and symptoms of hypothermia. Cover the casualty and keep them warm if needed.

BITES AND STINGS

The following section provides information and first aid procedures for bite and sting medical emergencies.

Animal and Human Bites

Animal and human bites that cause puncture wounds or lacerations may carry contaminated saliva into the body and are dangerous because of the risk of infection. The most common human bites in adults are to the hand. For human bites, although the risk is lower, there are concerns of contracting diseases such as hepatitis, Methicillin-resistant *Staphylococcus Aureus* (MRSA), Herpes Simplex virus, tetanus, and possibly HIV/AIDS. Contracting HIV through a human bite is rare; however, if there was blood in the mouth of the person who bit the casualty, there is a possibility of contracting this virus.

All animal and human bites that break the skin should be seen by a doctor.

Rabies is an acute viral disease of the nervous system that is always fatal if not treated. Rabies should be suspected in domestic animals if they behave in an unusual way, and in all attacks by wild animals (bats, foxes, skunks, raccoons, and more). The rabies virus can be transmitted to anyone who handles a diseased animal or who touches the area of the wound that carries the virus. To be safe, always give first aid for an animal bite as if the animal had rabies until it is proven otherwise.

Be especially careful when giving first aid to anyone you suspect may have been exposed to rabies and when handling the live or dead animal involved. Wear gloves and/or scrub your hands thoroughly after contact to reduce the risk of infection.

Even if a person has been exposed to a rabid animal, full-blown rabies can be prevented if immunization against the disease is administered as soon as possible.

First aid for animal and human bites

To give first aid for animal and human bites, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Examine the wound to see if the skin was broken.
3. If there is bleeding, allow moderate bleeding of the wound because this helps to cleanse the wound.
4. Wash the wound then apply a dressing and bandage.
5. Get medical help.

Snake Bites

In Canada there are a variety of snakes that can be found around British Columbia, Alberta, Saskatchewan and Ontario. However, the rattlesnake is the only kind of poisonous snake that lives in these areas.

13

When a rattle snake bites someone, they often leave one or two small puncture wounds in the skin which is how the snake injects the venom to the casualty. When bitten, the casualty will feel a burning sensation, followed by swelling, discoloration of the skin, weakness, severe pain, nausea and vomiting. It's important to note that the casualty's breathing may be affected. Ensure you monitor their breathing rate closely.

If you are travelling to areas where there are other poisonous snakes, take the time to research the possible signs and symptoms and first aid needed.

First aid for snake bites

To give first aid for snake bites, perform the following steps:

1. Perform a scene survey and primary survey.
2. Place the casualty in a position of comfort, ideally at rest, semi-sitting or lying down. Try to keep the casualty calm and the body part containing the bite wound below heart level to prevent the venom from spreading as quickly.
3. Allow some bleeding to occur, as this may help expel some of the venom.
4. Flush the bite if possible. Wrap a large roller bandage around the entire length of the bitten extremity, just tight enough that you can get your fingers under the bandage. This is an effective and safe way to slow circulation of the venom.
5. Immobilize the limb.
6. Give ongoing casualty care.

Precautions when dealing with snakes and snake bites

Keep yourself safe by adhering to the following snake bite tips:

- Be aware of your surroundings as most snakes will usually be within 10 meters of the area where they last bit the casualty.
- Attempt to keep the casualty at rest. If the casualty needs to be transported, attempt transport methods that don't include walking or running.
- Do not give the casualty alcoholic beverages.
- Do not try to suck the poison out with your mouth.
- Do not apply ice to the affected area as this could cause more damage.
- If the snake is killed, bring it along with you to medical help for identification. Note: Use caution when handling the head of a dead snake as they might still be able to bite due to their reflexes.

Insect Bites

Insect bites or stings can often cause pain, redness, swelling and itching at the site of the sting. People who are allergic or have severe allergies can experience life-threatening reactions to stings.

Signs and symptoms of a bite or sting can include:

- Localized pain
- Swelling
- Redness
- Itching
- Heat at the sting site

Signs and symptoms of an anaphylactic reaction to a bite or sting

Signs and symptoms of an anaphylactic reaction to a bite or a sting can include:

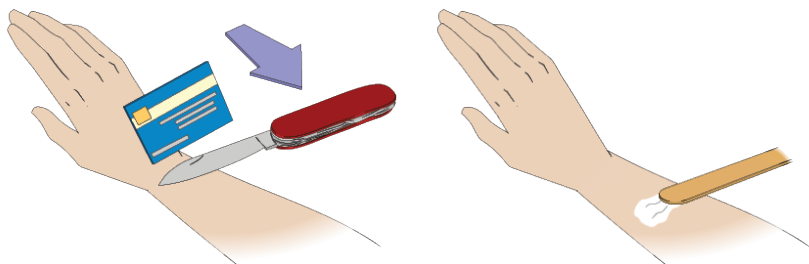
- A bump at the sting site that can be red, pink, white, or discolored
- General itching around the sting site or the body
- Generalized swelling around the body, especially the airway
- Breathing difficulties
- Anxiety, vomiting and abdominal cramps
- General weakness
- Headaches
- Fever

First aid for an insect bite or sting

To give first aid for an insect bite or sting, perform the following steps:

1. Perform a scene survey, then a primary survey. Are there any signs of an allergic reaction?

2. Take a good look at the sting site. Is there a stinger still attached to the skin? Honeybees will often leave their stinger attached with their venom sack, while wasps will not. If the stinger is there, remove it by carefully scraping the stinger and attached sac from the skin with a sturdy edge. Credit cards or the back of a knife work well.



3. Apply rubbing alcohol or a mix of baking soda and water to help alleviate the irritation. Do not use alcohol near the eyes. Ice can also be used to relieve pain.

Tick Bites

Ticks are commonly found in Canada, especially in areas with heavy vegetation. Ticks will drop from foliage onto animals or humans to feed. Ticks will then bite through the skin and anchor themselves onto the body with their barbed mouth making them hard to remove. A tick will feed on the blood of their host (the animal or human from which they are feeding) for many hours. Ticks can become quite large with the blood they ingest, and once they are done feeding the tick will detach itself and fall off the host.

They sometimes carry diseases that can be transmitted to humans. If a tick is found, check your body and clothing thoroughly for others. Keep the tick for identification by a medical professional.



First aid for tick bites

To give first aid for tick bites, perform the following steps:

1. Use a tick removal tool to pull out the tick by sliding the tool along the skin and carefully pulling away from the body.
2. If you do not have a tick removal tool, use tweezers by grasping the tick close to the skin and carefully pulling at a slow but steady pace. Do not grasp the tick body as it may break open, spraying the contents and therefore, spreading bacteria.
3. If you don't have tweezers, wear gloves or cover your hand with a plastic bag or tissue paper. If the tick is full of blood, wear eye protection.
4. Keep the dislodged tick and bring it to medical help for identification.
5. Clean the area and apply an antiseptic to prevent infection. Ticks can carry various diseases which may cause symptoms several days after exposure. If the tick is found engorged, or if the site of the bite shows any sign of infection or rash (which may be ring-shaped), get medical help.

Leech Bites

A leech will attach itself to the skin by making a small cut on the skin that is often not felt at the time of the bite. The leech will then feed off the blood of the human or animal to which it has attached. it . To remove a leech it is important to not pull it off as this will often cause the leech to tear into smaller parts which then can make it harder to remove and increase the risk of infection.

First aid for lesions from leeches

To give first aid for lesions from leeches, perform the following steps:

1. Detach the leech by first using a fingernail to push the head end of the leech off the skin. The head end is the

smaller, skinnier part of the leech. After the head is released, use a fingernail to push the larger end off the skin.

2. Once you detach the leech, the wound will begin to bleed. Leeches have anticoagulants in their saliva that will make the wound bleed more. Wash the area with soap and water and apply a paste of baking soda and water, or ammonia to relieve irritation.
3. If the wound starts to show signs of infection, seek medical help.

Stings from Sea Jellies (Jellyfish)

Sea jellies can be found in any body of water, whether salt water or fresh, with different varieties being found in Canada. Sea jellies that have been known to cause death live in tropical climates and have not been located near Canada. All sea jellies sting their prey using nematocysts, which in simple terms are stingers.

These stingers may contain venom which can be harmful, but more commonly cause an unpleasant stinging or burning sensation.

First aid for jellyfish stings

To give first aid for jellyfish stings, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Apply as much vinegar as possible to the affected area. Vinegar will stop the stingers from releasing venom.
3. To help relieve pain, bathe the affected part in warm water, as warm as the casualty can tolerate, for about 20 minutes.
4. Do not apply cold water. Cold water helps the stingers to continue releasing venom.
5. If signs of infection occur, seek medical help.

Chapter 14

Poisoning emergencies

TYPES OF POISONINGS

A poison is a substance that can cause illness or injury when absorbed by the body. Any substance can become a poison if not used in its intended way. Poisonous consumer products have poison symbols on their labels, but other poisonous substances do not carry warnings. These include:

- Alcohol
- Some common household plants
- Cannabidiol (CBD) and other cannabis products
- Contaminated food
- Medications when not taken as prescribed

Many substances that are not harmful in small amounts may be poisonous in large amounts.

Poisons are classified according to how they enter the body:

- **Swallowed poisons** : Through the mouth
- **Inhaled poisons** : Through the lungs
- **Absorbed poisons** : Through the skin and mucous membranes
- **Injected poisons** : Through a hollow needle or needle-like device (e.g., a snake's fangs)

An important part of the first aid for poisoning is telephoning your local or provincial poison information centre for advice on what to do. Before calling, the first aider must quickly gather as much information about the incident as possible. Use the history of the scene and the signs and symptoms of the casualty to gather the information you will need to answer the questions asked by the poison information centre.

HISTORY OF THE SCENE

You need to know four basic facts to give appropriate first aid for poisoning:

- **What poison was taken?** Container labels should identify the poison; otherwise, save some vomit and give it to medical help for analysis.
- **How did the poison enter the body?** First aid may differ for poisons taken by mouth, absorbed through the skin, injected into the blood, or breathed into the lungs.



- **How much poison was taken?** Estimate the quantity that may have been taken based on what you see or are told (for example, the number of pills originally in the container, the quantity of chemical substance in the bottle, etc.). Estimate the size/age of the casualty: the smaller the person the more dangerous the dosage.
- **When was the poison taken?** The length of time the poison has been in the body will help determine the first aid and medical care needed.

SIGNS AND SYMPTOMS OF POISONING

If the history does not reveal what poison was taken, or by what means it was taken, signs and symptoms may be helpful in answering these questions. The signs and symptoms are dependent on the method of poisoning; however, the common signs and symptoms of most poisonings include:

- Change in the level of consciousness
- Difficulty breathing (usually shallow and rapid)
- Change in the heart rate
- Burned tissue at the route of entry
- Chest pain

Other signs and symptoms related to the method of poisoning include:

- Swallowed poisons usually cause nausea, abdominal cramps, diarrhea, and vomiting. They may discolour the lips, cause burns in or around the mouth or leave an odour on the breath.
- Poisons absorbed through the skin may cause a reddening of the skin, blisters, swelling, and burns.
- Poisons injected through the skin usually irritate the point of entry.
- Inhaled poisons may cause coughing, chest pain and difficulty breathing.

Note that some poisonous gases (e.g., carbon monoxide) are colourless and odourless. They are not easily detectable. Exercise extra caution if inhaled poisoning is suspected.

GENERAL FIRST AID FOR POISONING

To give general first aid for poisoning emergencies, perform the following steps:

1. Perform a scene survey. Ensure your own safety and confirm the source of poisoning has been removed from the area.
2. Perform a primary survey. Gather any information about the suspected poison.
3. If the casualty is responsive, call the poison information centre in your region and follow their advice.
4. If the casualty is unresponsive or having a seizure, call 9-1-1.
5. If the casualty is unresponsive but breathing, place in the recovery position.
6. Give ongoing casualty care until medical help takes over.

Note: Health Canada has launched a new, toll-free telephone number for poison centres. Canadians can now call 1-844-POISON-X to access critical medical advice for poisonings.

Poison Information Centre Versus Ambulance

Consider the condition of the person you are caring for. Are they responsive? Can they tell you what they may have come into contact with, been exposed to or ingested, and how much? Are their ABCs normal? In this case, contact the poison information centre and follow their guidance on care. Often, poisons that do not pose a life-threatening situation can be cared for at home and pass through the body with time.

If your casualty has a reduced level of responsiveness, difficulty breathing, sweaty and cool skin, or severe pain anywhere in the body, they need to be seen by a hospital and the ambulance should be called instead of calling the poison information centre.

First Aid for Swallowed Poisons

If CPR is required, check the area around the mouth for poisonous residue and wipe clear. Always use a barrier device for added protection.

To give first aid for swallowed poisons, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Do not dilute a poison that has been swallowed (for example, by giving fluids) unless told to do so by the poison information centre.
3. If the casualty is conscious, wipe poisonous or corrosive residue from the casualty's face and rinse or wipe out the mouth.
4. Never induce vomiting except on the advice of the poison information centre. Many poisons will cause more damage when vomited.

First Aid for Inhaled Poisons

Perform a scene survey. Assess hazards with particular attention to the possible presence of a poisonous gas or vapour. Ensure your safety; it may be best to wait for the fire department to arrive.

To give first aid for inhaled poisons, perform the following steps:

1. Perform a primary survey.
2. Move the casualty to fresh air and away from the source of the poison.
3. If casualty is not breathing, begin CPR. Always use a barrier device with a one-way valve when performing CPR. In the case of a poisoning, it will reduce the risk of the poison affecting you.
4. If the casualty vomits, keep the airway open by clearing out the mouth and putting the casualty into the recovery position.
5. If the casualty goes into convulsions, do not restrict the casualty's movements. Protect them from injury.
6. Give ongoing casualty care. Get medical help.

