HEAVEN CAN WAIT

EMERGENCY FIRST AID TRAINING

# First Aid & CPR Manual Fourth Edition

Written by David Goodman, Paramedic,
Jess Copeland, Paramedic,
and Wendy Ogunyanwo, RN

Heart & Stroke Guidelines for CPR & ECC, CSA Z1210:24



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## Heaven Can Wait's

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**Heart & Stroke Guidelines for CPR & ECC, CSA Z1210.24**

## Approvals:

**Workplace Safety and Insurance Board (WSIB)**
**Heart and Stroke Foundation**
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# PREFACE
# By Dr. Michael Feldman

In an emergency, there's nothing worse than being unprepared. You have a sinking feeling as you watch a situation go from bad to worse, and a guilty feeling because you know you could have done something to help, if only...

David Goodman and his team bring considerable experience as paramedics and nurses in writing this first aid manual. It has detailed information not only on what the first aider must do, but on the causes of diseases or injuries, the potential outcomes, and likely treatments at the scene, in the ambulance, and in the hospital.

In combination with hands-on practice in first aid, CPR, and defibrillator use, this manual explains the whys of first aid, and not only the whats. A grasp of the anatomy, pathophysiology, and treatment of the disease or injury can help the first aider learn through understanding the principles, and not just through rote memorization. The manual goes on to describe specific procedures, such as how to stop bleeding, restore a pulse, treat medical conditions, or splint an injured limb, to name a few of the emergencies that can be encountered.

The in-depth information the Heaven Can Wait manual provides acts as a supplement to training, and serves as a useful guide and reference for all skills a learner must master.

Louis Pasteur once said, "Fortune favours the prepared mind." This equally applies to medicine. Good outcomes are possible with preparation and practice, and this is the reference book for the prepared.

**Dr. Michael Feldman, MD, PhD, FRCPC**

Paramedic Services Medical Director
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# INTRODUCTION

## *Welcome*

Hello,

I would like to take this opportunity to introduce myself. My name is David Goodman. I am a paramedic as well as the founder of Heaven Can Wait Emergency First Aid Training. I would like to congratulate you for investing in this invaluable life-saving education. After completing this course through Heaven Can Wait, you will feel enabled and empowered to provide the best care you can for anyone in any emergency situation. My job is saving lives and I want to provide you with the knowledge to do the same.

Sincerely,



David Goodman

BSc, AEMCA, Paramedic

President and Founder of Heaven Can Wait Emergency First Aid Inc.

# HOW IT ALL BEGAN

Heaven Can Wait Emergency First Aid Training was established by Paramedic David Goodman. Driven by his first hand witness accounts of serious medical situations, which often led to significant disabilities and death, David recognized the necessity to properly train the general public in First Aid and CPR. Too frequently had David responded to 9-1-1 calls where individuals, bystanders and family members were unable to effectively help the person in need. As a result, David embarked on his vision to share his knowledge and experience in Emergency Medicine by educating and empowering the public in First Aid and CPR Training. This built the foundation for the development of Heaven Can Wait.

Upon working with the general public and health care professionals, David's passion for health continued to evolve, as did Heaven Can Wait. Today, the Heaven Can Wait team is comprised of a variety of healthcare professionals; Paramedics, Physicians, Naturopathic Doctors, Holistic Nutritionists, Fitness Experts and more. Together, the team has created a wide range of Courses, Lunch and Learns and evening Seminars based on their professional expertise.

**"It's better to know First Aid and ideally not have to use it, than have to use it and not know it"**

All of Heaven Can Wait programs both Basic and Intermediate First Aid are taught strictly by healthcare providers whose knowledge and experience in emergency medicine is vast and ever-evolving.


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# DISCLAIMERS AND IMPORTANT INFORMATION

The information provided in this manual should not be used as a substitute for medical care and/or advice by a Physician. There may be variations in specific treatments that your Doctor may recommend based on individual facts and circumstances. Heaven Can Wait Emergency First Aid Inc. and the author of this manual have made considerable efforts to ensure information and First Aid protocols outlined are accurate, up-to-date and in accordance with guidelines as set out by respected and recognized governing bodies. Heaven Can Wait Emergency First Aid Inc. and the author of this manual cannot accept any responsibility for errors and/or omissions and it is the responsibility of users of this manual to stay within the guidelines outlined, as well as practicing within the "scope of practice" of which all First Aiders are to abide.

Heaven Can Wait is **not providing legal advice.** Therefore, this manual must not replace information provided by legal counsel.

The information provided in this manual both meets and exceeds all requirements dictated by the Workplace Safety & Insurance Board (WSIB), in addition to being in accordance with the 2025 guidelines of the International Liaison Committee on Resuscitation (ILCOR) the Heart and Stroke Foundation of Canada as well as the American Heart Association.

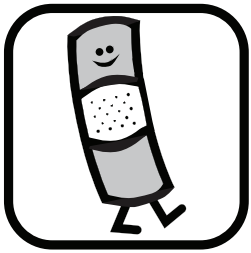
## NOTE

This First Aid Reference Manual is to be used in conjunction with Heaven Can Wait's educational lectures and as a quick reference, resource and educational learning tool. This guide **must not be considered substitution** for instruction by our paramedics and other professionals at Heaven Can Wait. The author and editor of this manual cannot accept any responsibility for errors and/or omissions. Great care has been taken to provide accurate and up-to-date information as they pertain to the accepted general practices and current standards of care in First Aid, CPR and Defibrillation. Heaven Can Wait Emergency First Aid Inc. cannot take responsibility for consequences of improper utilization and application of information provided in this manual.

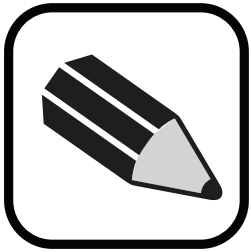
It is important to note that The Heart and Stroke Foundation of Canada highly recommends yearly re-certification in CPR and Automated External Defibrillation (AED).

How to get the most from your

# *Heaven Can Wait Emergency First Aid Training*



**First Aid** procedures in point form



**Notes** to remember to master the subject



**Important information. David's helpful hints and reminders.**


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# Chapter 1
## Roles and Responsibilities of the First Aider

## *Common Terms Used In First Aid*

### Definition of First Aid

**First Aid** can be defined as providing immediate emergency care to an injured or ill person. The primary purpose of First Aid is to sustain/preserve life, and to aid the casualty until the arrival of Emergency Medical Services.



First Aid is not meant to take the place of professional medical attention and treatment.

### Definition of First Aider

A **First Aider** can be defined as anyone who volunteers to take charge in an emergency situation. This individual is responsible for delivering emergency First Aid to a casualty as well as providing proper scene management until appropriate medical help arrives.

### Definition of Medical Help

**Medical help** is a term used to describe trained medical professionals, such as paramedics, who render specific medical treatment to those who are ill or injured.

## Definition of the Term "Casualty" and the Age Ranges for Adult, Child and Infant as they Apply to First Aid and CPR

A **casualty** is an individual who is in need of emergency medical care due to injury, illness, or other medical condition.

Specific **age ranges** for casualties in the context of First Aid and CPR are defined below:

**Adult:** Signs of puberty or older.

**Child:** 1 year old to signs of puberty: breast development and/or axillary (armpit) hair.

**Infant:** Less than 12 months.

## History and History Taking

Have you ever wanted to play detective? Well, here's your chance! History taking is one of the most vitally important aspects in providing effective First Aid for a casualty. **History taking** starts from the initial Scene Survey, looking for clues to what may have caused the injury or illness (**Mechanism of Injury**), right through to questions you will ask the casualty, in order to gain a better understanding of the nature and acuity of the injuries.

Before I provide you with an example of how to attain all this information, we must first define and understand a few key terms and concepts.

## The Concept of Mechanism of Injury (MOI)

It is crucial to understand the concept of **Mechanism of Injury**, as it provides an understanding of what events lead up to an injury or illness of a casualty. As well, the MOI provides clues to the First Aider of what underlying injuries may have been sustained, especially if the casualty is unresponsive and unable to provide you with a history. To better grasp this concept, an example is provided.

An individual driving his car at 100km/hr suddenly smashes into the back of a tractor trailer. Here is how the MOI is dissected for this particular example.

The car smashes into the tractor trailer at 100km/hr. The driver of the vehicle hits his chest against the steering wheel at 100km/hr. The driver's heart and brain smash into the chest wall and cranium both at 100km/hr respectively. This MOI is an example of a blunt force trauma and you may expect underlying injuries such as a closed head injury, internal bleeding and potential Shock-like symptoms.

## Signs and Symptoms

**Sign:** Something you can see, hear, smell etc… (e.g. blood, wheezing, burnt flesh).

**Symptom:** Something that the casualty describes feeling (e.g. headache, chest pain, dizziness).

Now that you have more of an understanding, let us now revisit the principles of **History Taking.**

You will now be introduced to a method to quickly and effectively gather pertinent information from an emergency scene as well as from a casualty. It's as simple as "**SAMPLE**". Remember, the information you gather will be very handy to EMS upon their arrival.



All you will need is a pencil and paper, your detective skills and your senses.

### SAMPLE

**S** **Signs and Symptoms:** If the casualty is conscious, ask them what they are feeling and listen for any abnormal breathing sounds. Begin a visual check, looking for anything out of the ordinary, such as blood, a fracture etc… If the casualty is unconscious, look at the **Mechanism of Injury** to help provide you with clues to his/her underlying injuries or see if there are bystanders who may have seen the events take place.

**A** **Allergies:** Ask the casualty if they have any known allergies and if so, what they are. Ask if they have an EpiPen Auto-Injector if they do have allergies. If the casualty is unconscious, look for a medical alert to provide you with clues to allergies or other health conditions.

**M** **Medications:** Ask the casualty if they take prescription or non-prescription medication and if so, write them down. Ask the casualty when they last took their medication(s).

**P** **Past Medical History:** This is where you try to find out if the casualty has any health and/or medical problems. If so, are they leading to the issue(s) at hand? Another acronym to help you remember important questions related to past medical history is **DR. BOSH**.

**L** **Last Meal or Last Oral Intake:** Find out when the casualty ate or drank last. This could be vitally important if you have a diabetic casualty.

**E** **Events** Leading to the Incident: who, what, where, when, why and how. Look for a Mechanism of Injury, especially if the casualty is unconscious.

**D=Diabetes** (e.g. Type I-Insulin dependant, Type II-Non-Insulin Dependant).

**R=Respiratory conditions** (e.g. Asthma).

**B=Blood Pressure** (e.g. High or Low Blood Pressure).

**O=Other Medical Conditions** (e.g. Osteoporosis).

**S= Seizures**

**H=Heart Problems** (e.g. Angina, Congestive Heart Failure).



Remember: Look for a medical alert to provide you with clues/information Places to look for medical information: (necklace, bracelet, anklet, earrings, tattoo, wallet card).

# *Legal Implications When Giving First Aid*

## The Good Samaritan Act (Ontario-Bill 20 April 2001)

The **Good Samaritan Act** protects individuals (bystanders) and medical professionals from liability when delivering assistance to casualties in emergency situations, acting in good faith.

A "*Good Samaritan*", according to the American Heritage Dictionary, is someone who demonstrates compassion and who unselfishly helps others.

Often, one of the major concerns an individual faces when deciding to help a stranger in an emergency situation is that of being sued, or being legally liable. This conflict (far too) often prevents emergency First Aid from being delivered to a casualty in need. For this very reason, in 2001, **The Good Samaritan Act** was enacted.

In most parts of Canada, excluding Quebec, individuals do not have a legal obligation to help someone in an emergency by providing First Aid. The Good Samaritan Act was enacted to inspire and encourage bystanders to help when such emergencies arise.



- If you choose not to get involved in an emergency situation, you can always help by calling 9-1-1. If you see someone in distress who you think requires help from Police, Fire, or Ambulance, make the call.
- Good Samaritan laws will vary from province to province, so it is recommended that you become familiar with specific regulations, for the jurisdiction in which you reside.

The **Good Samaritan Act** states:

**Protection from Liability:** "A person who voluntarily and without reasonable expectations of compensation or reward, provides the services described in The Good Samaritan Act, is not liable for damages that result from the person's negligence in acting or failing to act while providing the services, unless it is established that the damages were caused by the gross negligence of the person."

To provide more insight on this very important topic, below are individuals who are covered under the umbrella of the **Good Samaritan Act**:

a) Health Care Professionals

b) Individuals, excluding Health Care Professionals, who provide Emergency First Aid assistance to a person who is ill, injured or unconscious as a result of an accident or other emergency, **if** the individual provides the assistance at the immediate scene of the accident or emergency.



Specific individuals who **are** required to act in emergency situations include:

a) Lifeguards who must respond to individuals in need.

b) Individuals in a motor vehicle accident must help the others at the accident scene.

c) Those who have a "**Duty to Respond**".

The complete Good Samaritan Act, 2001 can be found online at: http://www.canlii.org/on/laws/sta/2001c.2/20051114/whole.html

## Consent

An individual who has made the decision to deliver First Aid to a person in need must always do their best to obtain permission from the casualty in advance of any treatment rendered. There are two types of consent we will be looking at:

**1. Expressed or verbal consent**

**2. Implied consent**

Legally speaking, you cannot touch another person without receiving their consent. With this being said, let us briefly view the two types of possible **consent** we can acquire from a casualty.

**1. Expressed/Verbal Consent-** This type of consent must be acquired for all conscious and competent individuals. Think: Are they in a suitable headspace to make a proper decision for themselves.

The following is an example of how one might obtain expressed or verbal consent (e.g. permission to help) from a casualty.

- Introduce yourself with your name and inform the casualty you are trained in First Aid.
- Ask the casualty if they would like help.

a) If the casualty responds by saying "**Yes**", you have just received **verbal consent**. If the casualty responds with a nod of the head, you have just received **expressed consent**. In either case, you have permission to help.

b) If the casualty answers "**No**", refuses treatment, REMEMBER that you should not touch the casualty **however** you can always **Call 9-1-1** if required.

- Always explain to the casualty what you will be doing in terms of First Aid procedures. This will gain trust between you and the casualty and may decrease the casualty's anxiety.

If the casualty is unable to respond verbally or with the nod of their head, you can now assume implied consent.

**2. Implied Consent**- Applies to any unconscious/unresponsive casualty who is in a potentially life- threatening emergency/situation. With this type of consent, it is assumed that the casualty would want life-saving First Aid procedures applied in order to help.

In instances where children are involved in life-threatening emergencies or situations and parents/caregivers, or guardians are not present to provide legal consent, you should deliver life-saving First Aid procedures based on the principals of "**implied consent**".

## Scope of Practice as it Pertains to the First Aider

As you progress through your First Aid training course, and embark on any other courses in the future, you will acquire specific knowledge and skills based on First Aid Principles. These standards have been dictated and approved by various governing bodies. When providing First Aid treatment to a casualty, you must always stay within your "scope of practice", meaning, within the limits of your training. For example, a First Aider can apply a leg splint or bandage a wound from a compound femur fracture but would not be allowed to use a traction device to restore the leg to its appropriate anatomical position. A traction device is not a device in which you are trained and hence, not a part of your "scope of practice".

## The Principle of Abandonment

Once First Aid treatment is initiated for a casualty in an emergency, the First Aider cannot leave/abandon the casualty until an equally qualified or more qualified individual arrives. (e.g. another First Aider, paramedic, nurse…).

- If activating the 9-1-1 system requires that you leave the casualty, do so but be sure to return.
- If your immediate environment becomes dangerous to you and your personal safety is at risk, then in this particular situation, you can leave the immediate scene. If the scene becomes safe again, return to the casualty and continue your treatment.

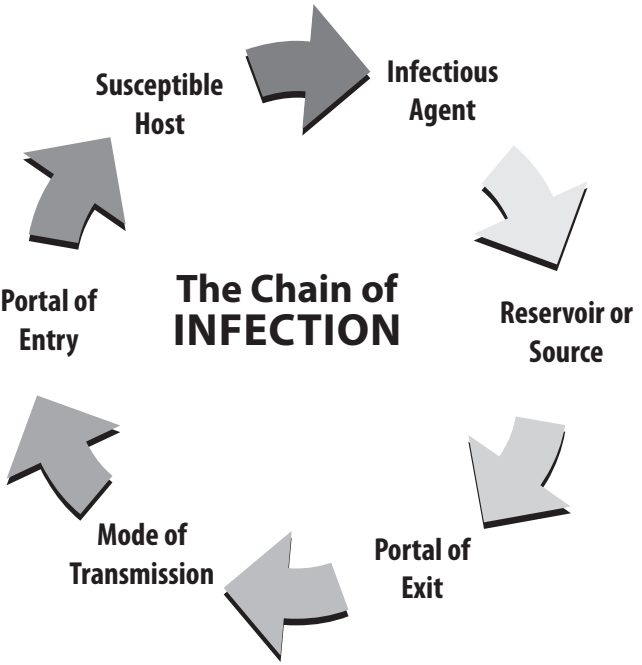
# *Principles Of Safety When Giving First Aid*

## Describe the Importance of Safety for Both the First Aider and the Casualty

### Personal Protective Equipment (PPE)

When we decide to take action and help a casualty who is in need of First Aid, we must be cognizant of the fact that this may be a complete stranger who, to put it bluntly, may or may not have an infectious disease. It is important to note that not all people know they have been infected with a disease. An infectious disease can range anywhere from the common cold to HIV/AIDS, Hepatitis, Meningitis, Tuberculosis etc… Although the risk is rare, it should NOT be dismissed.