If you work with chemicals such as toxic gases, make sure you know the specific first aid for the chemicals in your workplace. Ensure you wearing appropriate PPE (such as a respirator) as required. The safety data sheet (SDS), for each chemical contains this information. Send the SDS to the hospital with the injured worker if possible. If you work with chemicals at your place of employment, you must be certified in WHMIS/GHS.

First Aid for Absorbed Poisons

Most poisons absorbed by the skin cause irritation at the place of contact, but do not affect the rest of the body. The irritation, called contact dermatitis, includes redness, itching, and blisters. Some chemicals, however, do affect the rest of the body when absorbed by the skin, and these can cause life-threatening emergencies.

To give first aid for absorbed poisons, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Flush the affected area with large amounts of cool water; if the poisonous substance is a powder, brush off excessive amounts with a dry cloth before flushing.
3. Remove any clothing that has been in contact with the poison. Do not touch the clothing until it has been thoroughly washed.
4. Wash the affected skin thoroughly with soap and water.
5. Give ongoing casualty care until medical help takes over.

First Aid for Injected Poisons

Follow the general first aid for poisoning. Injected poisons should be contained near the injection site.

Delay the circulation of the poison throughout the body by placing the casualty at rest and keeping the affected limb(s) below heart level.

SUBSTANCE USE AND MISUSE

Substance use is the use of substances, such as drugs, alcohol, tobacco / nicotine, alcohol, or cannabis. People use substances for different reasons, and they can have benefits to health and/or enhance social or spiritual well-being in certain circumstances.

When the use of substances leads to negative consequences for the individual, family, friends, or society, this becomes substance misuse. Substance misuse can be understood in a spectrum, ranging from lower risk use to high-risk substance dependency. It can also lead to accidental poisonings.

Alcohol Poisonings

According to the Low Risk Alcohol Guidelines determined by the government of Canada¹¹ Low-risk alcohol drinking guidelines. (July 5, 2021). Retrieved July 24, 2024, from <https://www.canada.ca/en/health-canada/services/substance-use/alcohol/low-risk-alcohol-drinking-guidelines.html>.

, woman should limit their alcohol consumption to no more than two standard drinks a day or 10 per week. Men should limit their alcohol consumption to more than three standard drinks a day or 15 per week. It is not recommended to consume any alcohol while pregnant, breast feeding, or on any medications without approval of your primary health care provider.

These guidelines help reduce the short-term and long-term risks that are associated with the over consumption of alcohol.

First aid for alcohol poisonings

The symptoms for alcohol poisonings vary from person to person.

However it is important to note that that they can be fatal if not treated seriously.

The consumption of alcohol naturally reduces body temperature and lowers the heart rate. As a result, it is important to not mix alcohol with other non-prescribed drugs that have similar effects as opioids. It is also important to not mix alcohol with prescribed medications as these medications could increase the chances of alcohol poisoning. Always follow the directions of your Primary Health care doctor.

Signs and symptoms of alcohol poisoning include:

- Vomiting
- Reduced level of consciousness
- Reduced level of awareness
- Seizures
- Slower response to stimuli
- Confusion

For a casualty with alcohol poisoning, it is important to make sure the airway remains open and clear. If the casualty cannot sit down by themselves and keep their airway open and clear, the first aider should attempt to open and clear their airway by placing the casualty into the recovery position and monitor the ABCs closely.

If a casualty has any of the following symptoms, call 9-1-1 as the casualty requires immediate hospital care.

- Irregular breathing
- Seizures
- Unresponsive
- Responsive only to pain
- Cyanosis

Opioid Poisonings

Opioids are a class of drug that affects specific receptors in the brain which produces feelings of euphoria (intoxication, happiness and bliss). Opioids are frequently prescribed by medical practitioners to help with the management of severe pain. These medications can also be prescribed for other reasons such as managing coughs or suppressing diarrhea. Due to their side effects, mainly the feelings of euphoria, opioids are often misused for non-medical purposes.

Some commonly prescribed opioids are morphine, hydrocodone, oxycodone, codeine and fentanyl. These medications are also commonly known for their brand names such as Vicodin , OxyContin and Percocet .

Side effects, which are magnified when too much of the drug is taken, include:

- Nausea
- Constipation
- Respiratory depression
- Lowered level consciousness or sedation

Anyone who takes an opioid, whether by prescription or recreationally, is at risk of poisoning. Canada is currently facing a growing opioid crisis. Refer to the Health Canada website for the latest statistics on opioid-related deaths across Canada *Opioid- and Stimulant-Related Harms in Canada. (September 2021). Retrieved October 1, 2021, from <https://health-infobase.canada.ca/substance-related-harms/opioids-stimulants/>.*

With prescription opioid use, poisoning can happen due to a person taking more of an opioid than is prescribed. This can be either by mistake (they forgot if they took it or not) or due to a tolerance build up where the original prescription no longer provides the same relief. This often affects those who have had a recent surgery or suffer from chronic pain.

A casualty who is also using another substance (alcohol, other drugs) can also be at increased risk of poisoning due to the interactions between opioids and the other substances. In some cases, the casualty may not even know they took an opioid (it was in another substance they took, or they took the opioid while under the influence of another substance).

In emergency medicine, fentanyl is commonly used for rapid and effective pain control. Recreational fentanyl use has emerged as a public health crisis in many jurisdictions.

It is 100 times more potent than morphine and has a very rapid onset, which has made it a leading cause of fatal poisoning among drug users.

In Canada, fentanyl is being mixed (cut) into many drugs to increase their potency, most commonly heroin and cocaine. Another problem facing Canada is the proliferation of counterfeit pills on the black market that have been mixed with fentanyl, the most common being OxyContin .

Even small amounts of fentanyl can lead to severe reactions when misused. It is a tasteless drug and has no smell, meaning it cannot be detected when it is mixed with other drugs.

Fentanyl and opioid prescriptions should be filled only at a pharmacy to ensure safety.

Carfentanil is an even more potent and deadly opioid, and has been found in Canada's recreational drug supply. Carfentanil is 100 times more powerful than fentanyl and is used in veterinary medicine primarily as a sedative. A single grain of carfentanil, the size of a grain of salt, can cause a fatal poisoning.

Note: *There have not been any documented cases of skin exposure to these substances leading to a poisoning.*

An opioid poisoning will display some or all of the following signs and symptoms:

- A scene survey or history of the incident indicating potential drug use.
- Excessive drowsiness or loss of consciousness.
- Slow or absent breathing.
- Gurgling or snoring sounds.
- Cool, sweaty skin that is lacking colour.
- Cyanosis, a condition which occurs if someone cannot breathe or is not breathing enough. This results in a decrease in oxygen levels in the blood. For casualties with darker skin tones, their lips and fingernails turn greyish purple and their fingernails and lips will turn blue, purple or black. For casualties with lighter skin tones, their skin will also exhibit an unhealthy pallor, and may also take on a purple or blue hue.
- Constricted pupils (pinpoint pupils)

Naloxone

Naloxone (or Narcan) can help slow the effect of an opioid poisoning; it is an opioid inhibitor. Naloxone can force opioids away from receptors in the brain and coats the receptors preventing opioids from binding again. This temporary barrier then allows important brain functions, such as breathing, to happen normally. Naloxone is available as a nasal spray or as an injection.

In most parts of Canada, a naloxone kit can be obtained from a pharmacy free of charge. When the kit is dispensed, you will receive instructions on how to use the kit. Everyone is encouraged to get a naloxone kit and ensure it is properly maintained, especially if you are likely to be in contact with an individual who is experiencing an opioid poisoning.

First aid for an opioid poisoning

First aid for an opioid poisoning is a combination of rescue breathing, administration of naloxone (if trained and available), and CPR.

Rescue breathing is the same as the breaths delivered during CPR, except without chest compressions. Deliver one breath every 5 seconds, ensuring the chest rises. Perform this step even if they are breathing, as it may be an indication that they are likely not breathing fast enough.

If possible, have someone else perform the first aid steps while you prepare the naloxone for delivery. If you are alone, deliver the naloxone as soon as possible and continue rescue breathing or CPR.

Note: There are two types of naloxone: nasal and intramuscular (IM). IM is the most common form of naloxone in Canada, with the exception of Ontario, where nasal naloxone is used.

First Aid Steps for an Opioid Poisoning	
Without Naloxone	With Naloxone
Perform a scene survey.	Perform a scene survey.
Call 9-1-1.	Call 9-1-1.
Perform a primary survey.	Perform a primary survey.
Provide 5 rescue breaths: one breath every 5 seconds, ensuring the chest rises.	Deliver 5 rescue breaths.

If the casualty is not breathing normally, begin CPR.	Deliver one dose of naloxone (see below for instructions).
Reassess regularly to see if the rescue breaths and CPR are helping.	If the casualty is not breathing normally, provide CPR.
	Reassess after 2-3 minutes to see if the naloxone is helping. If there is no improvement, deliver another dose of naloxone and continue CPR.
<i>If at any point the casualty stops breathing entirely, begin CPR.</i>	

Administering nasal naloxone

To administer nasal naloxone, perform the following steps:

1. Open the naloxone packaging.
2. Hold the dispenser with your thumb on the plunger.
3. Insert the long end into the casualty's nostril (it does not matter which side).
4. Depress the plunger fully to deliver the dose.

If there is no improvement after 2 to 3 minutes, administer a second dose of naloxone. The dosage for a child is the same as for an adult.

Naloxone reverses the effects of an opioid poisoning, which may cause the casualty to vomit, to have a fast heart and breath rate, or to have a seizure. They may experience symptoms of withdrawal, which can be extremely painful for them.

They may become anxious, agitated, or distressed. In rare cases, they may become aggressive. Be ready to assist with these conditions if they happen and ensure your own safety.

Naloxone has a 20 to 30-minute window of effectiveness. If they wake up before EMS arrives, monitor the casualty and be alert for the signs and symptoms to reappear.

SAVE ME Steps

Remember the steps to respond to a suspected opioid poisoning with the SAVE ME mnemonic.

S Stimulate. Shout and/or tap the casualty's foot. Call 9-1-1.

A Airway. Open the airway. Is the casualty breathing?

V Ventilate. Deliver one breath every 5 seconds, ensuring the casualty's chest rises, for 5 breaths.

E Evaluate. Are these steps helping?

M Medication. Prepare and deliver one dose of naloxone.

E Evaluate again. Did the naloxone help? Keep giving rescue breaths. It can take 2 to 3 minutes for naloxone to become effective. If the casualty is not breathing, continue to provide CPR.

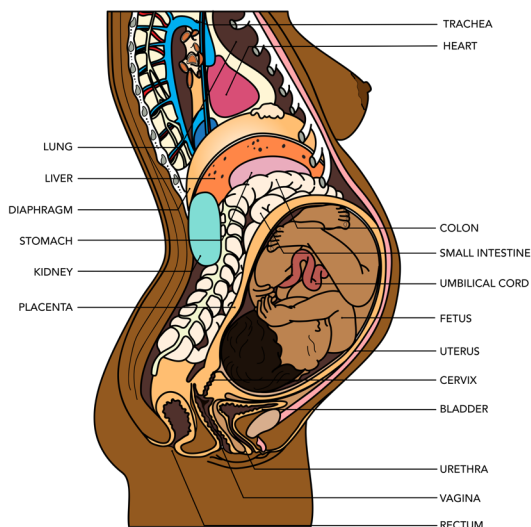
Chapter 15

Pregnancy and childbirth emergencies

INTRODUCTION

Emergency childbirth occurs when a child is born at an unplanned time or in an unplanned location. This may happen when there is a sudden, premature delivery or when the mother cannot get to the hospital for a full-term delivery. An average pregnancy is 40 weeks. If the baby is born before the 37th week, it is considered premature. Miscarriage is the loss of the fetus before the 20th week of pregnancy.

The following illustrates the anatomy of pregnancy.



It is important to note that prior to advanced maternity care, and in parts of the world without advanced maternal care, the death rate of the mother or baby during the pregnancy or the delivery period is about 1 in 10. Pregnancy and childbirth is a natural process, is associated with higher risk, and hidden complications. Obtaining medical care early in the pregnancy process and calling 9-1-1 for support during the early stages of delivery is extremely important to mitigate these possible risks.

PREGNANCY AND CHILDBIRTH

A baby is born in a three-stage process called labour. It can be hard to tell when labour has started, but it has probably begun when one of the following happens:

- The uterus contracts at regular intervals starting at ten to twenty minutes, with contractions getting increasingly stronger and closer together.
- Amniotic fluid comes out of the vagina, which means the amniotic sac has broken. This is also known as the water breaking. There may be a trickle or a rush of fluid.
- Blood and mucus come from the vagina. This is referred to as the bloody show which means that the mucus plug that had sealed the cervix has come out because the cervix has started to open.

Stage 1: Early Labour Opening of the Cervix

The first stage of labour, called early labour, involves muscular contractions that may begin as an aching feeling in the lower back. As contractions get stronger, they feel like cramps in the lower abdomen. Contractions cause the cervix to open or dilate.

The cervix has to dilate until the opening is about 10 cm across before the fetus can be pushed down the birth canal, which is the second stage of labour.

The time frame of the first stage of labour can vary considerably, making it difficult to know when the baby will be born: babies are not known for following any sort of preset and predictable timeline.

Usually, if it is the first baby, there will be enough time to reach the hospital to deliver. Subsequent births are usually faster, with early labour being considerably shorter than with the first child.

Stage 2: Birth of the Baby

The second stage of labour begins when the cervix is fully dilated, and the contractions start to push the fetus out of the uterus and through the vagina. When the baby's head is close to the vaginal opening, the mother may feel a tremendous urge to push the fetus out.

Usually, the fetus head is born first, then one shoulder, then the other shoulder, and then the rest of the body is pushed out quite quickly. The baby will still be connected to the mother by the umbilical cord attached to the placenta, which is still in the uterus.

This second stage of labour ends when the baby is born. As with early labour, the time this takes can vary widely.

Stage 3: Delivery of the Placenta

The third stage of labour is the delivery of the placenta, after the baby is born. The uterus gets smaller and pushes the placenta out. Labour is finished when the placenta is delivered. Time for the delivery of the placenta averages around 10 to 20 minutes, but again could be much shorter or longer.

EMERGENCY CHILDBIRTH

Your role here is to help the mother deliver the baby, to protect the mother and baby, and to save all parts of the placenta and amniotic sac until medical help takes over.

If labour is in the second stage, the baby could be born quite soon. Recognize the second stage of labour by the following indications:

- Longer and stronger contractions, less than two minutes apart.
- The mother's previous experience. If they say the baby is coming, believe them.
- Bulging of the vaginal opening and seeing the baby's head (called crowning).
- The mother is straining and pushing down, and feels like they have to have a bowel movement.

If you see these signs, you will probably not have time to get the mother to medical help. Call 9-1-1 and get ready to deliver the baby.

Emergency Delivery

The following section describes the stages of an emergency delivery.

Stage 1 Labour

To give first aid during labour, perform the following steps:

1. Locate someone to help you.
2. Get the materials you will need to deliver the baby and the placenta:
 - First aid kit (obstetrics kit if available)
 - Clean towels, blankets
 - Tape
 - Plastic bag(s)
 - Gloves

3. Gather the history:

- Length of pregnancy
- Previous births
- Complications during pregnancy
- Medical history (e.g., bleeding disorders, heart/breathing problems, etc.)

Stage 2 Birth of the baby

During the second stage of labour, when the baby will be born very soon, place the mother on their back with knees bent and head supported. If they prefer another position, use that position. Cover them with sheets so you can easily lift them to check on the progress of labour.

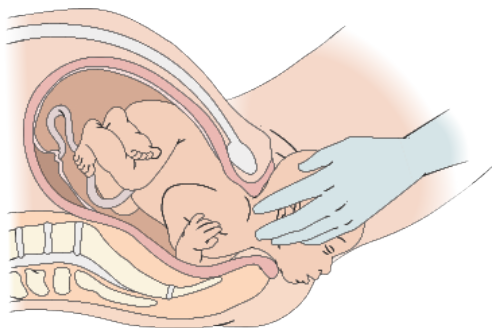


When the head appears, encourage the mother:

- To push with contractions
- Hold their breath while pushing for no more than 7 to 10 seconds
- Place their chin to their chest and avoid arching their back



Place your hand on the top of the baby's head as it crowns and apply slight pressure with the palm of your gloved hand to prevent an explosive delivery.



Support the baby's head once delivered, keeping the head lower than the body.

The head will (usually) be face down and then turn to the side to allow the shoulders to deliver. At this point, break the amniotic sac around the baby's mouth and nose if it has not already broken on its own.

Check for the umbilical cord around the baby's neck and carefully remove it from around the neck if needed. At this point, have the mother slow down their pushing. Once the shoulders have delivered, the rest of the baby will come out quickly.

A newborn is covered in fluids and is difficult to hold; therefore, ensure you maintain a firm, yet gentle, grip on the newborn.

Stage 3 After the birth of the baby

The baby should begin to cry (and therefore breathe) on their own, particularly after the amniotic sac has been broken. If this does not happen, stimulate the baby to make them cry by gently flicking the bottom of their feet or rubbing their back. If this does not stimulate the baby to cry within 30 seconds, begin CPR.



Wrap the baby in a clean blanket to maintain their body heat. If the umbilical cord is still pulsating, keep the baby at the same level as the vagina until it stops. If the umbilical cord has stopped pulsating, place the baby on the mother's chest to help keep the baby warm.

Encourage nursing, as this can improve the bond between baby and mother, will help in the delivery of the placenta, and may help decrease bleeding.

Record the time of the delivery.

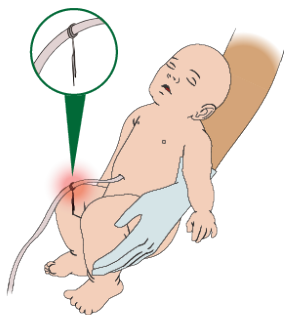
Cutting the cord

Check the vagina for bleeding. If bleeding from the vagina is severe, act quickly. The umbilical cord must be tied because the baby's blood may be bleeding through the cord and out of the placenta. Tie the umbilical cord six inches from the baby and keep the baby at the same level as the vagina.

If EMS is enroute and there is no severe bleeding, do not tie, pinch, or clamp the cord. Place the placenta in a bag or container when it is delivered, and keep it at the same level as the baby.

If EMS is delayed or there is severe bleeding:

- Wait until the umbilical cord has stopped pulsating.
- Clamp the cord (or tie with heavy string) 6 and 12 inches from the baby's body.
- Cut the cord between the clamps with sterile scissors.



Stage 4 Delivery of the placenta

The placenta usually delivers within 10 to 20 minutes of the birth of the baby. Massaging the lower abdomen can help with the delivery of the placenta, as will nursing.

When the placenta is delivered, wrap it in a plastic bag and ensure it goes to the hospital with the mother and baby.



Complications During Birth

The following are possible complications during the birth.

Newborn is not breathing

In the event that a newborn baby does not start breathing, even after attempting to stimulate them to cry (try for no more than 30 seconds), begin CPR.

Provide 30 chest compressions, followed by 2 breaths. Remember that a newborn's lungs are very small. Use a very small amount of air, just enough for the chest to rise.

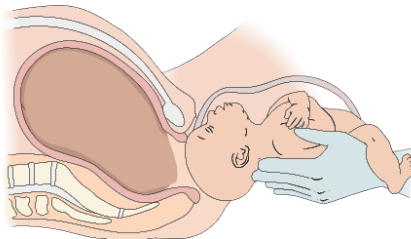
Ensure that EMS has been updated. Where possible, have another person provide emotional support for the parents.

Breech birth

A breech birth occurs when a baby does not turn in the womb and delivers with the buttocks emerging first. In this instance, delivery can still progress without serious complications.

To assist during a breech birth:

- Update EMS.
- Support the infant's body as it is born by placing your arm under the trunk of the body with legs dangling on either side.



Prolapsed umbilical cord

In some births, the umbilical cord will emerge from the birth canal before the baby. If this happens, do not try to push the umbilical cord back in, and do not pull on it.

Call 9-1-1 again and have the mother avoid pushing.

Limb presentation

In some births, a limb (arm or leg) will deliver before the rest of the baby. This type of birth is very rare and requires an emergency Caesarean section to deliver.

Call 9-1-1 again and update them.

Should this happen, do not pull on the limb. In fact, even touching the presented limb could trigger the baby to begin breathing and suffocate inside the womb.

Multiple births

Multiple births occur when more than one fetus develops in the womb. This can be due to one egg splitting into two fetuses or two eggs being fertilized. This leads to identical or fraternal twins. Multiple births could also be 3 or more.

Some indications that a multiple birth is possible:

- Mother states they are carrying twins (or more)
- Abdomen is still very large after birth of first baby
- Strong contractions begin within 10 minutes of the delivery
- The baby's size is out of proportion with the size of the mother's abdomen

The second delivery could occur very soon after the first birth (within a few minutes) or quite some time after (45 minutes or more). In approximately 33% of the cases, the second delivery will be a breech delivery.

CARING FOR THE MOTHER AND NEWBORN

After the delivery of the baby, take steps to care for the mother and the newborn. Remember that birth is a natural process. Remain calm, caring, and alert to possible complications.

Mother

Control bleeding from the vagina. Delivery of a baby may tear the skin that connects the vaginal opening to the anus (perineum), which will result in bleeding, or may cause bleeding from the vagina itself.

To control bleeding of the tissue around the vagina, place dressings and apply pressure as you would any other open wound. If the bleeding is from inside the vagina, do not place anything inside the vagina.

Note that a mother can lose up to 500 ml of blood from a birth without complications.



Newborn

Care for a newborn, once breathing has been established, focuses on keeping the baby warm and protected until transportation to the hospital can occur. Ensure the breathing remains effective by observing the baby's colour and amount of movement.

VAGINAL BLEEDING AND MISCARRIAGE

Miscarriage is the loss of the fetus before the 20th week of pregnancy. Most miscarriages happen because the fetus was not developing properly. The medical term for a miscarriage is spontaneous abortion.

Signs and symptoms include:

- Vaginal bleeding that could be severe
- Signs of shock
- Cramp-like pains in the lower abdomen
- Aching in the lower back
- Passage of tissue

First aid for miscarriage

Your main concern in first aid for miscarriage is the shock caused by severe bleeding. The casualty may be very distressed. To give first aid for miscarriage, perform the following steps:

1. Perform a scene survey and a primary survey.
2. Call 9-1-1.
3. Give first aid for shock. Place the mother on their back, or on their left side.
4. Ensure privacy. Reassure them and give them emotional support.
5. Keep any evidence of tissue and blood loss (bloody sheets, clothing, etc.). Send everything to the hospital with the mother for examination by doctors.
6. Give ongoing casualty care.

Chapter 16

BLS+CPR for healthcare
providers

INTRODUCTION

In the healthcare setting, the focus of CPR is on high-quality and effective resuscitation efforts. High-quality CPR includes an uninterrupted compression rate of 100 to 120 compressions per minute, appropriate compression depth, and complete chest recoil after each compression.

It is important to remember that where local protocols differ from this information, local protocols may supersede information in this chapter. Some local protocols may differ based on legislation, medical direction, and professional or workplace requirements.

AGE CATEGORIES FOR RESUSCITATION

The healthcare provider will respond to casualties based on the following categories:

- **Adult** The onset of puberty and older.
- **Child One-year** of age to the onset of puberty (about 12 to 14 years, as defined by the presence of secondary sex characteristics).
- Anyone under the age of one year.
- **Neonate**/newborn An infant who has been delivered, in the first hours after birth, and until they leave the hospital. The healthcare provider will not need to differentiate this group from other infants unless they are specifically trained to provide resuscitative care for that age group.

Activation of the Emergency Medical Response System

Healthcare providers (HCP) should be familiar with when and how to activate their own internal and/or external Emergency Medical Response system. A plan should be in place to allow for an AED (automated external defibrillator) to arrive on the scene with the rescuer, or for an AED to be quickly retrieved and easily accessible.

Casualties of all Ages Two Rescuers

Any time two rescuers are present, one rescuer should stay and begin CPR while the second rescuer will activate the Emergency Medical Response System and obtain an AED, if one is not already present.

Adult Casualty One-Rescuer

Anyone in cardiac arrest will need CPR, defibrillation and advanced life support.

The lone rescuer should activate the Emergency Medical Response System immediately when they encounter a witnessed arrest or an unwitnessed unresponsive adult casualty.

When a casualty of any age is believed to have suffered an asphyxial arrest (such as suffocation), the lone rescuer should call for help using a mobile phone. The phone can be put on speaker phone to save time. If a mobile device is not present, the rescuer should provide two minutes of CPR before leaving to activate EMS and obtaining the AED. The objective is to correct the cause of the arrest, and the lack of oxygen by performing two minutes of CPR first.

Infant and Child Casualty One-Rescuer

When the lone rescuer witnesses a child or infant casualty who suddenly collapses, they should immediately activate their Emergency Medical Response System and obtain and use the AED right away. In the case of an unwitnessed casualty, if they cannot activate the Emergency Medical Response System from the scene, the lone rescuer should provide two minutes of CPR before leaving to call.

When activating the Emergency Medical Response System, the rescuer may consider carrying the infant/child if the casualty is small enough, if injuries permit and if the distance they must go does not impact on the start or resumption of CPR.

ARTIFICIAL RESPIRATION (AR)

Artificial respiration (AR) is a way you can supply air to the lungs of a casualty who is breathing ineffectively or not breathing at all but has an adequate pulse. Pulse/breathing checks should be performed every two minutes for at least 5 seconds but no longer than 10 seconds.

The methods for ventilating a non-breathing casualty are:

- Mouth-to-mask with supplemental oxygen
- Two-rescuer bag-valve mask

Infants and children with a pulse rate of less than 60 beats per minute and who show signs of poor perfusion despite oxygen and ventilation should receive chest compressions in addition to ventilations.

AR can be given in a wide range of situations. In an emergency situation, keep the following in mind:

- AR should ideally be initiated with the first aider positioned above the casualty's head in order to position the mask and maintain the airway. In circumstances where it is not safe or possible to move the casualty, initiate AR in the best possible position available respecting the principles of opening an airway and maintaining an optimal seal.
- You can continue AR while the casualty is being moved to safety by other rescuers.
- While AR can be given for longer periods, it is common for first aiders to cramp or tire. Be prepared to swap places with another first aider as needed.
- AR techniques can be used to help a casualty with severe breathing difficulties.

In some situations, giving AR may be more difficult than in others. Some examples are:

- When severe injuries to the mouth and nose prevent a good seal around the mouth.
- When blood and/or other body fluids drain into the throat and block the airway, do your best to drain the mouth prior to beginning AR.
- The casualty has been poisoned by a toxic gas like hydrogen sulphide and coming in contact with the casualty may result in you being poisoned.
- The casualty has a corrosive poison on their face or in their mouth, and you don't have a face mask.

When this happens, you have to do the best you can (based on your level of training) without putting yourself into danger.

Opening the Airway

Healthcare providers will primarily open a casualty's airway using the head-tilt/chin-lift, except in cases where a spinal injury is suspected.