Below, is a chart which outlines the steps required for an infection to occur:



## Definitions:

**Infectious agent:** Microorganisms that cause disease, such as bacteria and viruses.

**Reservoir or Source:** Where the microorganism lives (e.g. animals, humans, insects).

**Portal of Exit:** The route a microorganism takes when escaping from its infected host.

## Mode of Transmission:

a) **Direct:** Physical contact, person to person (e.g. kissing).

b) **Indirect:** Transfer of microorganism from contaminate surfaces (e.g. computer keyboards).

c) **Droplet:** Tiny droplets found in air from sneezing, coughing.

d) **Airborne:** Microorganisms suspended on tiny particles in air for long periods of time (e.g. chicken pox).

e) **Vector-Borne:** Microorganisms that require insects or animals to spread (e.g. mosquitoes which spread malaria).

**Portal of Entry:** The specific path the microorganism takes to enter the body (e.g. skin, respiratory tract, gastrointestinal tract).

**Susceptible Host:** Individuals who suffer from:

a) Weakened immune systems.

b) Chronic disease such as heart disease or cancer.

c) Increased stress.

d) Lack of sleep and rest.

**Blood-Borne Diseases and other Infectious Agents** which are of significant importance to First Aiders are listed below:

**Hepatitis B Virus (HBV): Hepatitis B** is an infection of the liver caused by a virus. The main source of transmission of Hepatitis B is through the blood. The Hepatitis B virus can also be found, although in much smaller quantities in human saliva. Contact with human saliva, for example, from a bite injury can transfer the virus; however, no documented cases have been reported. There is a Hepatitis B vaccine available.

**Hepatitis C Virus (HCV): The Hepatitis C** virus causes chronic liver disease. Hepatitis C virus is transmitted through direct contact with infected blood. Many who are infected with Hepatitis C have little to no signs or symptoms of the disease. There is no vaccine to prevent infection from the Hepatitis C virus.

**HIV (Human Immunodeficiency Virus): HIV** is a virus that attacks the body's immune system. This damage prevents individuals from mounting an attack when infection strikes. HIV can be transmitted through blood, breast milk, vaginal fluid, or seminal fluid. There is no vaccine to prevent infection from HIV.

**Meningitis:** Inflammation of the brain, it's supporting tissues and structures. Usually caused by viruses or bacteria. Meningitis often occurs as a result of the spread of infection occurring elsewhere in the body. The bacterial form of this disease can be very serious and deadly. Meningitis caused by viruses is not as severe, with most patients making a full recovery.

**Tuberculosis (TB):** An infection caused by bacteria, commonly affecting the tissues of the lungs (pulmonary); however TB can spread to other areas of the body as well. The pulmonary form of TB is contagious; whereby an infected individual breathes out infected air and a bystander inhales the bacterial particles. This can result in subsequent infection and sickness.

The aforementioned information is not meant to scare you, it is meant as an educational tool to provide you with added knowledge and understanding about this very important topic.

One of the biggest deterrents bystanders have when helping a stranger in need of First Aid is the fear of disease transmission. The good news is there are specific steps one can apply to help protect not only themselves but also the casualty. One should never assume an individual "looks safe" and therefore has no diseases of which to be concerned. Assume that everyone has potential for infectious disease, regardless of age, race, or gender and implement the appropriate steps required to protect yourself.

## How to Reduce the Risk of Infection when Providing First Aid and CPR

Individuals who will be delivering First Aid and CPR should always make an effort to put on their appropriate **Personal Protective Equipment (PPE)**, such as, gloves, the use of barrier devices (whenever possible), goggles etc . A First Aider should always assume that all body fluids and/or blood products pose a serious risk for disease transmission and subsequent infection.



PPE should always be worn for all First Aid and Cardio Pulmonary Resuscitation (CPR) situations.

## First Aiders should always:

- Wear gloves; generally medical exam gloves and preferably non-latex (allergy alert).
- Place towels or blankets to prevent possible contamination / exposure if blood or body fluids are present.
- Use barrier devices with replaceable one-way valve and filter, or pocket face masks when performing Rescue Breathing and CPR.
- Remember to properly wash hands after removal of gloves and any other protective devices.
- Dispose of used equipment and if indicated, decontaminate (Decontamination procedures to follow).
- Vaccinations: As a First Aider, it is important and highly recommended to have all appropriate vaccinations up-to-date as the potential for exposure to various diseases in the workplace is a possibility. Here are a few examples of recommended vaccinations for an adult: Tetanus-Diptheria, Influenza, Hepatitis A and B.

## Contaminated Glove Removal Technique



- Inspect gloves before applying and, if damaged or discoloured, discard and apply a fresh pair.
- Put on a fresh pair of gloves when treating a second casualty and so on…
- If you have a cut or an open wound, wear two sets of gloves, one over top of the other.
- Gloves are to be disposed of immediately after an event and are for one time use only. Place contaminated gloves in a plastic bag and seal; discard in garbage.

**Fig. 1- Contaminated Glove Removal:** Follow the steps, in order from 1-5, to safely and properly remove contaminated gloves. Remember to wash your hands with soap and water after both gloves have been removed and discarded.

| | | |
|---|---|---|
| **1** |  | **Hold hands palm up, away from your body.** |
| **2** |  | **Careful not to touch bare skin, grasp the palm of one hand with the fingers of the other.** |
| **3** |  | **Gently pull the glove away from the palm and down the fingers, turning inside out. Hold removed glove in opposite gloved hand.** |
| **4** |  | **Careful not to touch the outside of the contaminated glove, slide index finger down inside of wrist band of gloved hand.** |
| **5** |  | **Pull out and down off the fingers, turning glove inside out. Properly dispose of contaminated gloves.** |

Fig. 1

**If, for whatever reason, you DO NOT feel comfortable providing First Aid to an individual in an emergency situation, you can still:**

- **Call 9-1-1**.
- Recruit others to help.
- Control the scene and make sure the casualty is safe.
- Provide reassurance.
- Deliver information to EMS or other qualified personnel upon arrival.

## Properties of Barrier Devices or Face Shields for Mouth-to-Mouth or Mouth-to-Nose Ventilations when Providing Artificial Respiration (AR)

Often times a casualty will have blood or body fluids around the face and nose from injury or trauma which pose an infectious disease hazard to the First Aider. It is also not uncommon for a casualty to spontaneously vomit during CPR procedures, again, posing a potential hazard.

To decrease the likelihood of infection during CPR, masks or face shields for ventilations should be used.

- **DO NOT** delay casualty care if breathing devices are unavailable.
- Use shields or face masks that are specifically designed to prevent disease transmission during CPR.

## The Appropriate Use, Care, Decontamination, and Disposal of Masks and Face Shields with One-Way Valves


Fig. 2

Barrier devices with replaceable one-way valves block body fluids from entering the First Aiders mouth. Pocket face masks also provide protection from the possible transfer of infectious disease when performing rescue breathing and CPR. These devices come in many different sizes and are available for all ages.

**Fig. 2 - Barrier Devices**

## Selecting the Most Appropriate Mask for Resuscitation

Resuscitation masks should meet the following criteria:

- One-way valve to allow the casualty's exhaled air to escape.
- Constructed from pliable material to allow for a proper face-mask seal.
- Easy to assemble.
- Functions in extreme heat or cold.

- While pocket face masks protect the First Aider from infection, they **DO NOT** protect the casualty from the possibility of receiving an infectious disease from the First Aider.



- All First Aid kits should contain at least one barrier device with a replaceable one-way valve.
- Barrier devices which have been subjected to extremes in temperature should be replaced immediately after use.

Devices which are for **one time use only** must be discarded. It is suggested that you seal the contaminated parts in a plastic bag and discard with your regular garbage. Equipment that can be decontaminated and are not disposable must follow the procedures listed below.

### Decontamination Procedure

- Decontaminate surfaces and objects that have been contaminated, as soon as possible.
- Clean with a bleach solution of ¼ cup bleach in 3.8 litres of water and apply to contaminated surfaces.
- The solution should be sprayed onto surfaces and equipment and left to sit for two minutes before wiping off.

## *Applying The Principles Of First Aid*

**First Aid:** Immediate emergency treatment given to an injured or ill person, prior to the arrival of Emergency Medical Services (EMS).

### The Objectives of First Aid:

- Preserve/sustain life.
- Prevent further injury and minimize pain.
- Promote recovery.
- Minimize/decrease the likelihood of Shock.

## The Three Priorities of First Aid

**Highest Priority-** A casualty who requires immediate transport to Hospital by EMS due to life-threatening injury or illness.

**Second Priority-** A casualty who does not present with signs and symptoms of Shock and who has no immediate life-threatening injury or illness.

**Third Priority-** A casualty who can wait for treatment. Casualties who fall under this priority are either deceased or have minor injuries and are able to ambulate (walk).

In certain situations, such as a multi car collision, there will be multiple casualties all requiring First Aid and medical attention at the same time. They are referred to as **Multiple Casualty Situations.**

These situations are very challenging because some of the casualties will be more seriously injured with life-threatening injuries compared to some of the other casualties at the same scene, who have little to nothing medically wrong with them. It will be your task as a First Aider to triage all the injured and make the decision who is Highest Priority and who is the Lowest Priority.

# Chapter 2
## Emergency Scene Management

## *Applying The Principles Of Emergency Scene Management*



### Emergency Scene Management

**Emergency Scene Management** is a recipe or algorithm, which follows a step-wise approach to safely and effectively control and secure an emergency scene, as well as provide initial and ongoing care of the casualty.

### Four Sequential Steps of Emergency Scene Management

The steps are as follows:

**1. Scene Survey**

**2. Primary Survey**

**3. Secondary Survey**

**4. Ongoing Casualty Care and Emergency Scene Control**



Ideally, the Scene Survey, Primary Survey, and the initiation of life-saving First Aid treatment(s) should take no longer than 45 seconds to 2 minutes.

## The Concept of Mechanism of Injury (MOI)

It is crucial to understand the concept of **Mechanism of Injury**, as it provides an understanding of what events lead up to an injury or illness of a casualty. As well, the MOI provides clues to the First Aider of what underlying injuries may have been sustained, especially if the casualty is unresponsive and unable to provide you with a history. To better grasp this concept, an example is provided.

An individual driving his car at 100km/hr suddenly smashes into the back of a tractor trailer. Here is how the MOI is dissected for this particular example.

The car smashes into the tractor trailer at 100km/hr. The driver of the vehicle hits his chest against the steering wheel at 100km/hr. The driver's heart and brain smash into the chest wall and cranium both at 100km/hr respectively. This MOI is an example of a blunt force trauma and you may expect underlying injuries such as a closed head injury, internal bleeding and potential Shock-like symptoms.

a) **History/Mechanism of Injury:** There are certain clues which can give a First Aider an indication as to whether or not a casualty has suffered a Head and/or Spinal injury. It is vitally important to look carefully at the MOI for these types of injuries to determine whether or not there is a likelihood of the casualty suffering from one or both of these potential traumas. An example is a child who dives into a swimming pool and hits his head on the bottom. The MOI suggests a high index of suspicion for a possible Head and/or Spinal injury. Other key points are to look carefully at the position in which the casualty was found and whether or not there is significant deformity or awkward positioning of the body.

Specific signs and symptoms may also enable a First Aider to suspect that the casualty has suffered a Head and/or Spinal injury.



# *Performing A Scene Survey*



**Remember, before entering a situation, you always want to assess for any hazards which may harm you and which may be potentially harmful to the casualty and bystanders. YOU are the most important and YOUR SAFETY is of paramount importance. Again, have all your senses working and be aware of any fire, electrical wires, gas, glass, traffic, hazardous materials, odd odors, unsafe structures, etc…**

1. **Take charge of the situation:** If there already is a bystander helping the casualty, ask if he/she needs assistance. If you are the lone bystander, then take charge of the scene and try to recruit others to help.



- Remember to take **PPE** (gloves, pocket mask, etc…).
- If you suspect, based on the MOI, that the casualty may have a Head and/or Spinal injury, tell them **not to move!**

2. **Call out for help to attract bystanders:** Make noise and try to attract attention as extra sets of hands are always beneficial in emergency situations. Bystanders can:

- **Call 9-1-1**.
- Provide crowd control.
- Deliver First Aid kits to the scene.
- Take notes from your history gathering.
- Lead Police and EMS personnel to the scene.



Often times you will require the assistance of **Police** (for situations where violent criminals are present or personal safety is compromised), **Fire Department** (for extrication or fires), **Hydro** (downed electrical wires), and especially **EMS** (who can provide advanced medical support for the casualty). It is imperative that you mention to the 9-1-1 call taker if you require assistance from any of the above.

3. **Assess hazards and make the area safe:** As mentioned above, your safety is the most important. Emergency situations, by their very nature, can be very dangerous. If you come across hazards which may put you at risk, don't take the chance, **call 9-1-1**. If you have the ability to make a scene safe without jeopardizing your safety, the casualty and bystanders, then do so.

4. **Identify yourself as a First Aider and offer to help.**

5. **Find out the History, how many People are Injured/involved and try to Determine the Mechanism of Injury.**



Remember, you must obtain consent. For an unconscious casualty, you have implied consent. Always approach a casualty from the feet in case there is a suspected Head and/or Spinal injury.

6. **If Head and Spinal injuries are suspected, provide and maintain support for the head and neck**

7. **Assess Casualty's Responsiveness:** Check to see if the casualty is responsive by asking their name, where they are and what happened. If you do not get a response, try speaking louder, as some people are hard of hearing and/or deaf. If loud verbal cues do not illicit a response, try tapping on their shoulder or pinching their ears. If you obtain no response from any of the above, then the casualty is deemed unresponsive and immediate 9-1-1 is necessary.

8. **Call 9-1-1 and retrieve and AED**



## Steps to be Taken When Sending a Bystander to Call 9-1-1

- **Choose a bystander.** Be clear and concise. **An example is: "You in the red shirt. I need you to go call 9-1-1. We need an ambulance. We have an unconscious male casualty, around 50 years of age. Please go make this call and come back and let me know you have done so."**
- Wait for a response of "Yes I will call". **DO NOT** accept a nod of the head as the individual may not clearly understand what it is you are asking.
- If the bystander does not return within a reasonable amount of time, you can assume the phone call to 9-1-1 was never made and therefore, you must send another bystander to do so (repeat the steps above).

Make sure you know the address of where the emergency is taking place and provide accordingly to the 9-1-1 call taker.

## Typical Questions you will be Asked by a 9-1-1 Call Taker



- Location of your emergency.
- Nearest main intersection.
- Building information (house, apartment, business).
- Phone number.
- The occurrence.
- How many casualties need help and if there are any special conditions?
- What is the Chief Complaint (main reason for calling 9-1-1)?

- Are there any safety issues?
- Age of the casualty.
- Gender of the casualty.
- Are they breathing etc…?
- Does the casualty have any pre-existing medical problems, medications, allergies?



- Never hang up the phone until the 9-1-1 call taker has hung up the phone.
- Cell Phone tracking is not a quick or reliable way to be found by emergency services, always do your best to figure out what your location is.

# Chapter 3
## The Workplace First Aider

## *Definition of Workplace First Aid*

Workplace first aid is defined as the one-time treatment or care of an injured or ill worker, and any follow-up visit(s) for observation purposes only. First aid does not replace medical care and is intended to provide immediate assistance until the individual recovers or more advanced care becomes available.

### The Role of the Workplace First Aider

Workplace first aiders play a critical role in ensuring the immediate safety and well-being of workers following an injury or sudden illness. Their responsibilities include:

- Providing an immediate response to workplace injuries or medical emergencies
- Using workplace-specific knowledge to respond effectively
- Maintaining hazard awareness to protect themselves and others
- Completing documentation and reporting requirements
- Performing maintenance duties related to first aid supplies and equipment
- Upholding confidentiality and respect for all injured or ill individuals

## Authority Having Jurisdiction (AHJ) Requirements and Legal Protections

**Authority Having Jurisdiction (AHJ) requirements exist to protect both workers and first aiders. When first aiders act within their training, scope of practice, and workplace policies, often they are legally protected while providing care.**

## Principles of Consent

**Consent must be obtained before providing first aid whenever possible. Consent may be:**

- Expressed, when the person clearly agrees to care
- Implied, when a person is unconscious or unable to respond and immediate care is required to prevent serious harm

Consent can be withdrawn at any time, and first aiders must respect the individual's wishes.

## Scope of Practice for Workplace First Aiders

**Workplace first aiders must work within the scope appropriate to their level of training and workplace requirements. This includes the ability to:**

- Perform CPR and use an AED
- Manage basic airway emergencies
- Control bleeding
- Manage shock, fainting, minor wounds, and burns
- Recognize and respond to medical emergencies
- Splint and immobilize suspected fractures
- Use personal protective equipment (PPE) appropriately
- Provide reassurance, support, and safe monitoring until EMS arrives

## Actions Outside the Scope of a Workplace First Aider

**Workplace first aiders are not permitted to:**

- Diagnose medical conditions
- Perform invasive procedures
- Prescribe or administer medications independently
- Determine whether a worker is fit to return to duty

## Medication assistance may be provided under specific conditions and according to AHJ requirements.

- Medications and ointments must not be stored in workplace first aid kits
- First aiders may retrieve prescription medications that belong to the injured or ill individual and are already present in the workplace
- Medications must be self-administered by the individual, unless specific workplace policies permit otherwise

**This includes assistance with:**

- Epinephrine auto-injectors (including in school and childcare settings)
- Inhalers
- Naloxone for suspected opioid overdose

**First aiders must follow workplace policy, training standards, and current regulations when assisting with medications.**

# *Workplace First Aid Kits and Equipment Requirements*

## Fewer Than 5 Workers

**A first aid station and box containing, at minimum:**

- ☐ Current edition of a standard St. John Ambulance First Aid Manual
- ☐ 1 card of safety pins
- ☐ 12 individually wrapped adhesive dressings
- ☐ 4 sterile gauze pads (3" × 3")
- ☐ 2 rolls of gauze bandage (2")
- ☐ 2 field dressings (4" × 4") or sterile bandage compresses
- ☐ 1 triangular bandage

At least one worker with a minimum Basic First Aid certificate must be available in the immediate vicinity.