In those cases, a jaw thrust is used. In the event that a spinal injury is suspected and the jaw thrust does not work, use a head-tilt/chin-lift to open the airway.

Using a jaw thrust

To use the jaw thrust method, perform the following steps:

1. With the head and neck supported, position your hands on either side of the head.
2. Steady your thumbs on the casualty's cheekbones. Grasp the angle of the jaw with your middle, ring and little fingers and lift to open the airway.
3. If necessary, open the mouth using the index fingers.
4. Check for signs of breathing and a pulse for at least 5 and up to 10 seconds while holding the airway open with the jaw thrust.

5. If there is a pulse, but no breathing, position the mask over the casualty's face. Blow into the casualty's mouth and watch for the chest to rise. Keep lifting the jaw to hold the airway open.
6. If there is no pulse, begin compressions and continue CPR until an AED arrives on the scene.

Using a pocket mask

A pocket mask is used to deliver artificial respiration, while providing some protection to the responder as well.

The pocket mask should be positioned over the mouth and nose, with the lower, wider end placed approximately one finger's width above the chin.

Using a bag-valve mask (BVM)

A bag-valve-mask (BVM) is a self-inflating bag with a one-way valve that a face mask can be attached to. The BVM will also accept an oxygen reservoir bag. The bags come in three sizes: adult, child, and infant.

A BVM is also used to deliver artificial respiration. It is recommended that the BVM be used with two responders.

To use a BVM, perform the following steps:

1. Open and secure the casualty's airway.
2. Select the correct sized mask based on the casualty's size (adult, child or infant)
3. Create a C grip on the mask by positioning your thumbs over the top of the mask and your index and middle fingers over the bottom half of the mask.
4. Make sure the mask fits properly by aligning the apex of the mask with the bridge of the nose and the lower end of the mask just below the mouth on the chin. Make sure to center the ventilation port, if your mask has one, to the center of the mouth.
5. Place your ring fingers and pinky finger at the corner of the jaw just below the ear and perform a jaw thrust.

6. Instruct a second rescuer to squeeze the bag every three to six seconds, depending on the casualty, with two hands, providing only enough air to make the chest rise.

Using advanced airways with masks

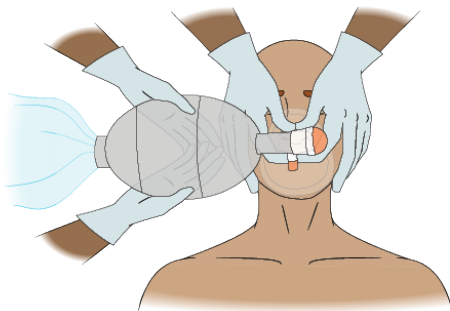
When using a pocket or bag valve mask, using an advanced airway is recommended. This involves advanced skill training. If an advanced airway is not available or you are not trained on how to use it, this does not preclude you from using a pocket mask or BVM. Using one or the other without an airway is acceptable. The healthcare professional may be asked to assist with the bag valve mask when an advanced responder has inserted an advanced airway. Adjunct airways (oral or nasal) may be necessary in conjunction with bag-valve mask if the casualty is unresponsive.

Adult AR: Two-Rescuer BVM

To provide two-rescuer BVM for an adult, perform the following steps:

1. One rescuer positions themselves at the casualty's head, and places the mask on the casualty's face.
2. Using the thumb and first finger of EACH hand around the valve in a C position, the rescuer presses the mask against the casualty's face.
3. Using the remaining fingers of EACH hand in an E position, the rescuer lifts up on the jaw and tilts the head back to open the airway. If the casualty has a suspected head/spinal injury, use a jaw thrust.

4. The second rescuer will squeeze the bag to ventilate. Give each breath every 5 to 6 seconds. Ensure the chest visibly rises.
5. Check the pulse approximately every 2 minutes.



Child AR: Two-Rescuer BVM

To provide two-rescuer BVM for a child, perform the following steps:

1. One rescuer positions themselves at the casualty's head, and places the mask on the casualty's face.
2. Using the thumb and first finger of EACH hand around the valve in a C position, the rescuer presses the mask against the casualty's face.
3. Using the remaining fingers of EACH hand in an E position, the rescuer lifts up on the jaw and tilts the head back to open the airway. If the casualty has a suspected head/spinal injury, use a jaw thrust.
4. The second rescuer will squeeze the bag to ventilate. Give each breath every 3 to 5 seconds. Ensure the chest visibly rises.
5. Check the pulse approximately every 2 minutes.

Infant Artificial Respiration: Two-Rescuer BVM

To provide two-rescuer BVM for an infant, perform the following steps:

1. One rescuer positions themselves at the casualty's head and places the mask over the nose and mouth. Do not cover the eyes or chin.
2. Using the thumb and first finger of EACH hand around the valve in a C position, the rescuer presses the mask against the casualty's face.
3. Using the remaining fingers of EACH hand in an E position, the rescuer lifts up on the jaw and tilts the head back to open the airway. If the casualty has a suspected head/spinal injury, use a jaw thrust.
4. The second rescuer will squeeze the bag to ventilate. Give 1 breath every second. Ensure the chest visibly rises.



5. Give 1 breath every 3 to 5 seconds (12 to 20 per minute).
6. Check the pulse approximately every 2 minutes.

Assisted Breathing

Assisted breathing helps a casualty with severe breathing difficulties breathe more effectively.

In a clinical setting, you may have access to a Continuous Positive Airway Pressure (CPAP) machine. It is most useful when the casualty shows very little or no breathing effort. If breathing effort is good, the casualty will likely breathe better on their own. Start assisted breathing when you recognize the signs of severe breathing difficulties.

The technique for assisted breathing is the same as for artificial respiration, except for the timing of the ventilations. If the casualty is breathing too slowly, give a breath each time the casualty inhales, plus an extra breath in between the casualty's own breaths. Give one breath every five seconds for a total of 12 to 15 breaths per minute.

If the casualty is breathing too fast, give one breath on the casualty's every second inhalation. This will hopefully slow down the casualty's own breathing. Give a total of 12 to 15 breaths per minute.

If the casualty is conscious, explain what you are going to do and why. Reassure the casualty often and encourage them to try to breathe at a good rate with good depth.

Be sure to watch the chest during ventilation. The chest should rise with each breath if the breath is effective.

Giving AR to a Casualty who Breathes Through a Stoma

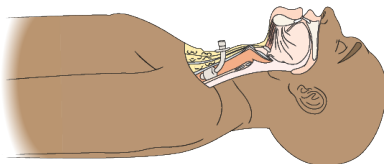
Some people breathe through an opening at the base of their neck. This opening, called a stoma, is the result of a previous medical operation called a laryngectomy.

You may not know someone breathes through their neck when you try to give AR. If the air seems to go down the airway when you blow, but the chest does not rise, check their neck for a stoma. You may also hear air coming out of the stoma as you blow.

Giving AR to a casualty with a stoma

The first aid rescue sequence does not change. Once you identify that a casualty breathes through a stoma, perform the following steps:

1. Expose the entire neck and remove all coverings over the stoma. If there is a tube coming out of the stoma, do not remove it.
2. Place a pad under the shoulders to keep them slightly elevated (if you have one close by).



3. Keep the head in line with the body and keep the chin raised.
4. Seal the mouth and nose with the hand closest to the head.
5. Seal your face shield or your pocket mask over the stoma, or connect your BVM to the tracheostomy tube, and ventilate.
6. Watch the chest rise (look, listen, and feel for air movement).
7. Let the air escape from the stoma between breaths.
8. Maintain a clean air passage, using a cloth to clean the opening; never use paper tissues.



Gastric Distension

If you blow into a casualty too fast or too hard, air may be bypassed into the stomach, causing it to fill with air and become bloated. This is called gastric distension, and it can make it harder to ventilate the casualty and increase the chances that the casualty will vomit. If the stomach becomes distended, try to prevent further distension by:

- Repositioning the head and opening the airway again
- Blowing more slowly, with less air
- Making sure the airway is held fully open

It is unusual, but the stomach can become so distended that the lungs cannot expand. In this case, the air you blow won't go into the lungs, so you have to relieve the gastric distension by forcing the air out of the stomach. Only relieve gastric distension when the lungs cannot expand and AR is ineffective.

To prevent gastric distension:

- Give breaths at the recommended rate:
 - Adults One breath every 5 to 6 seconds.
 - Children and infants One breath every 3 to 5 seconds.
- Only blow enough air to make the chest rise.
- Make sure the airway is fully open. Keep the head tilted well back (but not over-extended).



CPR

When assessing the casualty, the HCP (healthcare provider) will check for breathing and a pulse simultaneously before beginning compressions. Rescuers should check the:

- Adult Carotid pulse
- Child Carotid or femoral pulse
- Infant Brachial or femoral pulse

Chest Compression Fraction

The chest compression fraction is the estimate of time during the CPR event that the casualty receives chest compressions. The goal is to minimize the time compressions are not being performed (the time off the chest) to increase blood circulation to the vital organs during CPR. The target goal is 60% to 80% of the time performed on rescue chest compressions.

Bradycardia (slow pulse rate)

Bradycardia is a slow heart rate. A child or infant with a pulse rate of less than 60 beats per minute and showing signs of poor perfusion/circulation, despite oxygen and ventilation, should also receive chest compressions. The low heart rate (<60 bpm) does not provide enough circulation to sustain adequate cellular oxygenation; by providing a compression rate of 100 to 120 compressions per minute, the healthcare provider will assist in providing adequate circulation to a casualty.

CPR (Compression and Ventilation) Ratios

Healthcare providers will provide the same compression to ventilation ratios as the lay rescuer when performing one-rescuer CPR for adults, children and infants; as well as two-rescuer adult, but the ratio will change when they perform two-rescuer CPR for the child and infant.

For two-rescuer CPR on a child or infant, the rescuer will provide compressions and ventilations at a ratio of 15 compressions to 2 ventilations.

The depth of compressions should be at least $\frac{1}{3}$ the depth of the infant or child's chest with a rate of 100 to 120 compressions per minute.

In the case of the infant casualty, the rescuer may encircle the infant casualty's chest and use their thumbs side by side or one on top of the other to provide compressions. The method used will depend on the size of the infant casualty and the rescuer's thumbs.

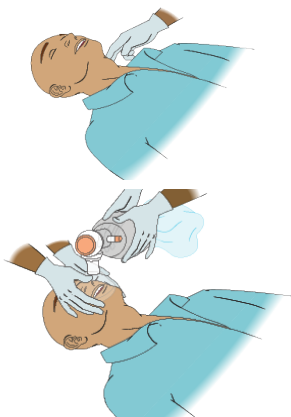
Adult CPR/AED

Check breathing and pulse for at least 5 and no more than 10 seconds.

If there is a pulse, but no breathing, begin artificial respiration.

If there is no pulse and no breathing, or only agonal breaths, begin compressions.

Agonal breathing is an abnormal pattern of breathing driven by a brain-stem reflex, characterized by irregular gasping respirations, at times accompanied by strange vocalizations. They can occur with cardiac arrest and lead bystanders to believe the casualty is breathing.



One-rescuer CPR 30:2

To provide one-rescuer CPR at a ratio of 30:2, perform the following steps:

1. Give 30 chest compressions in the middle of the upper chest using two hands.
2. Push hard, push fast (100 to 120 per min) to a depth of 5 to 6 cm (2 to 2.4 inches). The pressure and release phases take the same time. Release pressure and completely remove your weight at the top of each compression to allow the chest to return to the resting position after each compression. Minimize interruptions.
3. Give 2 breaths.
4. Continue CPR at a ratio of 30:2 until any of the following occurs:
 - a. An AED is ready for use.
 - b. EMS/advanced providers arrive.
 - c. The casualty shows signs of recovery.

Two-or-more-rescuer CPR 30:2

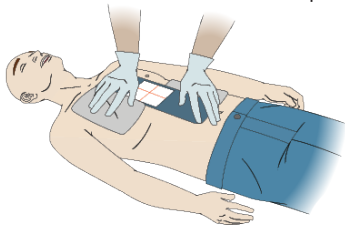
To provide two-or-more-rescuer CPR at a ratio of 30:2, perform the following steps:

1. Rescuer one gives 30 chest compressions at a rate of 100 to 120 per minute.
2. Rescuer two gives 2 rescue breaths, enough to make the chest visibly rise. Minimize interruptions.
3. Quickly change positions every 5 cycles (2 minutes).
4. If an advanced airway is in place, give one breath every 6 to 8 seconds, with no pause in compressions for breaths.

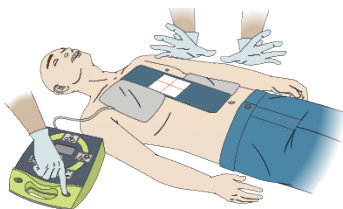
Defibrillation

To provide defibrillation on an adult, perform the following steps:

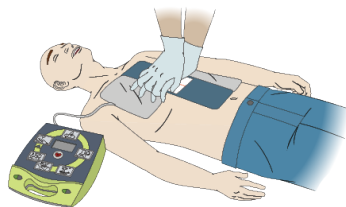
1. Expose the chest. Turn on the AED. Follow the voice prompts. Select and attach the adult pads.



2. If SHOCK is advised, CLEAR and give 1 shock. Immediately resume chest compressions.



3. If NO SHOCK is advised, immediately resume chest compressions.



4. Continue 30 compressions of 2 breaths for 5 cycles (approximately 2 minutes). Analyze heart rhythm, and continue CPR/AED until advanced providers take over.

Child CPR/AED

Check breathing and pulse for at least 5 and no more than 10 seconds.

If there is a pulse, but no breathing, begin artificial respiration.

If there is no pulse (or it is below 60 bpm) and no breathing, or only agonal breathing, begin compressions.

Perform the following procedures for one-rescuer and two- or more rescuer CPR/AED for a child.



One-rescuer CPR 30:2

To provide one-rescuer CPR at a ratio of 30:2 for a child, perform the following steps:

1. Give 30 chest compressions in the middle of the upper chest using one or two hands.
2. Push hard, push fast (100 to 120 per min) to a depth of about 2 inches (5 cm), or about 1/3 of the depth of the chest. The pressure and release phases take the same time. Release pressure and completely remove your weight at the top of each compression to allow the chest to return to the resting position after each compression. Minimize interruptions.
3. Give 2 breaths.
4. Continue 30 compressions to 2 breaths.

Two-or-more-rescuer CPR 15:2

To provide two-or-more-rescuer CPR at a ratio of 15:2 for a child, perform the following steps:

1. Rescuer one gives 15 chest compressions at a rate of at least 100 to 120 compressions per minute.

2. Rescuer two gives 2 rescue breaths, enough to make the chest visibly rise.
3. Quickly change positions every 10 cycles (2 minutes).
4. If an advanced airway is in place, give one breath every 6 to 8 seconds without a pause in compressions.

Common Problems While Performing CPR

Ventilation:

- Head-tilt/chin-lift or jaw thrust manoeuvres are not being held properly. The seal is loose between the pocket mask or the BVM and the casualty's skin.
- Taking too long during breaths (more than one second each).
- Providing breaths too fast or too slow.

Compressions:

- The compression rate is too slow (slower than 100).
- Pressing either too hard or not hard enough on the sternum.

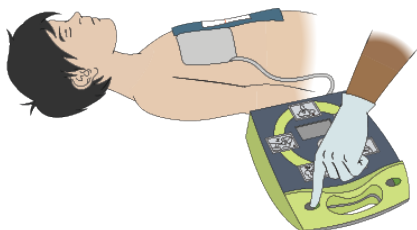
Complications of CPR:

After the CPR incident, even if CPR is done properly, there will likely be damage to the casualty. These can include broken ribs and internal lung damage. Despite the risk, we provide CPR and manage any injuries after the CPR incident is completed.

Defibrillation

To provide defibrillation on a child, perform the following steps:

1. Expose the chest. Turn on the AED. Follow the voice prompts. Select and attach the pediatric pads. If pediatric pads are not available, use adult pads.



2. If SHOCK is advised, CLEAR and give 1 shock. Immediately resume chest compressions.
3. If NO SHOCK is advised: Immediately resume chest compressions.
4. Continue 15 compressions at 2 breaths for 5 cycles (approximately 2 minutes). Analyze heart rhythm, and continue CPR/AED until advanced providers take over.

AED Special Circumstances

Pregnant women: AEDs can be used in all stages of pregnancy

Children: Automated external defibrillators (AEDs) may be used for children and infants. Special pads or a pediatric setting on the machine are used, but if not available, adult pads can be used. Some adult pads show an alternate placement for children/infants.

Patch medications: Some casualties wear a patch that contains medication such as nitroglycerin for angina. If the patch is in the way of the pad placement, gently remove it from the chest with gloved hands and wipe the area clean.

Wet environment: AEDs can be used in wet areas. Dry the chest to ensure good pad contact. Move the casualty to a dry area if possible. If you or the casualty is submerged in water, avoid using the AED.

Metal surfaces: AEDs can be used safely with the casualty on a metal surface.

Jewelry and piercings: Avoid placing pads over top of piercings, jewelry, or anything that would cause a gap. AED pads should adhere flat to the skin.

Environment: Ensure the environment you are using an AED in does not contain explosive gases.

Infant CPR/AED

Check breathing and pulse for at least 5 and no more than 10 seconds. For infants, you will check the pulse at the brachial (inner arm around the elbow crease) or femoral (crease of the groin on either leg) arteries, and not the carotid arteries.



If there is a pulse, but no breathing, begin artificial respiration.

If there is no pulse (or it is below 60 bpm) and no breathing, or only agonal breathing, begin compressions.

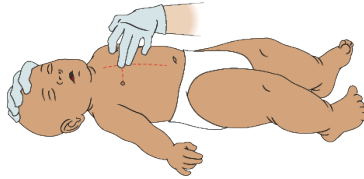


Perform the following procedures for one-rescuer and two- or more rescuer CPR/AED for an infant.

One-rescuer CPR 30:2

To provide one-rescuer CPR at a ratio of 30:2 for an infant, perform the following steps:

1. Give 30 chest compressions just below the nipple line using two fingers.



2. Push hard, push fast (100 to 120 per minute) to a depth of about 1 1/2 inches (4 cm) or 1/3 of the depth of the chest. The pressure and release phases take the same time. Release pressure and completely remove your weight at the top of each compression to allow the chest to return to the resting position after each compression. Minimize interruptions.
3. Give 2 breaths.
4. Continue 30 compressions: 2 breaths.

Two-or-more-rescuer CPR 15:2

In the case of the infant casualty, the rescuer may encircle the infant casualty's chest and use their thumbs side by side or one on top of the other to provide compressions. The method used will depend on the size of the infant casualty and the rescuer's thumbs.

To provide two-or-more-rescuer CPR at a ratio of 15:2 for an infant, perform the following steps:

1. Rescuer one gives 15 chest compressions at a rate of at least 100 to 120 compressions per minute.
2. Rescuer two gives 2 rescue breaths, enough to make the chest visibly rise.
3. Quickly change positions every 10 cycles (2 minutes).

4. If an advanced airway is in place, give one breath every 6 to 8 seconds without a pause in compressions.

Defibrillation

To provide defibrillation on an infant, perform the following steps:

1. Expose the chest. Turn on the AED. Follow the voice prompts. Select and attach the pediatric pads. If pediatric pads are not available, use adult pads.
2. SHOCK advised: CLEAR and give 1 shock. Immediately resume chest compressions.
3. NO SHOCK advised: Immediately resume chest compressions.
4. Continue 15 compressions - 2 breaths for 5 cycles (approximately 2 minutes). Analyze heart rhythm, and continue CPR/AED until advanced providers take over.

Team Approach

Healthcare providers should practise working in integrated teams. When a team is available, one rescuer provides airway control and ventilations right away, a second rescuer begins compressions, and a third obtains and uses the AED. This is the optimal situation, as the rescuers have the ability to maximize the compression fraction of CPR prior to defibrillation. A high-performance team can achieve an 80% compression fraction (i.e.: perform effective chest compressions for the majority of the time they are resuscitating the casualty).

Post-Resuscitation Care

After the CPR incident is over, if the circulation returns, the casualty will need to be monitored closely. If defibrillator pads have been attached, they should be kept on the chest. Check for vital signs every 2 minutes. If the casualty is not breathing or not breathing effectively, assist or provide ventilation.

CHOKING

A person chokes when the airway is partly or completely blocked and airflow to the lungs is reduced or cut off. The choking casualty either has trouble breathing or cannot breathe at all.

Causes of Choking		
Foreign objects	Tongue	Swelling
Infants and children (food, toys, buttons, coins, etc.)	Tongue falls to the back of the throat when lying on back	Injury to the throat area causes swelling of the airway
Adults (consuming drinks quickly with food in their mouths)	Saliva, blood, or vomit pools in the throat	Illness causes swelling (e.g., allergic reaction, asthma, epiglottitis, croup)
Elderly (food, pills, etc.)		Swollen airway

With good air exchange, the obstruction is mild and the casualty can still cough forcefully, breathe, and speak. With poor air exchange, the obstruction is severe and the casualty cannot cough forcefully, has trouble breathing, or cannot speak. With a completely blocked airway, there is no air exchange. It is impossible for the casualty to cough, breath, or speak.

When the air supply to the lungs is cut off, the casualty's face immediately becomes red or flushed. Shortly after, as the oxygen in the body is used up, their face becomes grey and the lips and ear lobes become blue. The casualty then becomes unconscious and eventually the heart stops beating.

Signs of Choking	
Mild Obstruction	
Able to speak	Not able to speak
Signs of distress (eyes show fear)	Signs of distress (eyes show fear)
Forceful coughing	Weak or no coughing
Wheezing and gagging between coughs	High-pitched noise or no noise when trying to breathe
Red or flushed face	Grey face and blue lips and ears

First Aid for Choking for an Adult or Child

To give first aid for a choking adult or child, perform the following steps:

1. Perform a scene survey.
2. If the casualty can cough forcefully, speak or breathe, tell them to try to cough up the object. If a mild obstruction lasts for a few minutes, get medical help.
3. If you think there might be a severe obstruction, check by asking, Are you choking? If the casualty cannot cough forcefully, speak or breathe, use back blows followed by abdominal thrusts to remove the blockage.
 - Give back blows and abdominal thrusts.
 - Support the casualty and give up to five blows between the shoulder blades using the heel of your hand.
 - If the obstruction is not cleared, step behind the casualty, ready to support them if they become unconscious.

- Make a fist, place it on the casualty's abdomen at the belly button, in line with the hip bones. Grasp one fist with the other hand and give five forceful inward and upward abdominal thrusts.
 - If the object is not removed, repeat back blows and abdominal thrusts.
4. If the casualty becomes unconscious:
- Lower them to the ground. Call for medical help and get an AED if available.
 - Begin chest compressions immediately. After the first 30 compressions, check the mouth. Remove any foreign object you can see. Try to give 2 breaths. If air does not go in, continue to give chest compressions and inspect the mouth before ventilations.

First Aid for a Casualty who is Pregnant or Larger than the Rescuer

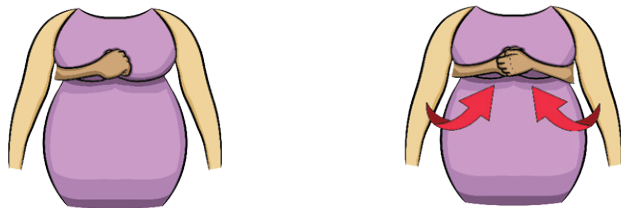
If a choking casualty is larger or is pregnant, give back blows as normal, followed by chest thrusts.

1. While supporting the casualty, give up to five back blows between the shoulder blades, using the heel of your hand.



2. If the obstruction is not cleared, stand behind the casualty.

3. Keep your arms horizontal and snug up under their arm pits.



4. Place your fist against the lower half of the breastbone, thumb-side in.
5. Hold your fist with your other hand. Pull inward forcefully.
6. Continue giving back blows and chest thrusts until either the object is removed, or the casualty becomes unconscious.

First Aid if you are Alone and Choking

If you begin to choke on an object, you may have to clear your own airway.

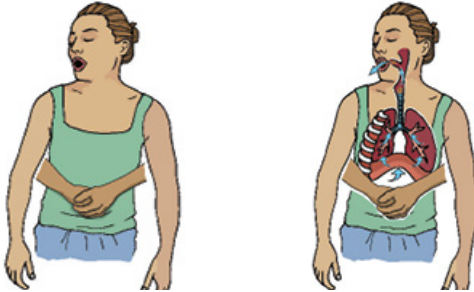
1. If there are people around, get their attention. Do not isolate yourself from others.
2. Try to cough up the object.
3. Give yourself abdominal thrusts until you can cough forcefully, breathe or speak.

A second method is to use a solid object like the back of a chair, a table, or the edge of a counter.

1. Position yourself so the object is just above your hips.
2. Press forcefully to produce an abdominal thrust.

How abdominal thrusts work

When you choke on something, your body tries to unblock your airway by coughing. Abdominal thrusts try to do the same thing with an artificial cough. This illustration shows how an abdominal thrust creates a cough.



An abdominal thrust quickly pushes the diaphragm up towards the lungs. This forces the air from the lungs up the airway and hopefully blows the obstruction out. For the best effect, the fist must be in the correct place. Keep your forearms off the abdomen and make each thrust a strong and sudden movement.

First Aid for a Choking Casualty in a Wheelchair

Some wheelchairs will allow the first aider to provide abdominal or chest thrusts as they would for a casualty who is standing.

If you can reach around from behind the wheelchair, give back blows as normal, and abdominal or chest thrusts.

If you cannot reach around the wheelchair:

1. Position the wheelchair against a wall (if possible) and place the wheelchair brake on.
2. If possible, carefully lean the casualty forward and support their shoulders. Perform five back blows between the shoulder blades, using the heel of your hand.



3. Put the heel of one hand, with the other on top, on the centre of the breastbone and give firm chest thrusts.
4. Repeat back blows and chest thrusts until the object is removed or the casualty becomes unconscious.



If a doctor, physiotherapist, or other health professional has shown you a different way of giving abdominal thrusts to a person in your care, use the recommended method.

If the casualty becomes unresponsive, you will need to take them out of the wheelchair.

1. Call for medical help and get an AED.
2. Pull the casualty forward supporting them as best as you can and lower them to the ground.
3. Roll the casualty to the floor to a face up position.

4. Begin chest compressions immediately. After the first 30 compressions, check the mouth. Remove any foreign object you can see. Try to give 2 breaths and continue to give chest compressions and inspect the mouth before ventilations.

First Aid for a Choking Infant

An infant is choking when they suddenly have trouble breathing, start coughing or gagging, and have high-pitched, noisy breathing.

1. Perform a scene survey and primary survey.
2. If the baby can cough forcefully or breathe, let the baby try to cough up the object. If a mild obstruction lasts for more than a few minutes, send for medical help.
3. If the baby cannot cough forcefully, cannot breathe, makes a high-pitched noise when trying to breathe or starts to turn blue, begin back blows and chest thrusts.
4. Secure the baby between your forearms and turn them face down.
5. With the "baby's head lower than the body, use the heel of your hand to give five forceful back blows between the shoulder blades.
6. Turn the baby face up and give five chest thrusts.
7. Keep giving back blows and chest thrusts until either the airway is cleared or the baby becomes unconscious.
8. If the baby becomes unconscious, send for medical help. Begin chest compressions immediately.
9. After the first 30 compressions, check the mouth. Remove any foreign object you can see. Try to give 2 breaths and continue to give chest compressions and inspect the mouth before ventilations.