## 5–15 Workers

**A first aid station and box containing, at minimum:**

- ☐ Current edition of a standard St. John Ambulance First Aid Manual
- ☐ 1 card of safety pins
- ☐ 24 individually wrapped adhesive dressings
- ☐ 12 sterile gauze pads (3" × 3")
- ☐ 4 rolls of gauze bandage (2")
- ☐ 4 rolls of gauze bandage (4")
- ☐ 4 sterile surgical pads for pressure dressings
- ☐ 6 triangular bandages
- ☐ 2 rolls of splint padding
- ☐ 1 roll-up splint

At least one worker with a minimum of a Basic First Aid certificate must be available in the immediate vicinity.

## 15–200 Workers

**A first aid station and box containing, at minimum:**

- ☐ Current edition of a standard St. John Ambulance First Aid Manual
- ☐ 24 safety pins
- ☐ 1 basin (preferably stainless steel)
- ☐ 48 individually wrapped adhesive dressings
- ☐ 2 rolls of adhesive tape (1”)
- ☐ 12 rolls of gauze (1”)
- ☐ 48 sterile gauze pads (3” × 3”)
- ☐ 8 rolls of gauze bandage (2”)
- ☐ 8 rolls of gauze bandage (4”)
- ☐ 6 sterile surgical pads for pressure dressings
- ☐ 12 triangular bandages
- ☐ 2 rolls of splint padding
- ☐ Splints of assorted sizes

## More Than 200 Workers

**A dedicated first aid room equipped with:**

- ☐ Current edition of a standard St. John Ambulance First Aid Manual
- ☐ Dressing scissors and forceps
- ☐ Safety pins
- ☐ Graduated medicine glass
- ☐ Tongue depressors and cotton swabs
- ☐ Denatured ethyl alcohol
- ☐ Adhesive dressings and sterile gauze pads
- ☐ Gauze bandages and adhesive plaster
- ☐ Absorbent cotton
- ☐ Triangular bandages
- ☐ Splints and splint padding

**The room must include appropriate furnishings, including washbasins, running water, a stretcher, blankets, and a curtained couch or cubicle.**

**The first aid room must be attended by:**

- A registered nurse, or
- A worker holding a valid Intermediate First Aid certificate whose duties allow uninterrupted first aid response

## Notification of EMS and Patient Handover

### 1. Stay With the Patient and Keep Communication Open

Remain with the patient until EMS arrives. Continue to reassure them and monitor their condition. Stay on the line with 9-1-1 if instructed, dispatchers may give you updates or additional instructions. EMS crews rely on you to bridge the gap until they arrive; abandoning the patient too soon can create unnecessary risk, and ALWAYS call back if the situation changes, for better or worse.

### 2. Give a Brief, Focused Report on Arrival

**When EMS arrives, provide a short summary of what happened and what care you provided.**

Aim for 30 seconds to 1 minute. Stick to the essentials: what happened, what you saw, and what interventions you performed. A clear, focused handover ensures the crew can get to work without delays or confusion.

### 3. Avoid Information Overload

Once you've given your brief report, step back and let EMS focus on the patient. Don't repeat the story multiple times, or provide extra details unless asked. Paramedics will direct their attention to the patient first, then ask you targeted questions if needed. This isn't meant to be dismissive, it's simply prioritizing patient care.

### 4. Provide Written Notes if Available

If you have documented observations (times, vital signs, treatments), hand these over. Written records are invaluable because details can be missed in stressful situations. Even a quick jot-down of times and symptoms helps EMS provide safer, more accurate care.

**5. Understand EMS Priorities**

EMS providers may not look at you much during your report or may seem focused entirely on the patient. This isn't rudeness, it's critical focus. They are listening while working, and patient stabilization takes precedence over conversation.

**6. Transfer Patient Belongings**

Before EMS departs, give them any personal items that belong with the patient, such as ID, health card, wallet, bag, or medications. These items can be crucial for identification, hospital admission, or ongoing care.

**7. Know What to Do About Hospital Transport**

You may ask which hospital the patient is being taken to. You can then proceed there independently if appropriate. Do not follow an ambulance with lights and sirens. Emergency vehicles often need to maneuver unexpectedly, and tailing them can cause crashes or delays in care. Traffic laws still apply, even if it's someone you care about.

## Examples of handover descriptions:

**Basic Example (Trauma)**

"This is John, about 35 years old. He slipped off a ladder about 10 feet. He was awake and alert the whole time. Complaining of left ankle pain. No head strike, no loss of consciousness. We splinted his ankle and kept him still, we put ice on the ankle about 10 minutes ago. No medications given. He fell about 20 minutes ago."

⏱ ~20 seconds

**Medical Example (Chest Pain)**

"This is Mary, 58 years old. She developed sudden chest pain while walking at 2:15 p.m. Pain is central, radiating to her left arm. She's alert and talking. No history of collapse or loss of consciousness. We gave her aspirin 81 mg at 2:20 p.m. No changes since the pain started. That's all I have written down here."

⏱ ~20 seconds

**Medical Example (Diabetic Emergency)**

"This is Alex, 25 years old, diabetic. Found him shaky and confused around 10 minutes ago. His blood sugar was low, 2.8. We gave him juice and he's improved, now alert and oriented. No other treatment given. Here's the sugar readings and times written down."

⏱ ~15 seconds

**Key Reminders for First Aiders Practicing Handover**

- Keep it short and organized (incident, patient status, care given, timeline)
- Hand over notes if you have them
- Then stop talking, let EMS take the lead, they'll ask if they need more



**Pro Tip: If you're unsure of timing, use the 9-1-1 call as reference, e.g., happened 5 minutes** before calling, or did x treatment 5 minutes after calling.

## Communication During Workplace Emergencies

Remaining calm and composed is essential. Clear communication helps control the scene and ensures effective care. First aiders should delegate tasks when appropriate and be aware of potential barriers, including:

Cultural considerations

Language barriers

Hearing or vision impairments

When barriers exist, first aiders should adapt communication methods and use available resources, including interpreter services through **9-1-1**.

# *Reporting and Documentation Requirements*

All workplace first aid incidents must be documented and records maintained.

**Workplaces do not report to WSIB when:**

Only first aid is provided

Modified work at regular pay lasts seven calendar days or fewer

**Workplaces must report when:**

- A worker misses regular work
- Earnings are reduced
- Modified work extends beyond seven calendar days

**Additional reporting guidance is available through WSIB document 15-01-02 and Workplace Safety and Insurance Board.**

## Workplace Hazards and Risks

**Hazard:** A source of potential harm or injury in the workplace.

**Risk:** The chance that exposure to a hazard will result in injury or illness, and the severity of that outcome.

**Workplace first aiders must be aware of hazards that pose risks to workers and responders, including:**

| | |
|---|---|
| Dust, gases, and fumes | Radiation |
| Noise and vibration | Infectious agents |
| Toxic substances | Extreme temperatures or pressures |

Scene safety must always be confirmed before providing care.

## Cleaning and Disinfecting First Aid Equipment

Reusable equipment must be cleaned and disinfected after use, including:

Scissors and shears

Tweezers and forceps

AED units and cases

Stretchers and spinal boards

**Steps for cleaning equipment:**

1. Ensure you are wearing fresh, and appropriate PPE for cleaning
2. Remove and visible soiling with paper towels and dispose after use
3. Use a health canada approved disinfectant, these typically contain at least 70% isopropyl alcohol or a diluted bleach solution
4. Follow the manufacturers instructions for effective cleaning
5. Rinse items if recommended by manufacturer
6. Air dry equipment

**Note:** Ensure you are changing your gloves before moving onto the next step if at any point they come into contact with any possible soiling, e.g., bodily fluid to prevent contamination of the cleaned equipment

## Environmental Cleanup After a First Aid Incident



**Contaminated environments must be thoroughly cleaned and disinfected. Bodily fluids must be removed using appropriate supplies, followed by approved disinfectants. In cases of extensive contamination, specialized cleaning services may be required.**

1. Ensure that the scene is safe, secure and all appropriate PPE is being worn
2. Use paper towels or absorbent pads to remove bodily fluids, use appropriate supplies for removing any debris from the area, e.g., broom for glass.
3. Use a health canada approved disinfectant to the immediate area, vicinity, and anywhere else bodily fluids may have ended up, ensure to follow the manufacturer's instructions for proper disinfecting protocols
4. Ensure there is no visible contamination in the area, all surfaces are dry, and any signage or barriers are removed.

## Disposal of Sharps and Contaminated Supplies

**All contaminated supplies must be disposed of in designated biohazard containers. Items contaminated with bodily fluids must never be placed in regular garbage.**

## Hazard Identification, Risk Assessment, and Control

**Risk Assessment:**

**Risk assessment determines how likely it is for a hazard to cause harm and how severe the outcome could be**

**Methods of assessment: consider likelihood, severity, and prioritize resources towards highest severity and likelihood hazards to reduce risk**

**Control processes:**

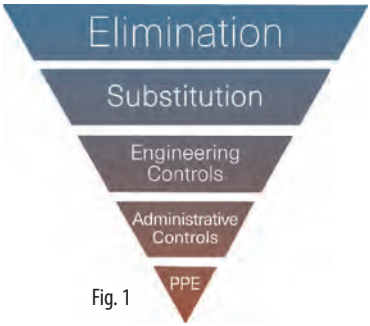


Fig. 1

**Implementation:**

Put the chosen control into practice - training and communication - monitoring and review - continuous improvement

# *Safety Data Sheets (SDS)*

A **safety data sheet** is a document that contains information on hazardous materials that are found within the workplace, they are typically found in a **binder labelled "MSDS" or "SDS"**. If there were ever to be an emergency incident involving a hazardous material within the workplace, first aid measures can be found within it.

The SDS matters for first aiders as it is a reliable resource for treatment and symptoms of different types of exposures to hazardous materials and can be passed along to the paramedics or hospital staff for reference when dealing with exposure to hazardous materials

Relevant sections for first aiders: Hazard identifications, first aid measures, accidental release measures, and exposure control/PPE

## The Role of the First Aider in an Occupational Health and Safety Management System (OHSMS)

First aiders contribute to workplace safety by providing emergency care, identifying hazards, maintaining records, and supporting a culture of safety within the organization.

The objectives of OHSMS are to prevent illness and injury, encourage safe work habits, and ensure legal compliance.

**The role of a first aider:**

- Until qualified assistance arrives, provide emergency care right away.
- Identify and report any dangers at work that are seen during incidents.
- First aid incidents should be documented and maintained as well as analyzed for any trends of injuries.
- When appropriate, take part in safety meetings, drills, and workplace inspections.

- Keep first aid supplies and equipment in good working order.
- Serve as a liaison between employers/supervisors and wounded workers.

### Role boundaries:

- First aiders are neither doctors or paramedics; their function is restricted to their scope of practice
- Must be aware of when to contact 911 or EMS.

### Incorporating OHSMS:

- First aiders incident reports assist the organization's hazard controls and safety measures.
- First aiders serve as role models for safe work practices and promote a culture of safety.

**In Ontario, enforcement and oversight are provided by the Ontario Ministry of Labour, Immigration, Training and Skills Development and the Workplace Safety and Insurance Board.**

## Key concepts of occupational health and safety legislations:

- Everyone has a role in health and safety under the Internal Responsibility System (IRS), including employers, supervisors, and employees.

**Right to Know:** Employees have the right to information about potential risks.

**Right to Participate:** Employees have the right to take part in health and safety events, such as safety meetings and training.

**Right to Refuse Dangerous Work:** Employees have the right to refuse work they deem hazardous without facing consequences.

**Within Ontario, the Ontario Ministry of Labour, Immigration, Training and Skills Development and WSIB play the following role:**

- Enforces laws by means of inspections, investigations, and regulations.
- Has the authority to impose fines, penalties, or stop-work orders.
- Establish standards and requirements for compliance.

**First Aider connection:**

- Act in accordance with OHS regulations (e.g., utilize PPE, follow reporting guidelines).
- Employer responsibilities (first aid kits, training, accessible SDS, reporting system) must be understood.
- Indications, contraindications and precautions of performing first aid

# Chapter 4

## The Patient Assessment

### Definition of the Primary Survey

**The main goal of the PRIMARY SURVEY is simple; to determine whether or not a casualty has injuries that are life-threatening and if so, to treat them immediately!**



Ideally, the Primary Survey should take no longer than 25-30 seconds.

Once a casualty is determined to be unresponsive, a rescuer will open the casualty's airway (head-tilt-chin-lift) and proceed with a quick visual and auditory inspection of breathing; no more than 5 seconds in duration. (In depth steps and descriptions to follow). If the casualty is showing no signs of breathing, abnormal breathing or gasping and no signs of life, the First Aider is to begin Chest Compressions immediately. Followed by 2 ventilations.







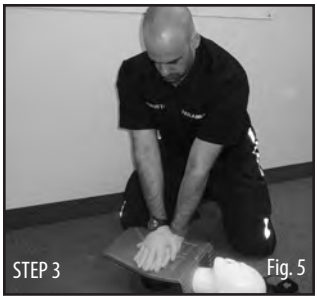






**Fig. 3-6**
**Primary Survey Sequence**

**STEP 1:**
**Open Airway**

**STEP 2:**
**Breathing Scan**

**STEP 3:**
**Chest Compressions**

**STEP 4:**
**Ventilations**

## Three Life-Threatening Priorities

### AIRWAY: (Refer to Fig. 3)

This is the most important of the three priorities. If a casualty does not have an open airway, death is inevitable. Air we breathe enters through both the mouth and nose. In order to breathe, we must have an open/unobstructed airway. In an unconscious/unresponsive casualty the most common cause of an obstruction of the airway is the tongue. An unconscious/unresponsive casualty cannot protect the airway. It is in these situations where a First Aider must react immediately. There are two methods for opening up a casualty's airway and they are:

1. **Head-tilt-chin lift** (No suspected Head and/or Spinal injury). **(Refer to Fig. 3)**
2. **Jaw-thrust without head-tilt** (Suspected Head and/or Spinal injury. [Health Care Providers Only] **(Refer to Fig. 8,9)**

**Fig. 3 - Head-Tilt-Chin Lift:** Place one hand on the casualty's forehead and the other hand under his/her chin and tilt the head back. Be careful not to hyperextend the neck.

## BREATHING:

An average adult breathes between 12-20 times per minute. Anything less than 12 or greater than 24 is considered a sign of respiratory distress, if other signs and symptoms are present. Breathing can only be assessed after the airway has been opened. In order to **"assess"** for breathing, the First Aider must initiate and maintain either the Head-tilt-chin lift or Jaw-thrust without head-tilt (Healthcare Providers Only) to prevent the tongue from falling back overtop of the airway thus preventing breathing. **Breathing is to be checked over a 5 second period. (Refer to Fig. 4).** Check to see if the casualty is in fact breathing, and whether it is effective or ineffective.

Often in situations of Sudden Cardiac Arrest a casualty will seem to have an odd breathing pattern referred to as **agonal respirations** ("gasping-like"). This type of breathing pattern is characterized by shallow, irregular respirations, generally 3-4 respirations/minute and with irregular pauses between the respirations. This type of "irregular" breathing pattern is **not** sufficient to sustain life and **chest compressions must be initiated immediately. In addition some casualties may present with a period of short seizure-like activity with abnormal or lack of breathing. Begin chest compressions immediately.**

**A) Unconscious/unresponsive casualty who is spontaneously breathing→** Place the casualty in the Recovery Position and monitor A,B,C's every 30 Seconds **(Refer to Fig. 7).**


Fig.7

**Fig. 7 - Recovery Position:** This is a life-saving position, utilized when a casualty is unconscious and breathing on his/her own.

**B) Unconscious/unresponsive casualty who is not spontaneously breathing, breathing irregularly or gasping → Begin Chest Compressions (Refer to Fig. 5).**

Scientific evidence has clearly demonstrated the sooner chest compressions are initiated, the greater the chance of survival in a casualty in Sudden Cardiac Arrest.

## CIRCULATION: (Refer to Fig. 5)

In order to have a pulse, one needs a pumping heart, adequate blood volume and a closed circulatory system. CPR guidelines **DO NOT** have First Aiders check pulses! Circulation can however be assessed by checking the casualty's skin temperature, skin colour and looking for the presence of sweating. **If a casualty is Unconscious, Not Breathing, Breathing Abnormally or Gasping, Begin Chest Compressions at a rate of 30 Compressions: 2 Ventilations.**

**Fig. 5 - Chest Compressions:** Look for signs of circulation. Place heel of hand in centre of sternum and interlock hands, keeping elbows locked and arms rigid. Begin compressions.

Individuals who have poor circulation may have bluish colour around the lips (cyanosis), in addition to cool, pale and moist skin.

**Gross Bleed Check:** Before performing chest compressions a First Aider must perform a quick visual **check for blood;** looking for blood-soaked clothing, blood pooling etc. If bleeding is present, address this immediately (application of dressings and bandages) prior to initiating CPR.

Only major/deadly bleeds will require the application of dressings and bandages prior to CPR; minor bleeds do not require attention.

**VENTILATIONS:** Once 30 compressions have been administered, deliver 2 ventilations and continually repeat (30:2).

Use a barrier device, make a proper face-mask seal over the casualty's mouth and nose and deliver two breaths/ventilations.

**Fig. 6 - Delivering Ventilations**

- If no barrier device is available, pinch the nose, put your mouth over the casualty's mouth, making a seal, and deliver two breaths.
- **Each breath should last a maximum of 1 second in duration while producing visible chest rise and fall.**

- Never force air into a casualty.
- Breaths/Ventilations should be no longer than 1 second in duration and discontinued once you see noticeable chest rise and fall.

If the first breath does not go in (no chest rise and fall), reset and reposition the airway and attempt a second breath

**Mouth-to-Nose Ventilations:** Certain injuries or situations will not allow you to make a proper mouth-to-mouth seal, so another option to provide ventilations is to use mouth-to-nose ventilations. Close the casualty's mouth, maintain a head-tilt-chin lift and make a seal around their nose. Deliver ventilations as mentioned above.

**Mouth-to-Stoma Ventilations:** Certain individuals, for varying reasons, have had a portion of their windpipe or larynx removed. In order to breathe effectively a hole is constructed in the front of their neck called a **stoma**. In this situation, air travels directly from the neck into the lungs and not via the mouth and nose. Air must be delivered directly into the stoma to deliver ventilations to these individuals.

- Assess for breathing directly over the stoma.
- Remove your mouth from atop the stoma between breaths to allow for air to escape.

**Jaw-Thrust Without Head-Tilt (Fig. 8, Fig 9)**

Throughout this manual, you will notice mention of the Jaw-thrust without head-tilt for suspected Head and/or Spinal injuries. This is only a Health Care Providers skill and is referenced in this manual specifically for the Health Care Providers course. Lay Rescuers/First Aiders will leave the casualty in the position found and secure both the head and neck for a casualty with a suspected Head and/or Spinal injury.



Fig. 8



Fig. 9

# *Introduction to the Secondary Survey*

A **Secondary Survey** is a logical, step-wise information-gathering assessment with the purpose of attaining a complete "big picture" perspective in regards to a casualty's condition. As time progresses through an emergency situation, information gathering may only be an option for a limited time. If the casualty's condition begins to deteriorate, a casualty may progress from being conscious to semi-conscious to unconscious, unable to answer vital questions.

## Important Points Regarding a Secondary Survey

- Injuries which are not evident in the Primary Survey are located and treated if necessary.
- A Secondary Survey is initiated when:

**1.** All life-threatening priorities have been addressed.

**2.** The casualty has greater than one injury.

**3.** You provide transport for the casualty.

**4.** EMS arrival is greater than 20 minutes.



- Information gathered from the Secondary Survey will prove to be valuable for EMS upon their arrival.
- A pad of paper and pen will prove to be invaluable when trying to remember all pertinent information.



**In certain situations you will not perform a Secondary Survey because you may still be troubleshooting issues that have not been corrected in the Primary Survey such as the case of a casualty who is severely injured or ill.**

## The Four Components of a Secondary Survey

**1.** History of the Casualty.

**2.** Vital Signs Assessment.

**3.** Head-to-Toe Examination.

**4.** Initiation of any First Aid treatments based on injury and/or illness of the casualty.

## History

**History taking** is a stepwise approach to quickly and effectively gather pertinent information from the emergency scene as well as from the casualty.

- **SAMPLE** and **DR. BOSH.**

## Vital Signs

There are **four vital signs** which First Aiders are expected to obtain when gathering information with respect to Secondary Survey. They are:

1. **PULSE** (rate, rhythm and volume).
2. **RESPIRATIONS** (rate, rhythm and depth).
3. **SKIN TEMPERATURE AND CONDITION** (skin colour, temperature, and moisture).
4. **LEVEL OF CONSCIOUSNESS** (oriented to person, place and time).



- For an adult or child, assess the pulse from the wrist (**Radial Pulse/Artery:** Located on the "thumb-side" of either wrist) or the neck (**Carotid Pulse/Artery:** Located on either side of the neck).
- To assess an infant's pulse, use the **Brachial Pulse/Artery** (Located on the inside of the upper arm in between the bicep and tricep muscles).
- Never use your thumb to take a pulse.
- Vital signs should always be documented and performed every 5 minutes.

## Head-To-Toe Examination

When you are on the lookout for any injuries or illnesses that were missed or were not present during your Primary Survey, initiate a **Head-to-Toe Examination**. Just as the title states, start at the head and end at the toes. Because a Secondary Survey is a "hands-on" survey, remember to obtain consent from the casualty before you begin.



- Prior to your assessments, explain to the casualty what it is you are going to do and why.
- It is just as important to speak to an unconscious casualty as you would if they were conscious because even though they are not able to respond, they may still be able to hear you. Did you

know, hearing is generally the last sense to go?

- Always compare one side to the other (e.g. right arm with left arm and so on…).
- Remember to be aware of fluids such as blood, cerebrospinal fluid, urine, feces, vomit. **REMEMBER YOUR PERSONAL PROTECTIVE EQUIPMENT**

The following is how a Secondary Survey should look. You can follow the **CLAPS/TICS** mnemonic to help you assess each area.

### Visualize

- **C** **Contusions** (bruising)
- **L** **Lacerations** (irregular tear-like wound)
- **A** **Abrasions** (scrapes).
- **P** **Penetrations** (stab or gunshot wounds)
- **S** **Swelling** (enlargement of an area)

### Palpate (Touch/Feel For)

- **T** **Tenderness**
- **I** **Instability**
- **C** **Crepitus** (grinding sound of bone moving on bone)
- **S** **Symmetry** (check to see if one side is equal to the other)

**Head:** Assess the skull and the entire face (all 360 degrees), looking for blood, scrapes lacerations and feeling for bumps, or depressions. Check the ears for blood or cerebrospinal fluid, the tongue for swelling and for soot marks around the mouth.

**Neck:** Assess and palpate (examine by touch) for deformities. Check the collarbones. Did you know the collarbone is the most frequently broken bone in the body and can become life-threatening if sharp boney ends puncture a lung.

- This assessment should ideally be done prior to putting on a protective cervical collar (C-collar).
- Never take the C-collar off if it has been placed and secured.

**Chest:** Assess for symmetrical (both sides equal) chest rise and fall, and for the presence of accessory muscle use (e.g. Muscles which are not ordinarily involved in breathing such as those in the neck, between the rib cage and stomach muscles when breathing becomes difficult). Accessory muscle use is indicative of respiratory distress. Ask the casualty to take a deep breath in and out. Look, listen and palpate. Assess for a pain response and look for deformity and/or asymmetry/paradoxical movement (not identical on both sides) of the chest wall.



The ribcage is 360 degrees, so don't forget to check the armpits and back

**Abdomen:** Assess the abdomen (4 quadrants), for bruising, tenderness or distension (bloating). If present, do not touch. If you do not observe the latter, you can gently press down and observe if this causes pain or if it feels rigid.



Assess the lower back if possible, as long as it will not cause further pain and/or injury.

**Pelvis:** Locate the tops of the hips and push them together and down to check for stability, a pain response, and for deformity and/or asymmetry of the pelvis.

**Legs:** Assess both legs, checking for deformity, shortening of one or both legs, or bones sticking out (compound/ "open" fracture). Palpate both legs of the casualty, checking for pain, cracking sounds, and instability. Work your way from the top of the leg right down to the toes. When you reach the toes, take the socks off and feel the skin temperature. Do a capillary refill test (Pressure applied and released to a fingernail and/or toenail to determine a casualty's circulatory status) and ask the casualty if he/she can feel and wiggle his/her own toes.

**Shoulders and Arms:** This is the last area to be assessed. Assess for deformity of the arms/shoulder blades. Palpate for instability and look for asymmetry. Note any pain response when you touch any part of the shoulder blade right down to the hands. When you reach the hands, ask the casualty if he/she can feel you touching them. Ask him/her to wiggle his/her own fingers. You will also want to assess capillary refill and skin temperature.



Look for a medical alert to provide you with clues/information. Places to look for medical information: (necklace, bracelet, anklet, earrings, tattoo, wallet card).



**If, while initiating a Secondary Survey, you discover a life-threatening problem, or if one arises, stop what you are doing and provide First Aid in an attempt to correct and/or alleviate that problem. Otherwise, if an injury presents itself during the Secondary Survey, continue and complete the Head-to-toe exam and then provide the appropriate First Aid.**

## Ongoing Casualty Care

Once you have provided the First Aid for any injuries or illnesses and while you are waiting for EMS arrival, certain steps should be taken which can make the casualty more comfortable and which allow you to constantly assess the casualty for any changes in status.



- Place the casualty in the most comfortable position (e.g. “Recovery Position”).
- Keep the casualty warm.
- Protect against potential Shock.
- Nothing to eat or drink (exception Diabetic casualties and dehydration).
- Monitor A,B,C’s.
- Re-asses vital signs frequently.
- Continue stabilization of injuries.
- Monitor previous First Aid procedures already applied to see if they are still benefiting the casualty.
- Loosen tight clothing.

## Emergency Scene Management Overview

**Scene Survey**

- Take charge of the situation and remember to use your PPE.
- Call out for help to attract bystanders.
- Assess for hazards and make the area safe.
- Find out the history.
- Identify yourself as a First Aider and obtain consent.
- Assess for and manage head and spinal injuries.
- Assess Responsiveness.

**Primary Survey**

- Airway.
- Breathing.
- Circulation.
- Gross Bleed Check.

**Secondary Survey**

- History of the casualty.
- Vital signs assessment.
- Head- to- toe examination.
- Initiation of any First Aid treatments based on injury and/or illness of the casualty.

**Ongoing Casualty Care**

- Monitor A,B,C's.
- Protect against Shock.
- Place in comfortable position.
- Monitor vital signs and re-assess frequently.
- Keep casualty warm.
- Continue stabilization of injuries.
- Nothing to eat or drink.

# *The Secondary Survey & Vital Signs*

## The Purpose of a Secondary Survey

A **Secondary Survey** is a logical, step-wise, information-gathering assessment with the purpose of attaining a complete "big picture" perspective in regards to a casualty's condition. As time progresses in an emergency situation, information gathering may only be available for a limited time. If the casualty's condition begins to deteriorate, he/she may progress from being conscious to semi-conscious to unconscious, unable to answer vital questions.

**Important Points Regarding Secondary Surveys**

- Injuries which are not evident in the Primary Survey are located and treated if necessary.
- A Secondary Survey is initiated when:

1. All life-threatening priorities have been addressed.
2. The casualty has greater than one injury.
3. You provide transport for the casualty.
4. EMS arrival is greater than 20 minutes.

- Information gathered from the Secondary Survey will be extremely valuable for EMS upon their arrival.
- A pad of paper and pen will prove to be invaluable when trying to remember all pertinent information.



In certain situations you will not perform a Secondary Survey because you will be troubleshooting issues that have not yet been corrected in the Primary Survey; such as the case of a casualty who is severely injured or ill.

## Performing the Four Steps in a Secondary Survey

**The Four Steps of a Secondary Survey are:**

1. History of the Casualty.
2. Vital Signs Assessment.
3. Head - To - Toe Examination.
4. Initiation of any First Aid treatments based on injury and/or illness of the casualty.

## The Four Steps in More Detail

1. **Obtain the history of the casualty:** History taking is one of the most important aspects in providing effective First Aid for a casualty. History taking starts from the initial Scene Survey, looking for clues as to what may have caused the injury or illness right through to questions you will ask the casualty, in order to gain a better understanding of the nature and acuity of his/her injuries.

When gathering information from a casualty, a good habit to follow is utilizing both the **SAMPLE** and **DR.BOSH** mnemonics. These information gathering tools will lead you in a logical step-wise approach, guiding you in attaining valuable information with respect to the casualty and the incident.

**S** **Signs and Symptoms:** If the casualty is conscious, ask them what they are feeling and listen for any abnormal breathing sounds. Begin a visual check, looking for anything out of the ordinary, such as blood, a fracture etc… If the casualty is unconscious, look at the **Mechanism of Injury** to help provide you with clues to his/her underlying injuries or see if there are bystanders who may have seen the events take place.

**A** **Allergies:** Ask the casualty if they have any known allergies and if so, what they are. Ask if they have an EpiPen Auto-Injector if they do have allergies. If the casualty is unconscious, look for a medical alert to provide you with clues to allergies or other health conditions.

**M** **Medications:** Ask the casualty if they take prescription or non-prescription medication and if so, write them down. Ask the casualty when they last took their medication(s).

**P** **Past Medical History:** This is where you try to find out if the casualty has any health and/or medical problems. If so, are they leading to the issue(s) at hand? Another acronym to help you remember important questions related to past medical history is **DR. BOSH**.

**L** **Last Meal or Last Oral Intake:** Find out when the casualty ate or drank last. This could be vitally important if you have a diabetic casualty.

**E** **Events** Leading to the Incident: who, what, where, when, why and how. Look for a Mechanism of Injury, especially if the casualty is unconscious.

**D=Diabetes** (e.g. Type I-Insulin dependant, Type II-Non-Insulin Dependant).

**R=Respiratory conditions** (e.g. Asthma).

**B=Blood Pressure** (e.g. High or Low Blood Pressure).

**O=Other Medical Conditions** (e.g. Osteoporosis).

**S= Seizures**

**H=Heart Problems** (e.g. Angina, Congestive Heart Failure).

Remember: Look for a medical alert to provide you with clues/information.(Necklace, bracelet, anklet, earring, tattoo or wallet card.)

**2. Assess and Record Vital Signs:**

There are four vital signs which First Aiders are expected to obtain when gathering information during a Secondary Survey:

**1.**Pulse (rate, rhythm and volume).

**2.**Respirations/Breathing (rate, rhythm and depth).

**3.**Skin temperature and condition (skin colour, temperature, and moisture).

**4.** Level of Consciousness (oriented to person, place and time).

- For an adult or child, assess for a pulse at the wrist **(Fig. 1-Radial Pulse/Artery:** Located on the "thumb-side" of either wrist) or the neck **(Fig. 2-Carotid Pulse/Artery: Located on either side of the neck).**
- To assess an infant's pulse, use the **Brachial Pulse/Artery, Fig. 3** (Located on the inside of the upper arm, in between the bicep and tricep muscle).
- Never use your thumb to assess for a pulse.
- Vital signs should always be documented and performed every 5 minutes.







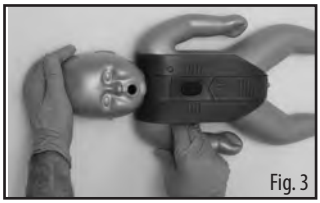



**Fig. 1 - Radial pulse assessment.**

**Fig. 2 - Carotid pulse assessment.**

**Fig. 3 - Brachial pulse assessment.**

3. **Perform a Head-To-Toe Examination:** When you are on the lookout for any injuries or illnesses that were missed or were not present during your Primary Survey, initiate a Head-to-toe examination. Just as the title states, start at the head and end at the toes. Because a Secondary Survey is a "hands-on" survey remember to obtain consent from the casualty before you begin.

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- This assessment should ideally be done prior to putting on a protective cervical collar (C-collar).
- Never take the C-collar off if it has been placed and secured.
- Look for medic alert. (Necklace, bracelet, anklet, earring, tattoo or wallet card.)

**Chest:** Assess for symmetrical (both sides equal) chest rise and fall, and for the presence of accessory muscle use (e.g. Muscles which are not ordinarily involved in breathing such as those in the neck, between the rib cage and stomach muscles when breathing becomes difficult). Accessory muscle use is indicative of respiratory distress. Ask the casualty to take a deep breath in and out. Look, listen and palpate. Assess for a pain response and look for deformity and/or asymmetry/paradoxical movement (not identical on both sides) of the chest wall.



The ribcage is 360 degrees, so don't forget to check the armpits and back.

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**If, while initiating a Secondary Survey, you discover a life-threatening problem, or if one arises, stop what you are doing and provide First Aid in an attempt to correct and/or alleviate that problem. Otherwise, if an injury presents itself during the Secondary Survey, continue and complete the Head-to-toe exam and then provide the appropriate First Aid.**

4. **Provide First Aid for injuries and illnesses:** Once all life-threatening priorities have been addressed and major injuries have been stabilized, you can provide treatment for injuries discovered from the Secondary Survey.

## The Four Vital Signs Used in First Aid

Vital signs are an excellent tool to assess the state of a casualty, as they gauge whether a casualty's condition is improving or deteriorating.

In order for vital signs to be an effective tool for the First Aider, they must always be recorded along with the time in which they were taken. Multiple vital sign recordings should be documented, every 5 minutes or sooner if indicated.

a) **Level of Consciousness :** To determine a casualty's Level of Consciousness, ask him/her a series of questions to see if he/she is oriented to person, place, and time. For example, ask him/her to answer questions such as "what is your name"; "where are you right now"; "what time of day is it". Ask the casualty to squeeze your hand to determine if he/she has motor control and if he/she can respond to verbal cues. Record his/her answers and re-assess every 5 minutes or sooner if indicated.



- Varying levels of consciousness can be experienced based on the general health of a casualty prior to an incident, his/her ability to compensate for injury/illness, his/her pain threshold and so on…
- A progressive loss of consciousness is a sign of deterioration of the casualty.

**b) Respirations/Breathing:** Breathing assessment is first completed in the Primary Survey to determine whether or not a casualty is breathing and if so, if it is sufficient/effective enough to sustain life. In a Secondary Survey, the purpose of a breathing assessment is to determine the rate, rhythm and depth of a casualty's breathing. An adult breaths on average 12-20 times/minute. Anything less than 12 or greater than 24, along with other signs and symptoms can be an indicator of respiratory distress. To assess a casualty's breathing, look at his/her chest and abdomen for 15 seconds counting rise and fall with each breath, along with the rhythm and depth of the breaths. Multiply that number by 4 to determine the total number of breaths/minute. If the casualty is unconscious, place one hand on his/her chest (Ask permission and inform the casualty what it is you are doing and why) and count the rate, while assessing the rhythm and depth.



Assess for signs of respiratory distress such as accessory muscle use, abdominal breathing, tracheal tugging and amount of energy exerted by the casualty while the breathing assessment is conducted.