Annexe

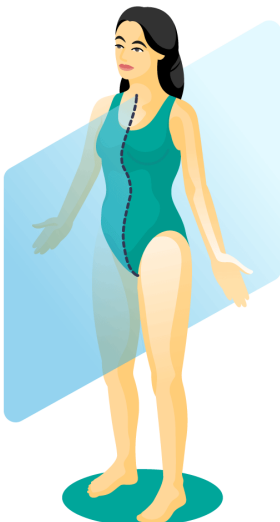
The body and how
it works

INTRODUCTION TO ANATOMY AND PHYSIOLOGY

As a first aider, you do not need to have full knowledge of anatomy and physiology. However, you should know the basic structure of the human body and how it functions normally. This chapter describes the terms used in anatomy so that you can be more precise when giving information about a person's condition. It gives a short description of the major organs and functions of the skin, musculoskeletal system, nervous system including the eye, digestive and urinary, circulatory and respiratory systems.

ANATOMICAL TERMS

These are the words used to describe where things are on the body and how they relate to each other.

**Posterior**

Toward the back of the body

Superior

Part toward the head of the body

Proximal

Closer to the attachment of arm/leg:
e.g., the elbow is proximal to the wrist

Extension

Straightening a joint

Lateral

Away from the mid-line of body: e.g.,
the small toe is lateral to the big toe

Flexion

Bending a joint

Distal

Further away from the attachment of arm/
leg: e.g., the fingers are distal to the wrist

Inferior

The part toward the feet of the body

Medial

Nearer to mid-line: e.g., the big toe is
medial to the small toe

THE SKIN

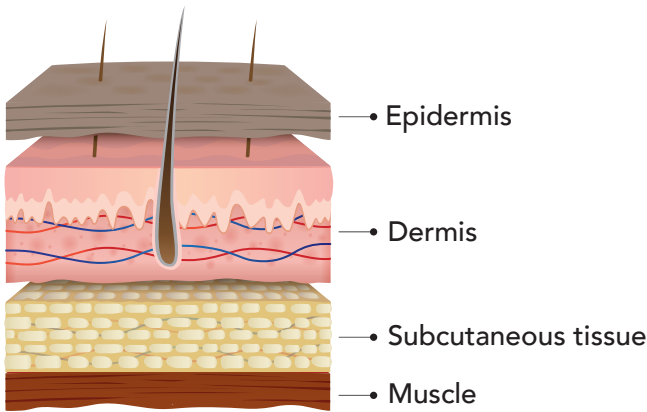
The skin is an important organ of the body. Its primary functions are to protect the body from environmental hazards and infection, eliminate waste in the form of sweat, help maintain normal body temperature, and tell the brain of environmental temperature changes.

Environmental Control

A rich supply of nerves in the skin keeps the brain aware of environmental changes. These nerves are sensitive to heat, cold, pain, and touch, and they transmit these sensations to the brain. The skin helps the body adjust to its environment and protects it from extreme temperatures. In cold temperatures, blood vessels constrict to reduce blood flow near the surface of the skin. This helps prevent loss of heat from the body core. The fatty layers under the skin insulate the body to keep in body heat. In hot temperatures, the blood vessels near the skin surface dilate (get larger), allowing more blood flow near the skin. This cools the body by moving heat from the core to the surface, where it either radiates from the body, or is used to evaporate perspiration, having a cooling effect.

Functions of the skin

- To protect the body from bacterial invasion
- To help control body temperature
- To retain body fluids
- To help eliminate waste products through perspiration
- To insulate the body



MUSCULOSKELETAL SYSTEM

The musculoskeletal system is the framework of the body within which organs and body systems function. This framework includes bones, muscles, tendons, and ligaments. Bones act as levers for muscle action; muscles shorten to produce movement; tendons attach muscles to bones; ligaments attach bones to bones at the joints. The musculoskeletal system protects organs, supports the body, and provides for its movement.

Muscles

Muscles are made of a special kind of tissue that contracts (shortens) when stimulated by nerve impulses. Generally, body movement is caused by several muscles working in combination; as some are contracting, others are relaxing. The nerves in the muscles carry impulses to and from the brain.

Muscles are classified as either voluntary or involuntary. Voluntary muscles are consciously controlled by the person, meaning they can be contracted or relaxed as the individual wishes. The muscles that move the skeleton are voluntary.

Involuntary muscles contract and relax rhythmically without any conscious effort on the part of the person. The heart, which has its own regulating system, is a good example of an involuntary muscle.

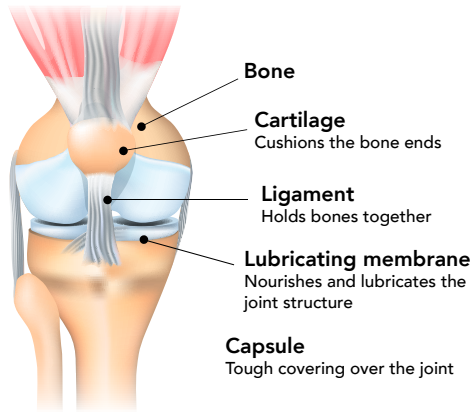
The diaphragm, a large dome-shaped muscle that separates the chest and abdominal cavities and is used in breathing, has characteristics of both voluntary and involuntary muscles. The contraction of this muscle, and thus the rate of breathing, can be changed at will for short periods of time.

SKELETON

The skeleton, made up of bones, forms the supporting structure that gives the body its shape. It also protects many of the organs. For example, the brain is protected by the skull, the heart and lungs by the ribs, and the spinal cord by the vertebrae.

The Joints

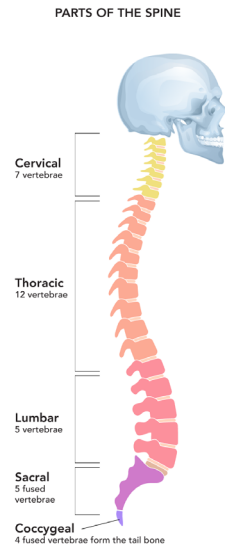
The bones allow body movement by serving as rigid levers for tendons and muscles. The joints are formed where two or more bones come together. Immovable joints allow no movement, as in the bones of the adult skull. Slightly movable joints allow only limited movement and are found between the vertebrae and between the pelvis and the spine. Freely moving joints are covered with smooth cartilage to minimize friction, and are held together by bands of strong tissue called ligaments.



Spine

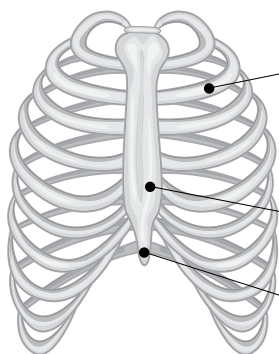
The spine is divided into five parts, as shown in the diagram. There are 33 bones in the spine, called vertebrae. The vertebrae stack on top of each other with discs between them. The discs are made of a tough flexible material and serve as shock absorbers in the spine. All the discs and vertebrae have an opening in the centre such that, when they stack together, there is a long channel that runs from the top to the bottom of the spine. The spinal cord, which carries all nerve impulses to and from the brain, runs through this channel.

The spine protects the spinal cord, but if the spine is fractured, broken bones, displaced tissue and swelling can damage the spinal cord, possibly causing lifelong disability.



Thorax

The thorax is made up of the ribs, the 12 thoracic vertebrae, and the sternum (breastbone). The thorax protects the organs in the chest, mainly the heart and lungs. It also provides some protection for the upper abdominal organs, including the liver at the front and the kidneys at the back. Injuries to the bones of the thorax threaten the organs they protect, and can therefore be life-threatening.



Ribs

12 pairs are attached to the vertebrae in back and either to the sternum, or to each other, in front. The lowest ribs attach to the vertebrae only, and are called "floating ribs"

Sternum

A dagger-shaped bone with the point downward

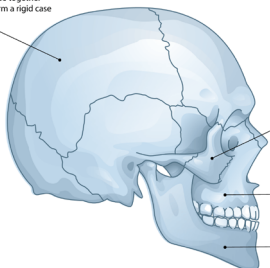
Xiphoid process (tip of sternum)

Strong piece of cartilage. Pressure on this cartilage can damage underlying organs

Skull

All the bones of the head make up the skull. The skull gives the head its shape and also protects the brain. When the skull is fractured, the brain may also be injured.

Cranium
The plate-like bones fuse together during childhood to form a rigid case for the brain

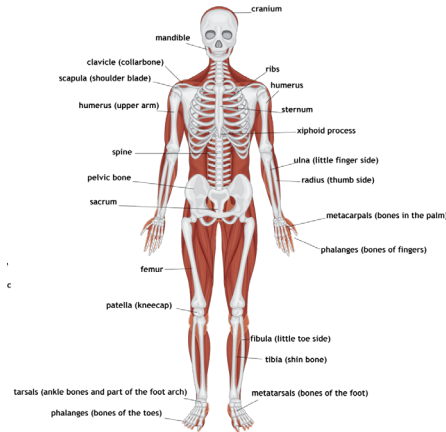


Facial bones
Join with the bones of the cranium to form the eye and nose cavities, which protect the eyes and nose

Upper jaw (maxilla)

Lower jaw (mandible)

Main Bones of the Skeleton



NERVOUS SYSTEM

The nervous system is composed of the brain, spinal cord, and nerves. The brain and spinal cord together are called the central nervous system. The nerves that spread out to all parts of the body are called peripheral nerves. The nervous system is subdivided into the voluntary nervous system and the autonomic nervous system. The voluntary nervous system controls functions at the will of the individual. The autonomic nervous system controls functions without the conscious effort of the individual (e.g., heartbeat, breathing, blood pressure, digestion, and glandular secretions such as hormones).

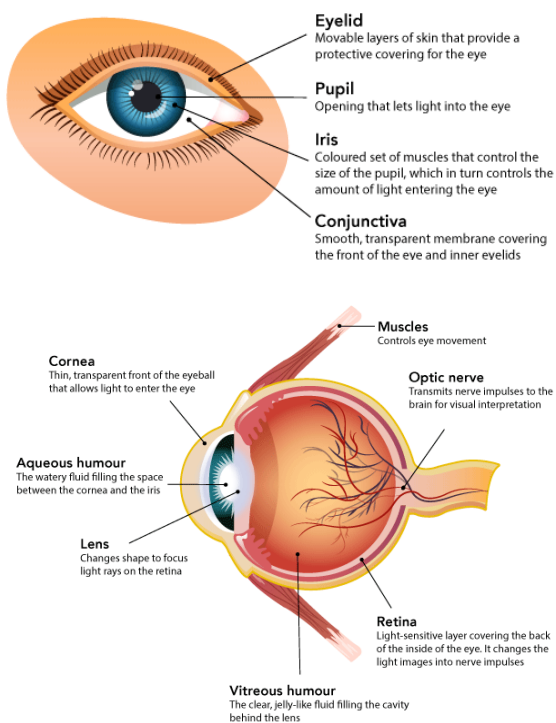
There are two kinds of peripheral nerves that extend from the spinal cord to all parts of the body: motor nerves and sensory nerves. Motor nerves control movement. Sensory nerves transmit sensations of touch, taste, heat, cold, and pain to the brain.

Brain

The brain, the controlling organ of the body, occupies almost all the space in the cranium. It is the centre of consciousness, memory, and thought. It receives information and transmits impulses to all parts of the body for voluntary and involuntary activities.

Eyes

The eye is the organ of sight. Any injury to the eye is potentially serious and may result in impaired vision or blindness. The quick response of the first aider and the correct first aid may help prevent permanent damage to the eye.

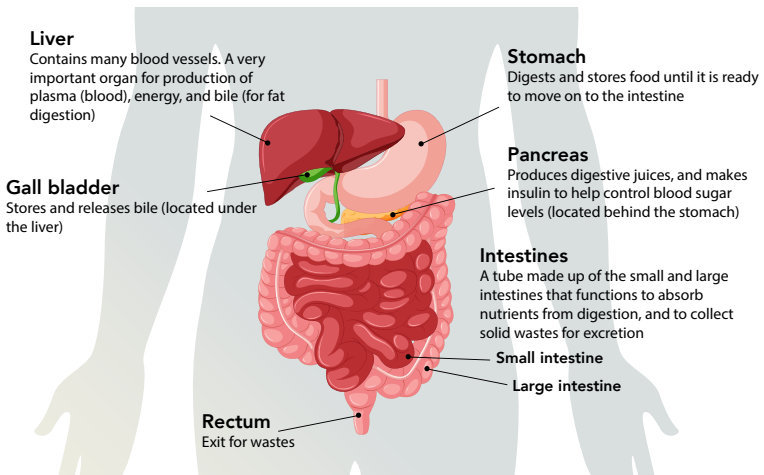


DIGESTIVE AND URINARY SYSTEMS

The digestive and urinary systems convert food and drink into nutrients for the cells and collect and dispose of solid and fluid waste. The organs of these systems are classified as hollow or solid. The hollow, tubular organs carry digestive and urinary materials. The solid organs are tissue masses with a rich blood supply.