**Rate:** Total number of respirations a casualty takes in one minute.

**Rhythm:** Assessed as either "regular" or irregular" and is measured by visually observing how regular each breath is from one to the next.

**Depth:** Breathing can either be "shallow", "normal" or "deep" and can be measured by determining the depth of each breath. Note any odd sounds during **inspiration** (breathing in) and **expiration** (breathing out) such as wheezing, gurgling, high pitched noises (stridor) etc...

Any deviations in one or all of the above can be a sign of respiratory distress and can give an indication of underlying illness/disease, and/or life-threatening conditions the casualty may be experiencing.

**c) Pulse (radial, carotid):** The most common site to assess for a pulse on an adult or child is the **radial pulse** which is located on the "thumb-side" of each wrist. Apply gentle pressure with your fingers and count for 15 seconds; then multiply that number by 4 to determine the total number of beats/minute. An adult's heart beats on average 60-100 beats/minute.

**Rate:** Number of heartbeats/minute.

**Rhythm:** Is the heartbeat "regular" or "irregular" between each beat?

**Volume:** Does the pulse feel strong or weak with each beat?

The **Carotid pulse** (carotid artery) is located on either side of the neck and is generally assessed on a casualty suspected of having low blood pressure, such as a casualty who may be in Shock. This particular pulse is assessed for 15 seconds and then multiplied by 4 to determine the total number of beats/minute.

The **Brachial pulse** (brachial artery) is located on the inside of the arm in between the bicep and tricep muscle and is the ideal location for assessing an infant's pulse (less than 1 year of age).



Never use your thumb to assess for a pulse as you may confuse the strong pulse your thumb generates to that of the casualty's.

**d) Skin condition and Temperature:** Changes in skin temperature, colour, and moisture are often present when a casualty is suffering from an injury or illness. For casualties in Shock, changes in temperature and colour are signs of deterioration and decompensation.

**Colour:** Does the skin have good colour and tone, or is it reddish, bluish, pale, or gray?

**Temperature:** Use the back of your hand and assess whether the skin is warm, cool, or cold.

**Moisture:** Is the casualty's skin, moist, wet, and clammy?

**AVERAGE VITAL SIGNS BY AGE**

| Age | Pulse Rate (beats/minute) | Breathing Rate (breaths/minute) |
|---|---|---|
| Newborn | 120-160 | 40-60 |
| 1 year | 80-140 | 30-40 |
| 3 years | 80-120 | 25-30 |
| 5 years | 70-115 | 20-25 |
| 7 years | 70-115 | 20-25 |
| 10 years | 70-115 | 15-22 |
| 15 years | 70-90 | 15-20 |
| Adult | 60-100 | 12-20 |

## The Importance of Monitoring and Noting the Changes in a Casualty's Level of Consciousness (LOC)

| Conscious | Semi-conscious | Unconscious |
|---|---|---|
| Responsive to person, place and time | Partially conscious; not fully aware of sensations | No response to any stimuli |

When a casualty has suffered an injury or illness, the body tries to compensate to help maintain and prevent further damage by implementing a series of specific physiological responses to help sustain the casualty through the trauma. Changes in LOC are an indication that a casualty's compensatory mechanisms are failing and that his/her condition is worsening.



- Varying levels of consciousness can be experienced and are often times dependant upon the general health of a casualty prior to an incident, his/her ability to compensate for injury/illness, his/her pain threshold and so on…
- An unconscious casualty cannot protect his/her own airway.
- A progressive loss of consciousness is a sign of deterioration of the casualty.

## The Three Responses Used for Assessing the Levels of Consciousness Using the Modified Glasgow Coma Scale

**The Modified Glasgow Coma Scale is a method used to determine a casualty's LOC and is an effective tool in gauging a casualty's condition throughout an emergency situation**

**1. Eye opening response**

- Eyes open
- Eyes open to speech or pain
- Eyes don't open

**2. Verbal response**

- Oriented and alert
- Confused, doesn't make sense
- No speech

**3. Motor Response**

- Obeys commands
- Moves to pain
- No movement

## Effective Breathing for a Healthy Adult Casualty at Rest

**Rate:** As noted earlier and in previous chapters, the normal respiratory rate for a healthy adult is between 12-20 breaths/minute.

**Rhythm:** A healthy adult will have a "regular" breathing rhythm/pattern observed between each breath (both inspiration and expiration).

**Depth:** A healthy adult will be fully conscious, present with no abnormal breathing sounds, and have good symmetrical chest rise and fall, with no signs or symptoms of respiratory distress or additional exertion.

## Characteristics of a Pulse for a Healthy Adult at Rest

**a) Average pulse rate:** The average number of beats/minute produced by a healthy adult at rest is between 60-100.

**b) Rhythm:** A healthy adult at rest will have a "regular" pulse rhythm.

**c) Volume:** A healthy adult at rest will have a strong and full pulse.

# Chapter 5
## Body Systems

### Introduction

The human body is made up of interconnected systems that work together to maintain life. In first aid, understanding the basic structure and function of key body systems helps explain why certain signs and symptoms are serious and why rapid recognition and action are critical. This chapter provides an overview of major body systems commonly involved in first aid emergencies and explains how they support normal function and respond to injury or illness.



## *The Musculoskeletal System*

### Introduction

The musculoskeletal system forms the framework of the body and allows movement, stability, and protection of vital organs. In first aid, understanding this system helps explain how injuries such as fractures, dislocations, and soft tissue damage can affect circulation, mobility, and overall safety.

### What Is the Musculoskeletal System?

**The musculoskeletal system combines two major body systems:**

- The skeletal system, which provides structure, support, and protection
- The muscular system, which produces movement

Together, these systems allow the body to move, maintain balance and posture, and perform everyday activities ranging from standing and walking to lifting and breathing.

# *Major Structures and Their Functions*

## Bones

Bones are living tissues that form the framework of the body. They support body weight, protect internal organs, store minerals such as calcium and phosphorus, and contain bone marrow, where blood cells are produced.

**Structure of a Bone:**

- Compact bone: The hard, dense outer layer that provides strength
- Spongy bone: The lighter, porous inner layer that helps absorb impact
- Bone marrow: The soft inner tissue responsible for producing red and white blood cells

**Rationale: Understanding bone structure helps first aiders recognize potential complications of fractures, including internal bleeding, swelling, and shock.**



## Joints

Joints are the points where two or more bones meet. They allow movement while maintaining stability. Cartilage cushions the joint surfaces, and synovial fluid reduces friction during movement.

## Types of Joints and Examples:

- **Hinge joints:** Allow movement in one direction
  Examples include elbows, knees, fingers, and toes
- **Pivot joints:** Allow rotation around a single axis
  Examples include the neck and forearm
- **Saddle joints:** Allow movement back and forth and side to side
  Example: the thumb
- **Condyloid (ellipsoid) joints:** Allow movement in multiple directions without rotation
  Example: the wrist

- **Plane (gliding) joints:** Allow sliding movement between flat bone surfaces Examples include small joints of the wrists and ankles
- **Ball-and-socket joints:** Allow the widest range of motion, including rotation Examples include the shoulder and hip

## Cartilage

Cartilage is a tough but flexible connective tissue found in joints, the ears, the nose, and between vertebrae. It acts as a shock absorber and prevents bones from rubbing directly against each other.

When cartilage deteriorates, such as in arthritis, joint movement can become painful and restricted.

## Ligaments

Ligaments are strong bands of connective tissue that connect bone to bone. They stabilize joints and limit excessive movement. An injury to a ligament is known as a sprain.

## Tendons

Tendons are fibrous connective tissues that attach muscles to bones. They transmit the force generated by muscles to produce movement. An injury to a tendon is referred to as a strain.

## General Anatomy of a Bone

Each bone is composed of several layers:

- **Periosteum:** The tough outer covering containing nerves and blood vessels
- **Compact bone:** The dense outer layer that provides strength
- **Spongy (cancellous) bone:** The inner layer that helps absorb impact
- **Bone marrow:** The innermost tissue responsible for blood cell production

## Summary

The musculoskeletal system is made up of bones, joints, muscles, ligaments, tendons, and cartilage. These structures work together to support the body and allow movement. Injuries to this system can cause pain, swelling, instability, internal bleeding, and shock. Proper recognition and support of musculoskeletal injuries are essential in preventing further harm.

# *The Respiratory System*

## Introduction

The respiratory system allows the body to take in oxygen and remove carbon dioxide. Oxygen is essential for cell survival, and even brief interruptions in breathing can quickly become life-threatening. In first aid, understanding the respiratory system helps explain why airway obstruction, breathing difficulty, and chest injuries require immediate attention.

## What Is the Respiratory System?

The respiratory system is a group of organs and tissues that allow breathing and gas exchange. When a person inhales, air travels through the airways into the lungs and fills tiny air sacs called alveoli. These alveoli are surrounded by small blood vessels called capillaries. Oxygen moves from the air into the blood, while carbon dioxide moves from the blood into the air to be exhaled.

This constant exchange of oxygen and carbon dioxide is essential for maintaining life.



## Breathing Mechanics

Breathing is controlled primarily by the diaphragm and the muscles of the rib cage. The diaphragm is a dome-shaped muscle located below the lungs.

During inhalation, the diaphragm contracts and moves downward while the rib cage expands outward. This creates negative pressure inside the chest, drawing air into the lungs. During exhalation, the diaphragm relaxes and moves upward, and the ribs move downward and inward, pushing air out of the lungs.

Proper breathing depends on balanced pressure within the chest cavity. If this balance is disrupted, breathing can become difficult or ineffective.

### Analogy to Remember

The lungs can be compared to two sponges attached to flexible tubes. When the tubes are open and clear, air flows easily. When they are blocked, narrowed, or compressed, it becomes difficult for air to move in and out.

## Breathing Mechanics and Pressure

Breathing is controlled primarily by the diaphragm, a dome-shaped muscle located below the lungs, and the rib cage. When a person inhales, the diaphragm contracts and moves downward while the rib cage expands outward. This creates negative pressure inside the chest, pulling air into the lungs.

When a person exhales, the diaphragm relaxes and moves upward while the ribs move downward and inward. This pushes air, now containing carbon dioxide, out of the lungs. Breathing depends on maintaining proper pressure within the chest cavity.

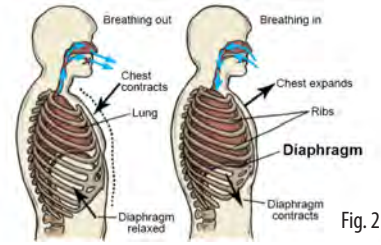


Fig. 2

If pressure within the chest becomes unbalanced, breathing can be severely affected. For example, if air becomes trapped in the pleural space, the lung may collapse, making breathing extremely difficult.



## Major Structures of the Respiratory System

The respiratory system is made up of several structures that work together to move air in and out of the body.

## Nose and Nasal Cavity

The nose and nasal cavity are the first entry point for air. Small hairs and sticky mucus trap dust, dirt, and germs before they reach the lungs. The nasal passages also warm and moisten the air, making it less irritating to the lower airways.

### Analogy to Remember

The nose acts like an air filter, similar to the filter in a furnace or vacuum. When it is clear, air moves smoothly. When it is blocked or congested, breathing becomes more difficult.

## Pharynx (Throat)

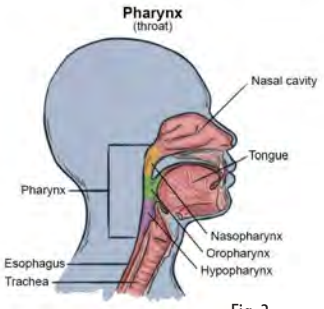


Fig. 3

The pharynx connects the nose and mouth to the trachea. It is a shared pathway for both air and food. During swallowing, the body must direct food away from the airway and toward the esophagus.

If the pharynx becomes blocked, such as during choking, air cannot reach the lungs. This is why airway obstruction is a life-threatening emergency and why airway management is a critical first aid skill.

## Larynx (Voice Box)

The larynx is located just below the pharynx and contains the vocal cords, which vibrate to produce sound. It also plays a vital role in protecting the airway.

A small flap called the epiglottis covers the larynx during swallowing to prevent food or liquid from entering the airway. This helps ensure that air enters the trachea while food enters the esophagus.

**Analogy to Remember**

The larynx functions like a gate that opens for air, closes for food, and also allows sound to be produced.



## Trachea (Windpipe)

The trachea is the main airway that carries air from the throat into the lungs. It is supported by C-shaped rings of cartilage that prevent it from collapsing during breathing.

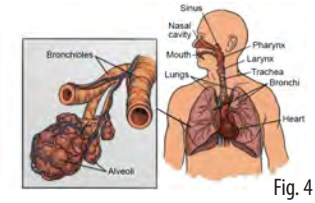


Fig. 4

The inside of the trachea is lined with mucus and tiny hair-like structures called cilia. Mucus traps particles such as dust and germs, and the cilia move them upward toward the throat to be coughed out or swallowed.

**Analogy to Remember**

The trachea can be compared to a vacuum hose: strong, flexible, and kept open so air can move freely.

## Bronchi and Bronchioles

At the base of the trachea, the airway divides into two main bronchi, one leading to each lung. These bronchi continue to branch into smaller tubes called bronchioles.

The bronchi and bronchioles distribute air throughout the lungs, ensuring oxygen reaches all areas where gas exchange can occur.

**Analogy to Remember**

The airway system resembles an upside-down tree. The trachea is the trunk, the bronchi are the large branches, and the bronchioles are the smaller branches that lead to the leaves, the alveoli.

## Alveoli

Alveoli are tiny air sacs located at the ends of the bronchioles. This is where gas exchange takes place. Oxygen passes through the thin walls of the alveoli into the bloodstream, while carbon dioxide moves out of the blood to be exhaled.

There are approximately 300 million alveoli in the lungs. When spread out, they cover an area roughly the size of a tennis court, allowing for efficient gas exchange.

**Analogy to Remember**

Alveoli can be compared to millions of tiny balloons. They expand when breathing in and shrink when breathing out. If they become damaged or filled with fluid or mucus, oxygen has difficulty entering the bloodstream.

## Diaphragm

The diaphragm is a large dome-shaped muscle located beneath the lungs. It is the primary muscle of breathing. When it contracts, it moves downward, increasing the size of the chest cavity and drawing air into the lungs. When it relaxes, it moves upward, helping push air out.

**Analogy to Remember**

The diaphragm works like a piston. When it moves downward, air is pulled in. When it moves upward, air is pushed out.

## The Lungs

The lungs are large, soft, spongy organs that fill most of the chest cavity. There are two lungs, one on each side of the chest. The right lung has three lobes, while the left lung has two lobes to make room for the heart.

The lungs themselves do not contain muscles. They rely on movement of the diaphragm and rib cage to inflate and deflate. Inside the lungs, air travels through smaller and smaller airways until it reaches the alveoli.

Each alveolus is surrounded by capillaries, where oxygen enters the blood and carbon dioxide leaves the blood.

## The Ribs and Chest Wall

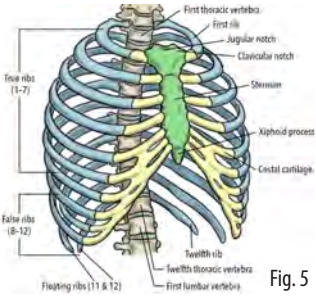


Fig. 5

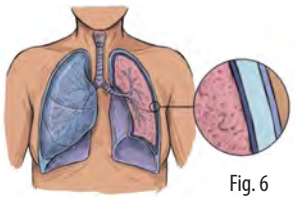
The ribs form a protective cage around the lungs and heart. In addition to protection, the ribs and chest wall play a key role in breathing.

Between the ribs are intercostal muscles. When these muscles contract, the ribs move upward and outward, expanding the chest and allowing the lungs to fill with air. When the muscles relax, the ribs move downward and inward, helping push air out of the lungs.

If ribs are fractured, such as in flail chest, part of the chest wall may move in the opposite direction during breathing. This abnormal movement can interfere with breathing and is considered a medical emergency.

## The Pleural Cavity

The pleural cavity is a thin space between the lungs and the chest wall. It is lined by two layers: the visceral pleura, which covers the lungs, and the parietal pleura, which lines the chest wall.


Fig. 6

A small amount of fluid within this space allows the lungs to glide smoothly during breathing and helps keep them expanded. This fluid creates a seal that allows the lungs to move with the chest wall.

If air, blood, or fluid enters the pleural cavity, the seal can be broken. This may cause the lung to collapse, resulting in severe breathing difficulty.

**Summary**

The respiratory system includes the airways, lungs, diaphragm, chest wall, and pleural cavity. These structures work together to move air in and out of the lungs and allow gas exchange in the alveoli. Disruption to any part of this system can impair oxygen delivery and lead to respiratory distress or failure. Breathing problems should always be treated seriously.

# *The Cardiovascular System*



The cardiovascular system is responsible for transporting blood throughout the body. It delivers oxygen and nutrients to tissues and removes waste products. In first aid, conditions affecting circulation or blood volume can rapidly deprive the brain and vital organs of oxygen.

## Oxygen-Rich and Oxygen-Poor Blood

As blood circulates through the body, it delivers oxygen to tissues and collects carbon dioxide. After passing through the tissues, the blood returns to the heart with a lower oxygen content and a higher level of carbon dioxide. The heart then pumps this blood to the lungs, where gas exchange occurs. Carbon dioxide is released from the blood, and oxygen is absorbed.

Once oxygen has been absorbed, the blood becomes oxygen-rich and returns to the heart. The heart then pumps this oxygenated blood to the rest of the body. This continuous process ensures that body tissues receive the oxygen they need and that waste gases are removed.

## The Heart

The heart is a strong, muscular organ located in the center of the chest, slightly to the left. Its primary function is to pump blood throughout the body.