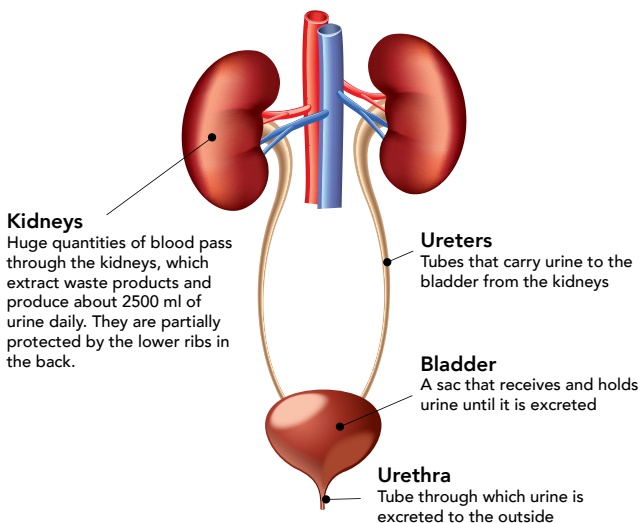
Injury to hollow organs may allow the contents to spill out into the abdominal or pelvic cavities, causing infection. Injury to the solid organs can result in severe internal bleeding.

Digestive System



Urinary System

The urinary system removes and collects waste products from the blood and eliminates them from the body in the form of urine. It is made up of the kidneys, ureters, bladder and urethra.



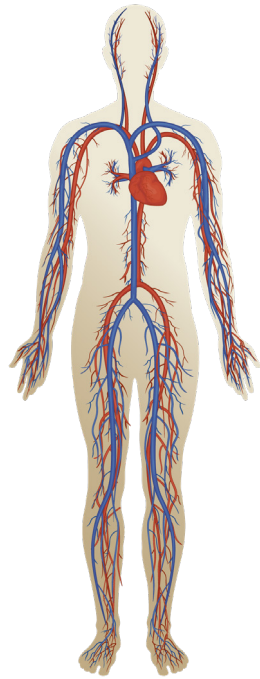
CIRCULATORY SYSTEM

The circulatory system is a complex closed circuit that circulates blood throughout the body. It consists of the heart and blood vessels. Blood circulation is essential for distributing oxygen and nutrients to cells, and for collecting waste products from cells for excretion from the body.

Heart

The heart is a muscle located in the chest cavity behind the ribs and sternum. This muscle is a hollow muscular organ that allows the blood in the body to circulate. The heart functions as a pump for the rest of the body, continually pumping blood to the lungs and then to the rest of the body. The heart has chambers that fill with blood when it relaxes. Once contracted the blood will be pushed out into the blood vessels. The pulse rate is measured by counting how many times the heart pumps in one minute.

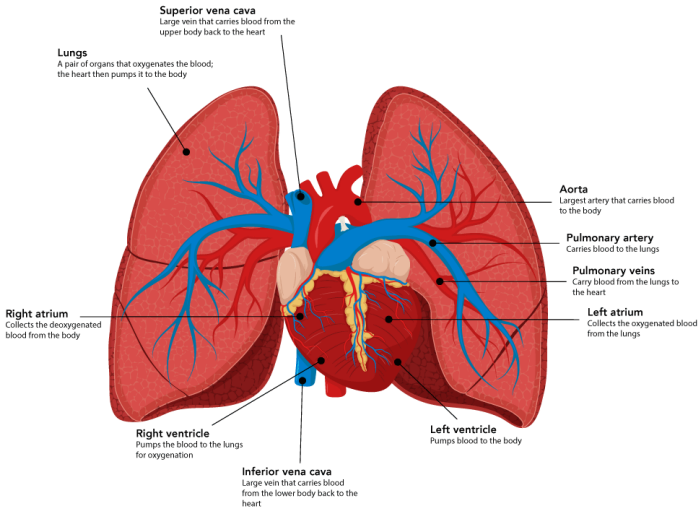
To make the heart beat effectively, it has a complex system of nerves. These nerves carry electrical impulses that control the beating of the heart.



Blood Vessels

The blood travels through blood vessels. There are three main types of blood vessels: arteries, capillaries and veins. The arteries are the strongest blood vessels. They carry blood, under pressure, from the heart to all parts of the body. The arteries expand according to the volume of blood being forced through them by the pumping action of the heart, and return to normal size as the heart refills for the next contraction. This pressure wave can be felt as a pulse.

The body and how it works



The largest artery, the aorta, emerges from the top of the heart. The coronary arteries branch off from the top of the aorta to supply the heart with blood. The smallest arteries are called arterioles and eventually form capillaries. Capillaries are the tiny blood vessels that reach every living cell to deliver oxygen, food, etc., and collect waste products. They have very thin walls to allow for the exchange of fluids and gases. Capillaries eventually join to form tiny venules, which in turn form veins. The veins take the blood back to the heart. Veins have thinner walls than arteries and most have cup-like valves that allow blood to flow only toward the heart.

Blood

Blood is the fluid that circulates through the heart and blood vessels. It transports oxygen and nutrients to the cells and carries away carbon dioxide and other waste products. Blood is composed of plasma, red cells, white cells and platelets.

Blood circulation

The blood circulation system is a closed loop beginning and ending at the heart. It consists of:

Pulmonary circulation Starting at the right side of the heart, blood is pumped to the lungs, where it drops off carbon dioxide and picks up oxygen, and then moves it back to the left side of the heart.

Systemic circulation Starting at the left side of the heart, blood is pumped to the body, where it delivers oxygen and picks up carbon dioxide, and then moves it back to the right side of the heart.

Blood components

The components that comprise blood include:

- Plasma Pale yellow liquid that carries cells, platelets, nutrients and hormones
- Red blood cells Carry oxygen
- White blood cells Protect the body against microbes
- Platelets Help form blood clots to stop bleeding

Blood pressure

Blood pressure is the pressure of the blood pushing against the inside walls of the blood vessels. With each heartbeat, there is a wave of pressure that travels throughout the circulatory system.

The pressure wave is strong enough to be felt as a pulse at various points in the body, including the wrist (radial pulse), the neck (carotid pulse), and the upper arm (brachial pulse). Three factors control blood pressure, and problems with one or more cause shock:

Blood volume (how much blood is in the body)

- The capacity and elasticity of the blood vessels
- The strength of the heartbeat

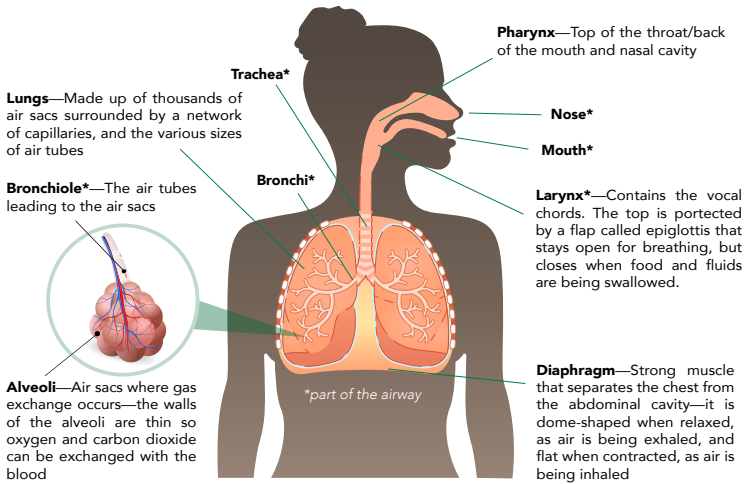
If blood pressure is too low, the body's tissues don't get enough oxygen. This results in shock. Severe bleeding reduces the blood volume, which affects blood pressure. The body tries to compensate for blood loss by constricting the blood vessels and reducing the capacity of the circulatory system. With continued blood loss, however, the body cannot compensate and blood pressure drops.

RESPIRATORY SYSTEM

The respiratory system causes air to be drawn in and out of the lungs. The fresh air we breathe contains about 21% oxygen. In the lungs, blood picks up some of the oxygen and releases carbon dioxide. The air we breathe out has less oxygen (about 16%) and more carbon dioxide.

The respiratory system has three main parts: the airway, the lungs and the diaphragm.

The airway is the passage that air follows to get from the nose and mouth to the lungs. In the lungs, blood drops off carbon dioxide and picks up oxygen. This process is called gas exchange. The diaphragm, a smooth, flat muscle just below the lungs, is used in breathing.



Respiratory Control

Breathing is controlled by the respiratory centre in the brain, located near the base of the neck. It monitors the amount of oxygen and carbon dioxide in the blood. As the levels of oxygen and carbon dioxide change, the respiratory centre responds by changing the rate and depth of breathing.

How much oxygen is used, and how much carbon dioxide is given off, is related to the person's level of physical activity, and stress. As physical activity goes up, or illness or injury is present, more oxygen is used and more carbon dioxide is given off, so the respiratory centre increases the rate and depth of breathing to compensate (the heart rate also goes up). Breathing slows down when less oxygen is needed and less carbon dioxide is being produced.

Mechanism of Breathing

The lungs have no way of drawing air into themselves. Instead, the diaphragm and the muscles between the ribs work together to expand the chest, which in turn expands the lungs. This causes air to be pulled into the lungs.

As the breathing muscles relax, the chest returns to its smaller size and air is forced out of the lungs.

The lungs are covered with a smooth, slippery tissue called the pleural membrane. It is a continuous, double-layered tissue, one layer attached to the lungs and the other to the inside of the chest wall. The pleura acts as a lubricating layer to allow easy movement between the chest wall and the lungs, and to ensure that the lungs expand with the action of the chest wall.

Glossary

A

Abandonment: a first aider leaves the casualty without consent and without the care of a responsible person.

Abdominal thrust: the Heimlich manoeuvre; the manual thrusts to create pressure to expel an airway obstruction.

ABCs: Acronym meaning A= airway; B = breathing; C= circulation.

Abortion: the premature expulsion from the uterus of the products of conception.

Abrasion: a scraped or scratched skin wound.

Acute: a condition that comes on quickly, has severe symptoms and lasts a relatively short time.

Adam's apple: the bump on the front surface of the neck formed by part of the larynx (voice box).

AED: automated external defibrillator- a device used to deliver a shock to help restart a stopped heart.

AIDS: Acquired immunodeficiency syndrome; a fatal disease spread through the HIV (human immunodeficiency virus).

Airway: the route for air in and out of the lungs.

Allergens: substances that trigger an allergic reaction in the body.

Allergic reaction: a hypersensitive response of the body's immune system to a particular allergen.

Alveoli: air sacs of the lungs.

Amniotic sac: a sac holding fluid surrounding a fetus in the uterus.

Amputation: complete removal of an appendage (leg, arm, finger, etc.).

Anaphylaxis: serious, potentially life-threatening allergic reaction.

Anatomy: the structure of the body.

Angina (pectoris): a spasmodic pain in the chest due to a lack of blood supply to the heart.

Aorta: the largest artery in the body; originates at the left ventricle.

Aqueous humour: the watery fluid produced in the eye and located between the lens and the cornea.

Arteries: blood vessels that carry blood away from the heart.

Arteriosclerosis: a name for several conditions that cause the walls of the arteries to become thick, hard, and inelastic.

ASA: acetylsalicylic acid a medication available without prescription used to relieve pain, reduce swelling, reduce fever, etc.

Asthma: attacks of difficult breathing with wheezing/ coughing, often due to allergens.

Atherosclerosis: a form of arteriosclerosis caused by fat deposits in the arterial walls.

Aura: a sensation of an impending seizure; may be a smell, taste, etc.

Autonomic nervous system: part of the nervous system that regulates involuntary functions (not controlled by conscious thought), such as pulse, breathing, digestion, hormone secretion, etc.

Avulsion: an injury where a piece of tissue is partially or completely torn away.

B

Back blows: sharp blows to the back, done to relieve an airway obstruction.

Bacteria: germs that can cause disease.

Bandage: material that holds a dressing in place.

Basic life support (BLS): maintaining the ABCs without equipment (excluding barrier devices).

Blood clot: a semi-solid mass of blood products used by the body to stop bleeding.

Blood pressure: the pressure of blood against the walls of arterial blood vessels.

Blood volume: the total amount of blood in the heart and the blood vessels.

Bloody show: the mucous and bloody discharge signalling the beginning of labour.

Brachial pulse: pulse felt on the inner upper arm, normally taken on infants.

Breech birth: the delivery of a baby's buttocks or a foot first, instead of the head.

Bronchi: the main branches of the trachea carrying air into the

lungs. Smaller branches are called bronchioles.

Bronchospasm: severe tightening of the bronchi/bronchioles.

Bruise: broken blood vessels under the skin.

C

Capillaries: very small blood vessels that link the arteries and the veins, and allow gases and nutrients to move into and out of the tissues.

Carbon dioxide (CO₂): a waste gas produced by the cells; an important stimulant for control of breathing.

Carbon monoxide (CO): a dangerous, colourless, odourless gas which displaces the carrying of oxygen by the red blood cells.

Cardiovascular disease: refers to disorders of the heart and blood vessels; e.g., high blood pressure and arteriosclerosis.

Cardiac arrest: the sudden stopping of cardiac function with no pulse and unresponsiveness.

Carotid artery: the main artery of the neck; used to assess the carotid pulse.

Carpals: small bones of the wrist.

Cartilage: a tough, elastic tissue covering the surfaces where bones meet, also forms part of the nose, and ears.

Central nervous system: part of the nervous system consisting of the brain and the spinal cord.

Cerebrovascular accident (CVA): stroke; sudden stopping of circulation to a part of the brain.

Cervical collar: a device used to immobilize and support the neck.

Cervix: the lowest portion, or neck, of the uterus.

Chest thrusts: a series of manual thrusts to the chest to relieve an airway obstruction.

Cholesterol: a fatty substance found in animal tissue or products; also produced by the body; thought to contribute to arteriosclerosis.

Chronic: a condition with a long and/or frequent occurrence.

Chronic obstructive pulmonary disease (COPD): a term describing a group of lung diseases that cause obstructive problems in the airways: usually consists of chronic bronchitis, emphysema.

Circulatory system: the heart and blood vessels.

Clavicles: the collarbones.

Clonic phase: describes a convulsion where tightness and relaxation follow one another.

Closed wound: wound where the skin is intact.

Compression: a condition of excess pressure on some part of the brain, usually caused by a buildup of fluids inside the skull.

Concussion: a temporary disturbance of brain function, usually caused by a blow to the head or neck.

Congestive heart failure: failure of the heart to pump effectively, causing a back-up of fluid in the lungs and body tissues.

Conjunctiva: the transparent membrane covering the front of the eyeball (cornea) and the inner eyelids.

Contamination: contact with dirt, microbes, etc.

Contract: to shorten; usually refers to a muscle that exerts a pull when it shortens.

Convection: the loss of heat caused by the movement of air over the body.

COPD: Chronic obstructive pulmonary disease (see above).

Cornea: the transparent front part of the eyeball.

Coronary artery: vessel that feeds the heart muscle.

Cranium: the part of the skull covering the brain.

Crepitus: the grating noise made when fractured bone ends rub together.

Croup: a group of viral infections that cause swelling of the inner throat.

Cyanosis: a bluish (for paler skin tones) or grey (for darker skin tones) colour of the skin due to insufficient oxygen in the blood.

D

Decapitation: the traumatic removal of the head.

Defibrillation: applying an electrical shock to a fibrillating heart.

Deoxygenated blood: blood containing a low level of oxygen.

Dermis: the inner layer of the skin containing hair-germinating

cells, sweat glands, nerves, and blood vessels.

Diabetes: a disease caused by insufficient insulin in the blood; causes excessive blood sugar.

Diaphragm: a large dome-shaped muscle separating the chest and abdominal cavities.

Diarrhea: excessive watery bowel movements.

Direct pressure: force applied directly on a wound to help stop bleeding.

Dislocation: when the bone surfaces at a joint are no longer in proper contact.

Distal: refers to a part that is farther away from the attachment of a leg/arm/finger/toe.

Dressing: a covering over a wound, used to stop bleeding and prevent contamination of the wound.

E

Embedded object: an object stuck onto the surface (usually on the eye) or impaled into tissues.

Embolus: any foreign matter such as a blood clot, fat clump, or air bubble carried in the blood stream.

Emetic: a substance used to cause vomiting.

EMS: Emergency medical services system a community s group of services that responds to emergencies including police, fire fighters, paramedics.

Emphysema: a chronic lung disease characterized by overstretched alveolar walls. See COPD.

Epidermis: The outermost layer of the skin.

Epiglottis: a lid-like piece of tissue which protects the entrance to the larynx (voice box).

Epiglottitis: an infection, usually in children, resulting in a swelling of the epiglottis may cause an airway obstruction.

Epilepsy: a chronic brain disorder characterized by recurrent convulsions.

ESM: Emergency scene management the sequence of actions a first aider should follow to give safe and appropriate first aid.

Exhalation: expiration; breathing out.

Extrication: freeing from being trapped (usually a car collision).

F

Femur: the thigh bone.

Fibrillation: uncoordinated contractions of the heart muscle, so that the blood outflow is almost nil.

Fibula: the bone of the lower leg on the little toe side.

Flail chest: a condition in which several ribs are broken in at least two places, allowing a free-floating segment.

Flexion: bending a joint.

First aid: the help given to an injured or suddenly ill person using readily available materials.

First aider: someone who takes charge of an emergency scene and gives first aid.

Fracture: a broken or cracked bone.

Frostbite: tissue damage due to exposure to cold.

G

Gallbladder: a sac under the liver that concentrates and stores bile; used for fat digestion.

Gastric distention: a swelling of the stomach usually with air, due to ventilating with excessive volume or force during artificial respiration.

Gauze: an open mesh material used for dressings.

Guarding: a tightening of the abdominal muscles when the casualty has abdominal pain and is touched there.

H

Head-tilt/chin-lift manoeuvre: opening the casualty's airway by tilting the head backward and lifting the chin forward.

Heart attack: the damaging or death of an area of the heart muscle caused by loss of blood supply.

Heart failure: a weakened heart muscle that is unable to push blood forward.

Heat cramps: painful muscle spasms due to excessive loss of fluid and salts by sweating.

Heat exhaustion: excessive sweating causing a loss of water and salts.

Heat stroke: a life-threatening emergency where the temperature regulation mechanism cannot cool the body and the temperature is far above normal.

Heimlich manoeuvre: abdominal thrusts done to remove an airway obstruction.

History: information about the casualty's problem: symptoms, events leading up to the problem, applicable illnesses or medications, etc.

Hyperglycemia: abnormally elevated blood sugar.

Hypertension: high blood pressure.

Hyperthermia: heat-related illnesses causing abnormally high body temperature.

Hyperventilation: abnormally deep and rapid respirations.

Hypoglycemia: abnormally low blood sugar levels.

Hypothermia: abnormally low body temperature.

Hypoxia: abnormally low levels of oxygen in the body tissues.

I

Impaled object: an object that remains embedded in a wound.

Immobilization: placing some type of restraint along a body part to prevent movement.

Incontinence: loss of bladder and bowel control.

Infarction: an area of tissue death due to lack of blood flow.

Infection: inflammation due to microbes.

Inflammation: a tissue reaction to irritation, illness or injury; shows as redness, heat, swelling, and pain.

Inhalation: breathing in; inspiration.

Insulin: hormone produced by the pancreas; important in the regulation of blood sugar levels.

Insulin coma/reaction/shock: hypoglycemia (blood sugar levels too low) due to excessive insulin.

Intra-pleural space: a tiny space containing a negative pressure (vacuum) between the two pleural layers.

Involuntary muscle: muscles not under conscious control; heart, intestines, etc.

Iris: coloured part of the eye; made of muscles that control light entering the eye.

Ischemic: lacking sufficient oxygen; as in ischemic heart disease.

J

Joint: a place where two or more bones meet.

Joint capsule: a tough covering over a joint.

K

Kidneys: a pair of organs that filter blood and produce urine.

L

Labour: the muscular contractions of the uterus that expel the fetus.

Laceration: a jagged wound from a rip or a tear.

Laryngectomy: removal of the larynx (voice- box); results in a neck breather.

Lens: a part of the eye which focuses light rays on the retina.

Ligament: a tough cord of tissue that connects bone to bone.

Lipoproteins: substances floating in the blood; made of proteins and fats.

Lymph: a fluid similar to plasma that circulates in the lymphatic system.

Lymphatic system: a system of vessels, nodes and organs that collects strayed proteins leaked from blood vessels and cleanses the body of microbes and other foreign matter.

M

Mandible: the bone of the lower jaw.

Mechanism of injury: the force that causes an injury and the way it is applied to the body.

Medical alert: a means of identifying casualties (usually a bracelet, necklace) who have a condition that may alter first aid treatment.

Medical help: the treatment given by or under the supervision of a medical doctor.

Mental Health Continuum: The Mental Health Continuum shows the range of mental health. Those with mental health illness or mental health problems can move through this range of healthy, reacting, injured, and ill.

Mental Health Problem: A mental health problem is a broad term that includes both mental disorders and symptoms of mental disorders that may not be severe enough to warrant a diagnosis of a mental disorder.

Metacarpals: bones of the palm of the hand.

Metatarsals: bones of the arch of the foot; between the ankle

and toes.

Micro-organisms: germs that can cause illness.

Miscarriage: the lay term for an abortion; the loss of the products of conception.

Mouth-to-mouth ventilation: artificial respiration by blowing air into the mouth of the casualty.

Mucous membrane: thin, slick, transparent lining, covering tubes and cavities that open to the outside; the inner surface of the mouth, nose, eye, ear, rectum, etc.

Musculoskeletal system: all of the bones, muscles, and connecting tissues that allow locomotion (movement of the body).

Myocardial infarction: death of part of the cardiac (heart) muscle; heart attack.

N

Nail bed test: a method of assessing the adequacy of circulation to the extremities; gentle pressure is exerted on the nail bed until the tissue whitens; the return of colour to the area is assessed upon pressure release.

Negligence: failure to perform first aid at the level expected of someone with similar training and experience.

Nerve: a cord made up of fibres which carry nerve impulses to and from the brain.

Nervous system: the brain, spinal cord and nerves that control the body's activities.

Nitroglycerin: a drug used to ease the workload on the heart; often carried as a pill or spray by casualties with angina.

O

O₂: the chemical symbol for oxygen.

Obstructed airway: a blockage in the air passageway to the lungs.

Oxygen: an odourless, colourless gas essential to life.

P

Pancreas: an organ located under the stomach; produces digestive enzymes and hormones which regulate blood sugar.

Paralysis: the loss of muscle function in part of the body.

Patella: the bone of the knee cap.

Phalanges: bones of the fingers and toes.

Pharynx: the back of the mouth and above the voice box (larynx); a passageway for both air and food.

Physiology: the study of functions of the body.

Placenta: an organ attached to the uterus that provides a fetus with nourishment.

Plasma: a pale yellow fluid containing blood cells, nutrients, gases, and hormones.

Platelet: a small, cell-like blood element important in blood clotting.

Pleural membrane: a slick membrane covering the outside surface of the lungs and the inside surface of the chest cavity (thorax).

Pneumonia: inflammation of the lungs.

Pneumothorax: an accumulation of air in the pleural space. Normally the pleural space contains a negative pressure or a vacuum; the air mass (instead of a vacuum) collapses the lung under it.

Position of function: refers to the position an injured hand is placed in when bandaged and/or splinted; i.e.: fingers are gently curved, with palm slightly downwards.

Primary survey: a step of ESM assessing the casualty for life-threatening injuries and giving appropriate first aid.

Proximal: refers to a part that is closest to the attachment of a leg/arm/finger/toe/intestine.

Pulmonary artery: the major artery emerging from the right ventricle; carries deoxygenated blood to the lungs.

Pulse: the rhythmic expansion and relaxation of the arteries caused by the contractile force of the heart; usually felt where the vessels cross a bone near the surface.

R

Radiate: to diverge or spread from a common point; the pain of a heart attack in the chest radiates to the left arm.

Radius: the bone on the thumb side of the lower arm.

Red blood cells: the most numerous type of blood cells; carry oxygen.

Respiratory arrest: stopped breathing.

Retina: the covering at the back of the eyeball; changes light rays into nerve impulses.

Reye s Syndrome: A rare but serious disease in children and adolescents that is reported to be associated with taking ASA

for a viral infection. Reye's Syndrome affects the brain, liver and blood. It can cause permanent brain damage or death.

RICE: R = Rest; I = Immobilize; C = Cold; E = Elevation. First aid for certain bone and joint injuries.

Rule of nines: a system of estimating the amount of skin surface burned.

S

Sacrum: a bone formed from five fused vertebra; forms the back of the pelvis.

Scapula: shoulder blade.

Scene survey: the initial step of ESM (emergency scene management), where the first aider takes control, assesses any hazards, and makes the area safe, finds out what has happened, identifies self as a first aider, gains consent from the casualty, calls for help from bystanders, and starts organizing them to get help for the casualty.

Sclera: the white of the eye; the tough, opaque layer of the eyeball.

Secondary survey: a step of ESM; assessing the casualty for non-life-threatening injuries and giving appropriate first aid.

Sign: objective evidence of disease or injury.

Sling: a support for an arm or shoulder, usually brought around the neck.

Spleen: an organ of the lymphatic system; functions to cleanse foreign matter from the blood; blood reservoir.

Spontaneous pneumothorax: air in the pleural space due to an unexplained rupture of the underlying lung.

Splint: a rigid and padded support used to prevent movement in a bone or joint injury.

Sprain: supporting tissues about a joint (such as ligaments) are stretched, partly or completely torn.

Sternum: the breastbone.

Stoma: an opening in the neck through which the person breathes.

Strain: a stretched or torn muscle.

Sucking chest wound: a wound in which air is pulled into the chest cavity through the chest wall; it can cause a collapse of the lung beneath.

Superficial: on the surface of the body; as opposed to deep.

Superior vena cava: one of the two largest veins; it drains the arms and head of deoxygenated blood and empties into the right atrium.

Symptom: an indication of illness or injury experienced by a casualty; cannot be detected by an observer without asking.

Syrup of ipecac: an emetic; used to induce vomiting.

T

Tendon: a tough cord of tissue that attaches muscles to bones or other tissues.

Tension pneumothorax: air in the pleural space presses on the heart and blood vessels and affects their function.

Tetanus: a type of bacteria in a wound; can cause severe muscle spasms.

TIA: transient ischemic attack: a mini-stroke.

Tibia: the bone in the lower leg; on the large toe side; the shin bone.

Tonic phase: first stage of a convulsion where the muscles are rigid.

Tourniquet: a constricting band used to stop severe bleeding.

Trachea: a tube for air, kept open with cartilage rings; is located between the larynx (voice box) and the bronchi.

Traction: gently but firmly pulling below a fracture to bring the limb into alignment.

Transient ischemic attack (TIA): temporary signs and symptoms of a stroke due to a lack of sufficient oxygen to the brain.

Trauma: any physical or psychological injury.

Triage: a system of placing priorities for first aid and/or transportation for multiple casualties.

U

Ulna: bone in the lower arm; on the little finger side.

Urethra: a tube which carries urine from the bladder to the outside.

Uterus: the muscular sac that holds, protects a fetus.

V

Vein: a blood vessel; carries blood to the heart.

17 Ventilation: supplying air to the lungs.

Ventricles: the muscular lower chambers of the heart which pump blood into the arteries.

Ventricular fibrillation: a quivering action of the heart muscles so that little blood is pumped.

Vital signs: the four signs that show the basic condition of the casualty: level of consciousness; breathing; pulse; skin condition and temperature (sources vary as to the components of vital signs).

W

White blood cells: blood cells that are involved in immunity and control of microbes.



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