**The heart contains four chambers:**

- Right atrium
- Right ventricle
- Left atrium
- Left ventricle

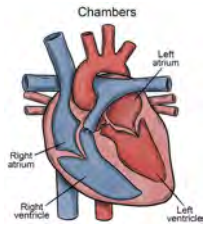


Fig. 7

The right side of the heart pumps oxygen-poor blood to the lungs, where oxygen is absorbed. The left side of the heart pumps oxygen-rich blood to the rest of the body. Valves within the heart open and close with each heartbeat, ensuring blood flows in one direction.

The heart beats automatically and is regulated by its own internal electrical system.

## The Electrical Conduction System

The heart has a built-in electrical system that controls the timing and rhythm of each heartbeat. Electrical signals travel through the heart, causing the chambers to contract in a coordinated manner.

This system:

- Initiates each heartbeat
- Regulates heart rate
- Ensures efficient pumping of blood

Disruptions to the electrical system can cause the heart to beat too fast, too slow, or irregularly, which may interfere with blood flow to the body.



## Blood Vessels

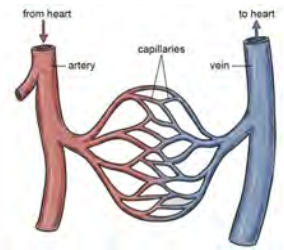



Fig. 8

Blood vessels are tubes that transport blood throughout the body. There are three main types of blood vessels, each with a specific function.

### Arteries

- Carry oxygen-rich blood away from the heart
- Have thick, strong walls to withstand high pressure

### Veins

- Carry oxygen-poor blood back to the heart
- Contain valves that prevent blood from flowing backward

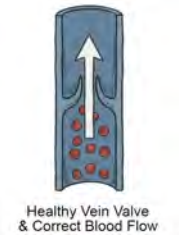



Fig. 9

## Capillaries

- The smallest blood vessels in the body
- Connect arteries and veins
- Allow the exchange of oxygen, nutrients, and waste products between the blood and body tissues

## Blood

Blood transports essential substances throughout the body and plays a role in protection and healing.

**Blood is made up of:**

- Red blood cells, which carry oxygen
- White blood cells, which help fight infection
- Platelets, which assist with clotting to stop bleeding
- Plasma, the liquid portion that carries nutrients, hormones, and waste products

In first aid, recognizing signs of severe blood loss or poor circulation is critical, as blood is necessary for oxygen delivery, immune defense, and healing.

## The Lungs

Although the lungs are part of the respiratory system, they work closely with the cardiovascular system.

Blood flows from the heart to the lungs, where it releases carbon dioxide and absorbs oxygen. The oxygen-rich blood then returns to the heart and is pumped to the rest of the body. Without this exchange, body cells would be deprived of oxygen and begin to fail within minutes.

## Valves

Valves are located within the heart and in many veins. They function as one-way openings that keep blood moving in the correct direction.

**Valves:**

- Prevent blood from flowing backward
- Promote efficient circulation
- Assist with blood return to the heart, especially when changing positions

Valve dysfunction can interfere with circulation and may contribute to other cardiovascular problems.

## Functions of the Cardiovascular System

The cardiovascular system performs several essential functions, including:

- Transporting oxygen and nutrients to cells
- Removing carbon dioxide and waste products
- Maintaining blood pressure and circulation
- Delivering hormones and immune cells
- Helping regulate body temperature
- Supporting clot formation to control bleeding

The cardiovascular system consists of the heart, blood, and blood vessels. Together, they maintain circulation and support oxygen delivery to the body. Severe bleeding, heart attack, stroke, and shock can quickly compromise circulation and oxygen supply. Early recognition and rapid response are essential in cardiovascular emergencies.



# *The Nervous System*

### Introduction

The nervous system is the body's control and communication network. It allows the body to sense its environment, make decisions, and respond through movement and automatic functions. In first aid, injuries or illnesses affecting the nervous system are particularly serious because they can disrupt breathing, consciousness, movement, and sensation.

## What the Nervous System Does

The nervous system keeps the body informed and ready to respond. It constantly receives information, processes it, and sends instructions throughout the body.

**The nervous system has three primary roles:**

- **Sensory:** Detecting changes inside and outside the body
- **Processing:** Interpreting and understanding information
- **Motor:** Sending signals that create movement or action

All body activities, including breathing, speech, movement, and reflexes, depend on the nervous system functioning properly.

## Two Main Parts of the Nervous System

The nervous system is divided into two major parts that work together to control body functions.

## Central Nervous System (CNS)

The central nervous system is the control centre of the body. It processes information and directs responses.

**The CNS is made up of:**

- Brain
- Spinal cord

**The CNS is responsible for:**

- Processing information
- Decision making
- Sending instructions to the body

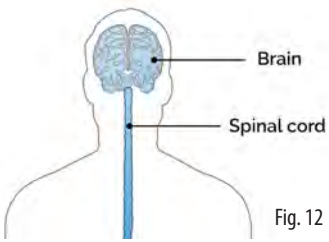



Fig. 12

## Peripheral Nervous System (PNS)

The peripheral nervous system consists of all nerves outside the brain and spinal cord. It connects the central nervous system to the rest of the body.

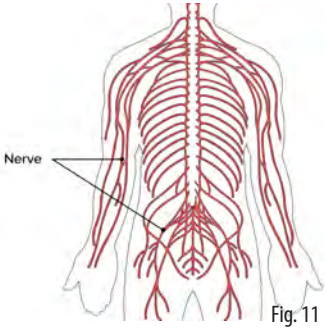


Fig. 11

**The PNS is responsible for:**

- Carrying sensory information to the CNS
- Transmitting commands from the CNS to muscles, skin, and organs

The CNS and PNS must work together for normal body function. Damage to the spinal cord can disrupt communication between the brain and the body. When this communication is interrupted, movement, sensation, or normal function may be lost below the level of injury. For this reason, suspected spinal injuries are treated as serious emergencies.

## Brain: Structure and Function

The brain is the main control centre of the body. Different areas of the brain perform specific functions, and injury to any area can affect movement, sensation, behaviour, or consciousness.

### Cerebrum

The cerebrum is responsible for higher-level functions, including:

- Thinking and memory
- Speech and understanding
- Emotions and personality
- Voluntary movement
- Sensation such as touch, pain, and temperature

### Cerebellum

The cerebellum helps coordinate movement and balance, including:

- Balance and posture
- Coordination
- Smooth, controlled movements

## Brainstem

The brainstem controls vital life-sustaining functions, including:

- Breathing
- Heart rate
- Blood pressure
- Level of consciousness
- Protective reflexes

In first aid, any suspected injury to the brain is considered serious because it can affect essential body functions.

## Spinal Cord: Structure and Function

The spinal cord is the main communication pathway between the brain and the rest of the body. It carries messages that control movement and sensation.

**The spinal cord:**

- Sends movement instructions to muscles
- Sends sensory information back to the brain
- Coordinates reflex actions
- Connects the brain to the entire body
- Controls function below the level of injury

Spinal cord injuries are serious because they can affect movement and sensation below the level of damage.

## Nerves and How They Work

Nerves connect the brain and spinal cord to all parts of the body. They transmit signals rapidly, allowing the body to respond quickly to changes and potential threats.

**There are two main types of nerves:**

- **Sensory nerves**, which carry information such as touch, pain, temperature, and body position to the brain
- **Motor nerves**, which carry instructions from the brain to the muscles, allowing movement

Damage to nerves can result in numbness, tingling, weakness, or loss of movement.

## The Autonomic Nervous System

The autonomic nervous system controls involuntary body functions that occur without conscious thought. It helps maintain internal balance and supports survival.

**The autonomic nervous system has two main divisions:**

- **The sympathetic system**, which prepares the body for stress and emergencies
- **The parasympathetic system**, which calms the body and restores normal function

These systems influence heart rate, breathing, blood pressure, digestion, and body temperature. Changes in these functions may be seen in many medical emergencies.

## Reflexes

Reflexes are rapid, automatic responses that protect the body from injury. They occur without conscious thought.

Reflex actions are controlled through the spinal cord rather than the brain. Examples include pulling away from a hot object or blinking when something approaches the eyes. Damage to the spinal cord may affect reflexes below the level of injury.



## Sensory and Motor Pathways

The nervous system uses specific pathways to send and receive signals throughout the body.

**Sensory pathways:**

- Carry information about touch, pain, temperature, and body position to the brain

**Motor pathways:**

- Carry instructions from the brain to muscles to produce movement

Damage to these pathways may cause numbness, tingling, weakness, paralysis, or coordination problems. These symptoms are commonly associated with head or spinal injuries.

## Consciousness and the Nervous System

A person's level of consciousness depends on normal brain function. When the brain does not receive enough oxygen, blood flow, or normal electrical signals, awareness can change rapidly.

**Changes in consciousness may include:**

- Confusion
- Slurred speech
- Altered behaviour
- Drowsiness
- Unresponsiveness
- Seizures

Any sudden change in level of consciousness is considered a medical emergency and requires immediate care.

## Electrical Activity and Body Control

The nervous system communicates using electrical signals. These signals control muscle movement, organ function, and coordination.

**Disruption of normal electrical activity can result in:**

- Seizures
- Loss of coordination
- Muscle spasms
- Weakness or paralysis
- Abnormal breathing

## Nervous System and Breathing

The cerebrum allows conscious control, such as breath holding or blowing out candles, and the brainstem allows breathing during sleep, with assistance from the spinal cord and nerves.

**Key points include:**

- The brainstem regulates breathing rhythm
- Nerves control the diaphragm and breathing muscles
- High spinal cord injuries may weaken or stop breathing
- Head injuries may cause abnormal breathing patterns

In head and spinal injuries, monitoring airway and breathing is critical, as breathing may be impaired or stop entirely.

## Protection of the Nervous System

The nervous system is delicate and requires strong protection. The skull and spine protect the brain and spinal cord from injury.

## Skull

The skull is a rigid structure that surrounds and protects the brain. It shields areas responsible for thinking, memory, speech, and movement and helps absorb force during minor impacts.

## Spine

The spine is made up of stacked bones called vertebrae. These bones form a protective tunnel around the spinal cord. Ligaments and discs help absorb force and allow flexibility while maintaining protection.

Damage to the spine can compress, stretch, or sever the spinal cord, disrupting communication with the body below the injury site. For this reason, spinal injuries are treated with extreme caution.

## Cerebrospinal Fluid

Cerebrospinal fluid is a clear liquid that surrounds and cushions the brain and spinal cord. It acts as a shock absorber and helps keep these structures stable.

In serious head injuries, damage to the skull or protective layers may allow cerebrospinal fluid to leak from the nose or ears. This is a sign of a significant skull fracture and is treated as a medical emergency.

The nervous system includes the brain, spinal cord, and nerves throughout the body. It controls awareness, movement, sensation, reflexes, and vital automatic functions. Damage to the nervous system can lead to loss of consciousness, weakness, paralysis, seizures, or abnormal breathing. Any sudden neurological change should be treated as a medical emergency.

## Chapter Summary:

Body systems do not work in isolation. The musculoskeletal system provides structure and movement, the nervous system controls communication and vital function, the respiratory system supplies oxygen, and the cardiovascular system delivers oxygenated blood to the body's tissues. When one or more of these systems is disrupted, the body may not receive the oxygen, circulation, or control it needs to survive. Understanding how these systems function helps first aiders recognize emergencies early and respond appropriately.

# Chapter 6
## Fainting

### What is Unconsciousness?

To define unconsciousness, we must first define consciousness. **Consciousness** is defined as the state of being conscious; an awareness of one's own existence, sensations, thoughts, surroundings, etc... **Unconsciousness** can be defined as not being conscious; without awareness, sensation, or cognition. In addition, an individual can be deemed **semi-conscious**. This can be defined as an individual who is only aware of/oriented to certain stimuli, (e.g. The casualty may know who he/she is but not his/her present location or time of day).



- Varying levels of consciousness can be experienced and are often times dependant on the general health of a casualty prior to an incident, his/her ability to compensate for injury/illness, his/her pain threshold and so on…
- An unconscious casualty cannot protect his/her own airway.
- A progressive loss of consciousness is a sign of deterioration of the casualty.

| Conscious | Semi-conscious | Unconscious |
|---|---|---|
| Responsive to person, place and time | Partially conscious; not fully aware of sensations | No response to any stimuli |

**LEVELS OF CONSCIOUSNESS**

**STIMULI . . . . . .RESPONSE BY CASUALTY**

**A**lert . . . . . .Answer questions appropriately
**V**erbal . . . . . .Respond to verbal stimuli
**P**ainful . . . . . .Only respond when painful stimuli applied
**U**nresponsive . . . . . .No response to any stimuli

# *First Aid Procedures For An Unconscious Casualty*

## First Aid for an Unconscious Casualty



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- If the casualty is unconscious but breathing on his/her own, put him/her into the Recovery Position if you do not suspect a Head and/or Spinal injury.
- Loosen tight clothing.
- Treat for Shock.
- Provide Ongoing Casualty Care.



- An unconscious casualty cannot protect his/her own airway, when supine (laying on his/her back) because the tongue falls back and seals off the airway, causing a cessation of breathing.
- To assess the airway, use the Head-tilt-chin lift method to open the airway. If you suspect a Head and/or Spinal injury, use the Jaw-thrust without head-tilt procedure (Health Care Providers Only).
- If the casualty is unconscious and not breathing begin CPR immediately, 30:2
- If a Head and/or Spinal injury is suspected, leave the casualty in the position found and assess A,B,C's.
- Assess for breathing every 30 seconds.



**If you need to leave a casualty to go call 9-1-1, and a Head and/or Spinal injury is not suspected, place him/her in the Recovery Position. Upon your return, roll him/her onto his/her back and re-asses A,B,C's**




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# *Recognizing Fainting*

## Definition of Fainting

**Fainting** (in medical terms, syncope), is a transient loss of consciousness due to a decrease in blood and oxygen to the brain, followed by a recovery to previous mental status.

- Time of recovery is variable on the casualty's age, underlying diseases and factors which initially triggered the event.

- Symptoms such as weakness, dizziness, or lightheadedness may or may not be present prior to one fainting.

## Common Causes of Fainting

- **Response to emotional distress** such as from pain or fear. This can occur while standing or sitting. Symptoms are generally paleness, low blood pressure and low heart rate.

- **Heart problems:** Narrowed blood vessels can cause a decrease in both blood volume and blood pressure which can cause one to faint.

- **Fainting while assuming an upright position:** This type of fainting occurs when one tries to stand up from a sitting position. Heart rate and blood pressure are not able to effectively compensate when assuming a standing position, causing one to faint. This can be caused by low blood volume from dehydration, from a severe bleed, prolonged heat exposure, alcohol, and pregnancy.

- **Hyperventilation:** Hyperventilating can cause a fainting episode because the brain becomes deprived of oxygen, in addition to a drop/decline in blood pressure.

- **Drugs and toxins:** Certain illicit drugs, prescription medications and specific toxins can cause one to faint.

- **Low blood sugar:** Low levels of circulating blood sugar can cause one to faint (e.g. diabetics).

### Signs and Symptoms of an Impending Faint

- Paleness
- Dizziness/Lightheadedness
- Sweating
- Nausea
- Confusion
- Ringing in the Ears
- Blurred Vision or Spots in front of your eyes
- Clammy Sweat

# *First Aid Procedures For Fainting*

### First Aid for a Person who Feels Faint



- Have the casualty sit down and put his/her head between his/her knees or lay him/her down in the Shock Position.
- **Call 9-1-1** if necessary.
- Monitor the casualty and provide Ongoing Casualty Care.

### If the casualty has fainted



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's (If the casualty is unconscious and breathing on his/her own put him/her into the Recovery Position and monitor A,B,C's every 30 seconds; if unconscious and not breathing, begin CPR, 30:2).
- Keep warm.
- Treat for Shock.
- Provide Ongoing Casualty Care.

# Chapter 7
## Shock

### Definition of Shock

**Shock** is a life-threatening medical condition that can happen when the body isn't getting enough blood and oxygen to keep the organs working properly. When this happens, the heart, brain, and other organs that are essential for life start to shut down.

Shock can happen for a few different reasons. Sometimes the body doesn't have enough blood or fluid to circulate, or the heart isn't able to pump effectively. In other cases, the blood vessels become too wide and relaxed, making it hard to keep blood moving. Shock can also occur if something physically blocks blood flow, stopping the blood and oxygen from reaching parts of the body that need it.

When shock is not treated quickly, it will often lead to organ failure and death. Recognizing the signs and symptoms can save a person's life



Think of shock like your body running out of "fuel" for the organs—if the heart and vessels can't deliver oxygen, your body's "engine" starts to fail.

### Types of shock + Signs and symptoms of shock

**There are five main types of shock, each caused by different problems in the body:**

**Hypovolemic Shock** happens when the body loses too much blood or fluid, such as from bleeding, burns, or severe dehydration.

**Cardiogenic Shock** happens when the heart is damaged or too weak to pump blood effectively.

**Distributive Shock** happens when blood vessels become too wide and relaxed, causing blood to spread out instead of being pushed to vital organs.

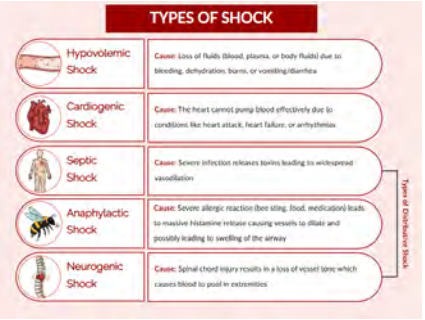



Fig. 1

This includes septic shock (infection), anaphylactic shock (severe allergic reaction), and neurogenic shock (spinal injury).

**Obstructive Shock** happens when something physically blocks blood flow in the body, such as a blood clot or collapsed lung pressing on the heart.

# *1. Hypovolemic Shock*

**Cause:** This type of shock happens when the body loses too much blood or other fluids that make up blood volume, things like plasma, water, and salts.

**This can happen from:**

- Severe bleeding (external or internal)
- Burns, which can cause plasma and fluid to leak out through damaged skin
- Dehydration from heat, vomiting, or diarrhea, where the body loses large amounts of water and electrolytes

## What's happening in the body:

Blood isn't just red cells, it's mostly fluid. That fluid carries oxygen, nutrients, and heat through the body. When a lot of blood or body fluid is lost, there isn't enough left to fill the blood vessels.

**When fluid is lost:**

- The heart beats faster to try to move blood to where it's needed most.
- The body sends blood away from the skin and stomach to protect the brain and heart.
- Without enough blood flow, organs stop getting oxygen, and they start to slow down and can be permanently damaged if not treated quickly.

### Signs & Symptoms:

- Rapid heart beat
- Dizziness or fainting
- Cool, clammy skin
- Pale or grayish skin
- Rapid, shallow breathing
- Thirst
- Confusion

### Management:

1. **Call 9-1-1** and retrieve an AED
2. Control any bleeding by pressing firmly with a clean cloth or bandage.
3. Lay the person flat and raise their legs slightly (unless there's a possible head, neck, or back injury). This helps more blood flow back to the heart and brain.
4. Keep them warm using a blanket or jacket. When someone is in shock, their body loses heat and has difficulty with circulation, being warm has been proven to help the outcome.
5. Monitor vital signs Things can change quickly in shock so it is important to monitor them and reassess breathing, skin condition, and level of consciousness every 2 minutes until paramedics arrive
6. Do not give any food or drink it could cause choking or delays in medical care if they need surgery
7. If the person becomes unresponsive and stops breathing, start CPR immediately

## *2. Cardiogenic Shock*

**Cause:** This type of shock happens when the heart is too weak or damaged to pump blood properly. It can happen after or during a heart attack, from heart failure, or from an abnormal heart rhythm that makes the heart beat too slow, too fast, or too irregularly.

### What's happening in the body:

The heart's job is to push oxygen-rich blood through the body.

When it can't do that effectively:

- Less blood and oxygen reach the organs, including the brain and heart itself.
- Blood can back up into the lungs, causing shortness of breath and chest pressure.
- The body tries to fix this by making the heart beat faster, but that extra effort can make things worse and tire the heart out even more.

### Signs & Symptoms:

- Chest pain or discomfort
- Dizziness or fainting
- Pale, cool, sweaty skin
- Anxiety or restlessness

### Management:

1. **Call 9-1-1** and retrieve an AED
2. Keep the patient calm and seated upright if breathing is difficult.
3. Monitor vital signs
4. Keep them warm using a blanket or jacket
5. Do not give any food or drink
6. If the person becomes unresponsive and stops breathing, start CPR immediately

## *3. Distributive Shock*

**Cause:** This type of shock happens when the blood vessels become too wide and relaxed, which makes it hard for blood to stay where it needs to go. Even though there might be enough blood in the body, it's not being pushed properly to the brain and organs.

There are three main kinds:

**Septic Shock:** caused by a severe infection.

**Anaphylactic Shock:** caused by a serious allergic reaction.

**Neurogenic Shock**: caused by a spinal cord injury.

## What's happening in the body:

The walls of the blood vessels loosen and open up, letting blood spread out instead of being directed to vital organs. Sometimes, fluid leaks from the vessels into the tissues, which makes it even harder for blood pressure to stay high enough for the body to function properly. When that happens, the brain, heart, and other organs don't get enough oxygen, and the person can quickly become very sick, end up with permanent organ damage, or death.

### a) Septic Shock

**Cause:** A severe infection releases toxins into the bloodstream that make blood vessels open up and leak fluid.

## Signs & Symptoms:

- Fever, chills, confusion
- Warm skin early; cold skin later
- Dizziness, fainting

## Management:

1. **Call 9-1-1** and retrieve AED
2. Monitor vital signs
3. Keep them warm using a blanket or jacket
4. Do not give any food or drink
5. If the person becomes unresponsive and stops breathing, start CPR immediately

**b) Anaphylactic Shock**

A severe allergic reaction to something like a bee sting, food, or medication causes a sudden release of chemicals inside the body that make the blood vessels widen and the airway swell.

## Signs & Symptoms:

- Hives, itching
- Swelling of face, lips, tongue
- Shortness of breath, wheezing
- Dizziness, loss of consciousness

## Management:

1. **Call 9-1-1** and retrieve an AED
2. Use an epinephrine auto-injector (EpiPen) if the person has one. This medicine helps open the airway and tighten blood vessels.
3. Help them sit up if breathing is easier that way, or lay them down if they feel faint.
4. Monitor vital signs
5. Keep them warm using a blanket or jacket
6. Do not give any food or drink
7. Be ready to use a second EpiPen if symptoms don't improve and help hasn't arrived yet.
8. If the person becomes unresponsive and stops breathing, start CPR immediately

**c) Neurogenic Shock**

**Cause:** A spinal cord injury affects the nerves that control blood vessels, causing them to relax too much. This makes blood pool in the lower body instead of going back to the heart and brain.

### Signs & Symptoms:

- Warm, dry skin below injury
- Weakness, paralysis
- Injury to head, neck, or back

### Management:

1. **Call 9-1-1** and retrieve an AED
2. Keep the person completely still, movement could make the spinal injury worse. Tell them "don't move!" and keep them in the position they were found in as long as they can breathe well
3, Support the head and neck to prevent movement if possible  place both of your hands on either side of their head and neck (if possible) to prevent them from turning their head side-to-side.
4. Monitor vital signs
5. Keep them warm with a blanket or jacket
6. Do not give any food or drink
7. If the person becomes unresponsive and stops breathing, start CPR immediately

## 4. Obstructive Shock

**Cause:** This type of shock happens when something physically blocks blood from moving normally through the heart or major blood vessels.

Even though the heart itself may be strong, it can't pump properly because of the blockage.

**This can happen from:**

- A blood clot in the lungs **(pulmonary embolism)**
- A collapsed lung that puts pressure on the heart **(tension pneumothorax)**
- Fluid or blood building up around the heart **(cardiac tamponade)**

## What's happening in the body:

When blood flow is blocked, oxygen can't reach vital organs.

- The heart struggles to fill or pump against the pressure.
- Blood backs up behind the blockage, and less blood reaches the brain and body.
- Without enough oxygen, organs begin to slow down, and breathing often becomes harder as pressure builds in the chest.

## Signs & Symptoms:

- Dizziness, loss of consciousness
- Shortness of breath
- Chest pain
- bulging neck veins (in some cases)

## Management:

1. **Call 9-1-1** and retrieve AED
2. Help the person sit upright if breathing is easier that way → sitting can reduce pressure on the lungs and heart
3. Keep them calm and still → movement and stress increases oxygen demand and can make the heart beat faster, which can make symptoms worse.
4. Monitor vital signs
5. Keep them warm using a blanket or jacket
6. Do not give any food or drink
7. If the person becomes unresponsive and stops breathing, start CPR immediately

## Summary

Shock is not just about one body part being affected, it's the body's way of saying "I'm not getting enough oxygen to survive" It can start in different ways but always leads to the same problem: vital organs are being starved of oxygen.

**When this happens, the body goes into survival mode:**

- The heart beats faster to move blood around.
- The skin turns pale and cool because the blood is directed away from the surface and towards the heart and brain
- The person may feel wreck, dizzy, or confused as the brain continues to loose oxygen and in turn, lose function

**Shock can affect anyone, from a child who is severely dehydrated to an adult having a heart attack.**

No matter the cause it is important to be aware of shock, be able to recognize it, and get the person help as fast as possible, shock can not be fixed with first aid and the person needs a higher level of care as soon as possible.

By recognizing the signs and symptoms, calling 9-1-1, and taking steps to improve their current condition by stopping a bleed, keeping them warm, or administering an epi-pen can make the life saving difference their body needs.

## *Quick Reference Guide: Caring for Any Type of Shock*

- **Call 9-1-1 and retrieve an AED** → Shock is always life-threatening so it's important to get help by calling 9-1-1 and prepare for the worst case scenario by retrieving an AED.
- **Help their body compensate,** you can do this by stopping the bleeding, administering an epi-pen, positioning to help reduce the workload of their heart, and keeping them warm → While these things will not cure them, it can help buy them more time while you wait for paramedics to arrive.
- **Assess and constantly reassess vital signs** → Things change quickly and it is important to take note of any changes and take action when possible.
- **Do not give any food or drink** → It can cause choking or delays in medical care
- **Be ready to do CPR and use the AED** → If their vital organs are starved of oxygen for too long, the body ultimately will go into cardiac arrest, quick recognition, CPR and AED can improve their chances of survival drastically.


Fig. 1


Fig. 2


Fig. 3

## Positions to be used to Prevent Injury Aggravation and to Promote Recovery

**Fig. 1 - Position Found:** If you suspect a Head and/or Spinal injury, the casualty should be left in the position found in order to minimize pain and discomfort and to decrease the chance of further injury/impairment.

**Fig. 2 - Semi-Sitting:** This position is appropriate for a casualty who is having breathing difficulties who does not have a suspected Head and/or Spinal injury, or a suspected life-threatening injury.

**Fig. 3 - Recovery Position:** This is a life-saving position, utilized when a casualty is unconscious and breathing on his/her own. This position protects the casualty's airway by keeping it "open". If the casualty has blood in the airway or if there is a risk of vomiting, this position, due to gravity, will protect the casualty from aspiration (inhalation of foreign materials to the lungs.)

## Recovery Position Procedure

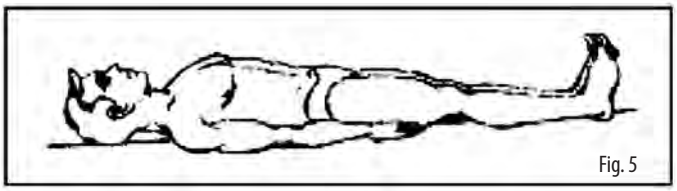
**1.** Place the casualty's arm, which is closest to you, above the casualty's head.

**2.** Place the casualty's other arm across his/her chest.

**3.** Bend the leg furthest away from you, placing it as close as possible to the casualty's buttock.

**4.** While supporting the casualty's head, pull the knee that is bent (from step 3) downward towards the ground.

**5.** Rest the casualty's head on the extended arm.


Fig. 5

## HAINES Position Procedure

The casualty is rolled onto his/her side (in a controlled fashion) while his/her arm is extended above his/her head. The head rests on this extended arm, keeping the casualty's head and body in a neutral alignment. Knees are now bent to stabilize the casualty in this position.

**Fig. 5 - Supine Position:** This position can be used to help casualties who are suspected of suffering from shock. The casualty lays on his/her back with their face up.

# Chapter 8
## Heart Attack & Stroke

## *Cardiovascular Emergencies*



### Cardiovascular Disease-101

Cardiovascular Disease/Heart Disease are catchall phrases used to describe diseases and injuries to the Cardiovascular System, which includes the heart, blood, and blood vessels. Cardiovascular Diseases include Heart Attack, Heart Failure, Coronary Heart Disease, High Blood Pressure and Strokes.



- Cardiovascular Disease is the number 1 killer of both men and women in the world.
- A person dies every seven minutes from heart disease or stroke in Canada.
- Cardiovascular Disease is responsible for more deaths in Canada than any other disease.
- There are an estimated 70,000 heart attacks per year in Canada. (Statistics provided by the Heart and Stroke Foundation of Canada)

**Risk Factors for Cardiovascular Disease**

| **Modifiable** | **Non-modifiable** |
|---|---|
| Stress | Gender |
| Smoking | Age |
| Alcohol/drug consumption | Genetics |
| High blood pressure | Medical history (e.g. Diabetes) |
| Diet | Race |
| Exercise | |
| Cholesterol | |

**Now Let's Take a Closer Look at How Cardiovascular Disease/Heart Disease Affects Our Blood Vessels**

Our blood vessels, which are located throughout our body, carry vital oxygen and nutrients to support our tissues and cells. There are two types of blood vessels; arteries, and veins. **Arteries** carry oxygenated blood (blood containing oxygen) and nutrients away from the heart, to the body's cells and tissues, and are strong, thick elastic blood vessels. **Veins**, which are thinner, less flexible, and which contain one way valves to prevent a backflow of blood, carry deoxygenated blood, carbon dioxide, and waste products from cellular metabolism back to the heart, lungs and liver for their removal. Over time, pressure builds up in our arteries, making them thicker and less elastic. This can lead to a decrease in blood flow to organs and tissues and is known as **Arteriosclerosis**. The more common term used to describe damage to the heart and blood vessels is **Atherosclerosis**. Atherosclerosis is a chronic inflammatory reaction occurring in response to a build up of plaque or fatty deposits in the walls of the arteries. Some of the major culprits leading to atherosclerosis and eventual heart disease are:

- Poor diets, including saturated and trans fats.
- Smoking
- Inactivity
- Being overweight



## First Aid Measures that are Priority for all Cardiovascular Emergencies

In general, there are **three** main First Aid measures which are priority for all Cardiovascular Emergencies. They are:

**1. Seek medical help immediately ("Time is muscle").**

- Myocardial infarction can lead to Sudden Cardiac Arrest.

**2. Place the casualty at rest**

- Decrease the workload of the heart, thereby decreasing the supply and demand.

**3. Provide CPR if necessary.**

- CPR at a ratio of 30 Compressions to 2 Ventilations.

## Why it is Important to Get Help Immediately

An individual who is unconscious, not breathing, who does not have the presence of a pulse or signs of circulation is deemed "clinically dead" or "vital signs absent" (VSA). Organs in the body, including the brain and heart, possess oxygen and nutrient reserves to keep the tissues alive for several minutes; however, this oxygen is finite. "Clinical death", zero to four minutes post-SCA, is a **reversible phase** if immediate CPR and defibrillation are rapidly initiated. In the absence of appropriate resuscitation techniques (both CPR and defibrillation) brain cells begin to die, generally between four to six minutes post SCA, and the casualty will spiral down a slippery slope incurring irreversible brain damage or "biological death", due to prolonged oxygen deprivation to the brain. Typical onset of biological death is between eight to 10 minutes post SCA. Biological death is an **irreversible phase**.



**Some Important Definitions**

**Clinical Death**: Breathing and heart beat cease

• **0-4** minutes after SCA

• This is a **reversible** phase if immediate CPR is initiated and a Defibrillator is applied to the casualty in less than 5 minutes.

- For a casualty in Sudden Cardiac Arrest (SCA), with every minute that passes, his/her chance of survival decreases by 10%.
- There is a 3%-5% chance of survival for an individual suffering an out-of-hospital SCA.
- If immediate and effective CPR is initiated for a SCA casualty and a Defibrillator is attached in less than 5 minutes, there is upwards of 76% chance of survival.

**Biological Death:** Irreversible brain damage due to prolonged oxygen deprivation to the brain. This typically occurs **8-10** minutes post SCA, if the casualty goes without supplemental oxygen.

- This is an **irreversible** phase.
- Without proper CPR the cells in the brain (neurons) will begin to die within **4-6 minutes.**



# *Types of Cardiovascular Disorders Explained*

**Hypertension /High Blood Pressure (HBP):** This can be defined as a consistent elevation of systolic or diastolic blood pressure over three different occasions from a person who has been at rest for at least 5 minutes. What does this really mean? Well, the force at which blood must be pumped by the heart through the arteries to eventually reach the rest of the body is increased. This increase causes a hardening, thickening and eventual inelasticity of the blood vessels→ Arteriosclerosis.



- The World Health Organization estimates that HBP causes one in every eight deaths worldwide.
- African Americans are at increased risk for HBP.
- Risk increases with age.

**Coronary Artery Disease (CAD):** These are diseases which directly affect the arteries that feed the heart muscle, known as the **coronary arteries**. CAD is the leading cause of heart attacks. In general, the blood flow travelling through these arteries becomes restricted as a result of atherosclerosis. The heart muscle does not receive appropriate amounts of blood and therefore, lacks adequate amounts of oxygen.



## The Causes of Angina/ Heart Attack (Myocardial Infarction)

**Angina:** Angina, otherwise known as **Angina Pectoris**, is a severe pain, originating from the heart, in response to a decrease in the amount of blood and therefore, oxygen it is receiving in response to an increased oxygen demand. For economic buffs, angina is a "supply and demand" issue. Here is how it would work. You want to walk up a flight of stairs carrying your laundry. The heart (heart muscle cells) is demanding more oxygen but the supply (in the form of oxygen rich blood), can't reach its customers in time. The heart gets angry and irritable, hence the pain.

Angina is typically caused by atherosclerosis, but there are other factors which can contribute to the phenomenon, such as exposure to cold, participation in sports, climbing stairs, and shoveling snow.



Rest and medication generally cause a cessation in pain and symptoms associated with angina. If symptoms persist longer than 10 minutes **after** rest and treatment with medication, then something more serious may be occurring→ **Myocardial Infarction**.

**Heart Attack (Myocardial Infarction):** A **Heart Attack**, otherwise referred to as a **Myocardial Infarction (MI)** is the death of heart muscle cells in response to prolonged oxygen deprivation. Any phenomenon that completely interrupts the flow of blood through the coronary arteries will cause a heart attack. Culprits such as blood clots and fatty deposits lining the artery walls are common causes. When the heart muscle becomes completely deprived of blood and oxygen, the heart begins to fail and therefore, blood is not adequately circulated to the rest of the body. An oxygen-deprived heart muscle becomes susceptible to life-threatening electrical conduction disturbances called **arrhythmias**; the most common being **Ventricular Fibrillation**. Heart attacks are very serious and potentially life-threatening conditions which can ultimately lead to Cardiac Arrest.





- Heart cells begin to die after approximately 20 minutes of oxygen deprivation.
- There is a medication, called a thrombolytic, which can be administered to an individual suffering from a MI, in a hospital setting. This medication can potentially reverse the effects and re-establish blood flow through the coronary arteries. **Call 9-1-1** immediately for EMS transport to hospital as soon as possible.

**Heart Failure:** Heart failure, also known as **Congestive Heart Failure**, is a condition in which the heart is unable to pump adequate amounts of blood to the organs and tissues. This condition can cause shortness of breath, swelling of ankles (fluid retention) and generalized fatigue.

**Stroke/Cerebral Vascular Accident (CVA):** The two classifications of strokes are Ischemic (Decreased blood flow as a result of a physical blockage in one of the brain's blood vessels) and Hemorrhagic (Hemorrhaging/bleeding from a ruptured blood vessel in the brain). A Stroke/CVA, is sometimes referred to as a **"brain attack"** and is a brain injury resulting from a disruption of blood flow through the brain. Regardless of the type of stroke (ischemic or hemorrhagic), reduction in blood flow and oxygen can lead to brain injury and death of brain cells causing permanent damage and disability. Individuals who are especially at risk are elderly who have high blood pressure, diabetics, individuals with high cholesterol and individuals who have heart disease.

## Signs and Symptoms of Angina and Myocardial Infarction



- Denial
- Pain ranging from a mild discomfort to crushing chest pain, fullness, pressure, ache, or constriction. Also described as a squeezing, tightness, or a heavy feeling/pressure in the chest.
- Pain is often felt in the centre of the chest behind the breast bone (sternum).
- Pain may spread to the shoulder, neck, jaw or arm.(Common in left arm but may also be felt in right arm)
- Upper Back Pain
- Toothache
- Anxiety
- Shortness of breath
- Cool, pale skin
- Nausea/vomiting
- Indigestion/Heart Burn
- Palpitations
- Weakness and fatigue
- **Angina is often classified as pain lasting less than 10 minutes, brought on by physical activity, not as intense and relieved by medication and rest.**
- Post menopausal women and female diabetics are at greater risk of suffering from a heart attack.
- The most common symptom of a heart attack in women is **chest pain.**
- Heart disease is the leading cause of death in women.
- 1/3 of women experience **no** chest pain when experiencing a heart attack and another 71% describe feeling flu-like symptoms anywhere from 2 weeks to a month prior to having more serious and common signs and symptoms. Other sings and symptoms females may experience are nausea/vomiting that won't stop, discomfort in the lower jaw, discomfort in the upper back, sudden onset of weakness that won't go away, physical inability

to perform usual household chores and a racing heart sensation with a rapid pulse.

- Often times, older adults do not experience chest pain accompanying an MI, rather, they experience atypical symptoms (not typical) such as fatigue, shortness of breath, tingling in the extremities, nausea/vomiting, weakness, fainting and confusion.
- 1 in 4 heart attack casualties present with no symptoms, or symptoms that are not generally deemed "heart attack" symptoms, and suffer what is called a "**Silent Heart Attack."**

## First Aid Treatment for Angina/Myocardial Infarction

- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1** immediately→"Time is muscle".
- A,B,C's.
- Have the casualty rest and discontinue his/her previous activity.
- Loosen tight clothing (e.g. belts, ties).
- Rest and reassure the casualty.
- Assist with medications (e.g Nitroglycerin-Fig. 1, Aspirin-Fig. 2)
- Monitor vital signs.
- Provide oxygen if you are trained.
- Provide a blanket.
- **DO NOT** provide anything to eat or drink.
- Treat for Shock.
- Provide Ongoing Casualty Care.



**Fig. 1 - Nitroglycerin: Nitroglycerin spray bottle.**

**Fig. 2 - Aspirin (ASA, Acetylsalicylic Acid):** Administer 2 x 81 mg baby aspirin/low dose aspirin or 1 x 325 mg tablet (non-enteric-coated) to a casualty suspected of suffering from Angina/MI.



Fig. 1




Fig. 2

**Administering Aspirin (2 x 81 mg or 1 x 325 mg)**

According to the Heart and Stroke Foundation, if a First Aider suspects a casualty is suffering from a heart attack/myocardial infarction, he/she can help administer 2 x 81 mg baby aspirin/low dose aspirin (acetylsalicylic acid) or 1 x 325 mg tablet (non-enteric-coated) to a conscious casualty.

**ASA** can be a very powerful medication in casualties who are suffering from a suspected heart attack. When you **call 9-1-1**, the dispatcher will ask you a set of questions which will aid you in the delivery of this important medication and let you know when it is appropriate to do so.

**Common Questions a 9-1-1 Dispatcher Will Ask a First Aider with Respect to Delivering ASA to a Casualty Suspected of Having a Heart Attack**

**1.** Is ASA available?

**2.** Does the casualty have an allergy to ASA or have they had a bad reaction to it in the past?

**3.** Has the casualty vomited blood or coffee ground-looking blood in the past 24 hours?

If everything checks out the 9-1-1 dispatcher will instruct you to give the appropriate dose of aspirin to the casualty.



Other pain medications such as tylenol (acetaminophen) and advil (ibuprofen) do not have the same heart-benefit effects as shown with aspirin. Do not substitute.



## The 5 Rights to be Observed When Assisting With Medications:

**1.** Right person.

**2.** Right medication (e.g. Aspirin).

**3.** Right dose (e.g. Two, 81mg baby Aspirin).

**4.** Right route (e.g. Aspirin is administered orally, via the mouth).

**5.** Right time (e.g. Signs and symptoms of an MI. Is this the appropriate time for this medication?).

# *Sudden Arrhythmia Death Syndrome*

## What is SADS?

**Sudden Arrhythmia Death Syndromes (SADS)** refers to a group of genetic conditions that interfere with the heart's electrical system. When the electrical signals are abnormal, the heart may beat too fast, too slow, or irregularly. In some cases, this can cause the heart to stop pumping effectively, leading to sudden cardiac arrest. These conditions often affect children, teenagers, and young adults who were previously thought to be healthy. In many cases, a person may not be aware of SADS as a diagnosis, sudden unexpected death or cardiac arrest of a young person without obvious cause may be the only clue. Awareness is important because early recognition, diagnosis, and family screening can prevent deaths.



## Warning Signs and Red Flags

People with SADS may have no symptoms, but certain signs should raise concern:

- Family history of sudden, unexplained death under age 40.
- Fainting or seizure-like episodes during exercise, excitement, or sudden fright.
- Unexplained chest pain, palpitations, or shortness of breath during activity.
- Near-fainting episodes or unexplained collapse.

In over half of SADS cases in children, teens, and young adults two warning signs were present: **1) family history** – sudden unexplained death or SADS diagnosis of a family member (most often a parent) or **2) fainting.**

These signs may be subtle but are important to recognize and follow up on.

## Why This Matters for First Aid and CPR

SADS can cause sudden cardiac arrest without warning. This reinforces the importance of taking any collapse seriously, even in young and healthy individuals. When someone stops breathing, immediate CPR and early defibrillation offer the best chance of survival.

As a first aid provider, being aware of SADS helps you consider that an underlying cardiac electrical issue may be present, especially in younger patients.

## Key Points to Remember:

- SADS involves electrical, not structural, problems with the heart.
- Many individuals with SADS appear healthy until a serious event occurs.
- Family history is often an important clue.
- Early recognition and proper follow-up can prevent sudden cardiac arrest.

Rapid CPR and AED use are critical in emergencies.

## Conclusion

SADS is uncommon but important for all first aid and CPR providers to understand. Being aware of the signs, the role of family history, and the potential for sudden cardiac arrest in young individuals helps improve response, ensures timely treatment, and supports prevention through screening.

**For more information please visit: sads.org**

# *Recognizing Stroke/TIA and Providing First Aid*

## Two Classifications of Strokes:

**1. Ischemic Stroke (decreased blood flow):** This is the most common cause of stroke and is a result of a prolonged blockage in arterial blood flow to a part of the brain. These blockages can be as a result of a **thrombus** (blood clot) or **embolus (**occurs when a blood clot travels to the brain from another part of the body and lodges itself in a blood vessel). Ischemic strokes are typically a result of atherosclerosis. Frequently, an individual will experience one or more **Transient Ischemic Attacks (TIA's)** before an ischemic stroke occurs.

**a) Transient Ischemic Attack:** A brief, reversible disruption in brain function as a result of decreased oxygen to an area of the brain. This can occur when a blood vessel in the brain spasms or when small blood clots temporarily block a blood vessel.



- TIA's typically do not last longer than 24 hours.
- A TIA can have the same signs and symptoms as a full blown stroke so it is imperative to always **call 9-1-1** if you suspect a casualty of having stroke-like signs and symptoms.
- TIA's are considered a warning sign of a full stroke. Casualties who have experienced a TIA have a 14% chance of suffering from another TIA or complete stroke within 1 year.

**2. Hemorrhagic Stroke:** This is the second most common type of stroke and occurs when a blood vessel in the brain ruptures. Culprits leading to a hemorrhagic stroke include high blood pressure, a burst/ruptured aneurysm (outpouching or ballooning of a weakened arterial wall), or an abnormal connection of blood vessels in the brain, termed an arteriovenous malformation.

# *Preventive Health Measures*

## Healthy Lifestyle Habits which can Help Reduce the Risk of Cardiovascular Disease and Stroke

There are ways one can prevent Cardiovascular Disease or slow down its progression. All in combination will make the future look and feel brighter. Preventative strategies include eating a high fiber, low fat diet, partaking in regular exercise, quitting smoking, decreasing stress in your life, getting sufficient rest, limiting alcohol consumption, controlling any prior medical conditions and making an effort to get a yearly physical.

## Signs And Symptoms Of Stroke / TIA With Their Respective First Aid Treatments



**5 Major Warning Signs of a Stroke According to the Heart and Stroke Foundation**

**1.** Weakness: Sudden loss of strength or sudden numbness in the face, arm or leg, even if temporary

**2.** Trouble Speaking: Sudden difficulty speaking or understanding or sudden confusion, even if temporary



**3.** Vision Problems: Vision trouble, even if temporary

**4.** Headache: Sudden severe and unusual headache

**5.** Dizziness: Sudden loss of balance, especially with any of the aforementioned signs.

The **F.A.S.T** acronym will help you recognize major signs and symptoms of a TIA/Stroke.

**F** **Face**- Facial droop/numbness/weakness. Generally only one side of the face is affected.

**A** **Arms**- Arm droop/weakness. Generally occurs on one side of the body and opposite from the side of the face experiencing the facial droop/paralysis.

**S** **Speech Impairment**- Slurred speech, difficulty speaking or understanding.

**T** **Time/Tongue-** Onset of signs and symptoms **(Time)**. A **thrombolytic** (Medications used to break apart and dissolve blood clots) can be administered in hospital, for casualties suffering from a stroke. **These medications may reverse the symptoms caused by the stroke. This medication must be administered within 6 hours from the onset of signs and symptoms. "TIME IS BRAIN"!**
**(Tongue)** Casualty may not be able to stick their tongue out straight.

**Other signs and symptoms include:**

- Paralysis
- Sudden severe headache.
- Nausea/vomiting.
- Aphasia (inability to speak), or garbled speech.
- Confusion
- Vision difficulties.
- Loss of coordination.
- Casualty may not be able to smile
- Casualty may have difficulty sticking their tongue out straight.
- Dizziness

**First Aid Treatment for TIA/Stroke**



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1** immediately→"Time is brain".
- A,B,C's.
- Reassure the casualty.
- Position of comfort (If tolerated, position the casualty with his/her paralyzed side flush with the ground in the Recovery Position).



- No Aspirin/ASA if the casualty complains of a headache.



- Aspirin will increase bleeding in the brain if the casualty is suffering from a hemorrhagic stroke.
- Nothing to eat or drink.
- Treat for Shock.
- Provide Ongoing Casualty Care.

**Table 2** Summary of High-Quality CPR Components for BLS Providers

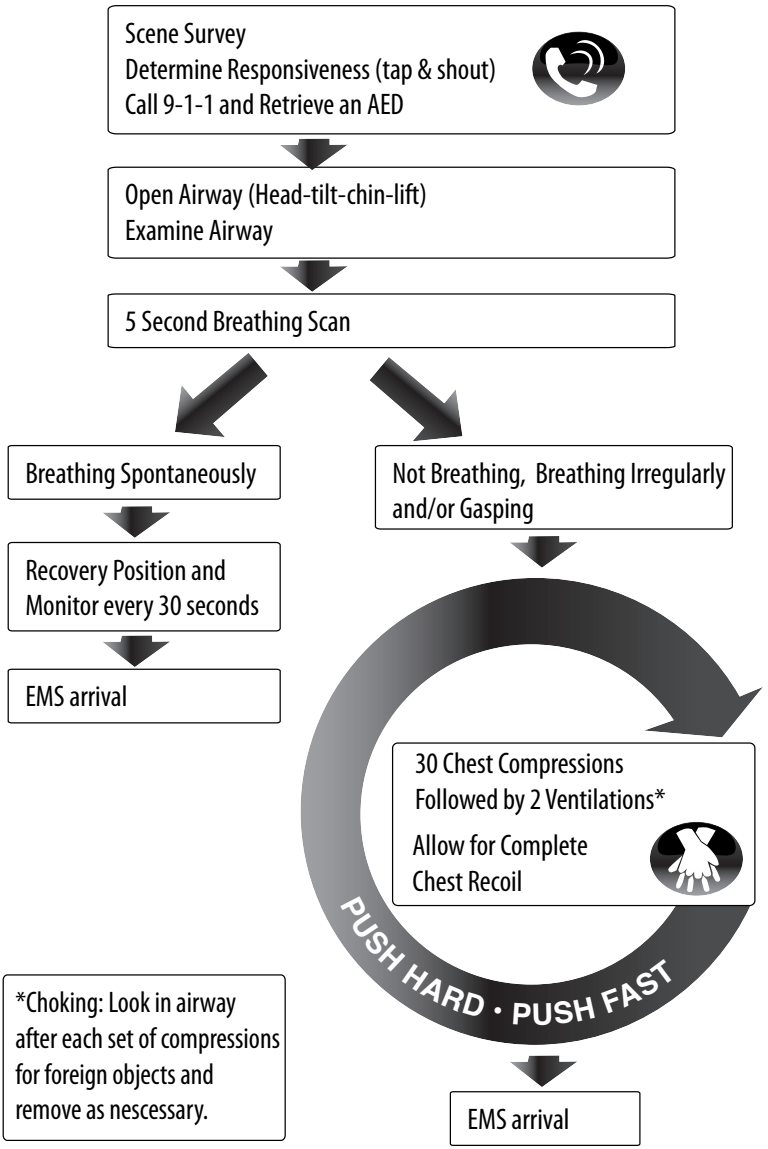
| Component | Adults and Adolescents | Children (Age 1 Year to Puberty) | Infants (Age Less Than 1 Year, Excluding Newborns) |
|---|---|---|---|
| **Scene safety** | Make sure the environment is safe for rescuers and victim | | |
| **Recognition of cardiac arrest** | Check for responsiveness<br>No breathing or only gasping (ie, no normal breathing)<br>No definite pulse felt within 10 seconds<br>(Breathing and pulse check can be performed simultaneously in less than 10 seconds) | | |
| **Activation of emergency response system** | If you are alone with no mobile phone, leave the victim to activate the emergency response system and get the AED before beginning CPR<br>Otherwise, send someone and begin CPR immediately; use the AED as soon as it is available | ***Witnessed collapse***<br>Follow steps for adults and adolescents on the left<br>***Unwitnessed collapse***<br>Give 2 minutes of CPR<br>Leave the victim to activate the emergency response system and get the AED<br>Return to the child or infant and resume CPR; use the AED as soon as it is available | |
| **Compression-ventilation ratio *without advanced airway*** | ***1 or 2 rescuers***<br>30:2 | ***1 rescuer***<br>30:2<br>***2 or more rescuers***<br>15:2 | |
| **Compression-ventilation ratio *with advanced airway*** | Continuous compressions at a rate of 100-120/min<br>Give 1 breath every 6 seconds (10 breaths/min) | | |
| **Compression rate** | 100-120/min | | |
| **Compression depth** | At least 2 inches (5 cm)* | At least one third AP diameter of chest<br>About 2 inches (5 cm) | At least one third AP diameter of chest<br>About 1½ inches (4 cm) |
| **Hand placement** | 2 hands on the lower half of the breastbone (sternum) | 2 hands or 1 hand (optional for very small child) on the lower half of the breastbone (sternum) | ***1 rescuer***<br>2 fingers in the center of the chest, just below the nipple line<br>***2 or more rescuers***<br>2 thumb–encircling hands in the center of the chest, just below the nipple line |
| **Chest recoil** | Allow full recoil of chest after each compression; do not lean on the chest after each compression | | |
| **Minimizing interruptions** | Limit interruptions in chest compressions to less than 10 seconds | | |

*Compression depth should be no more than 2.4 inches (6 cm).

Abbreviations: AED, automated external defibrillator; AP, anteroposterior; CPR, cardiopulmonary resuscitation.

# CPR Assessment Algorithm (Adult)

- Scene Survey
- Determine Responsiveness (tap & shout)
- Call 9-1-1 and Retrieve an AED
- Primary Survey A,B,C's



# Chapter 9

## CPR - Adult

**Cardiac Arrest: Cardiac Arrest/Sudden Cardiac Arrest (SCA)** is the sudden cessation of consciousness, breathing and circulation. The most common cause is an electrical disturbance (arrhythmia) in the heart's conduction pathway which causes the heart to start beating in a disorganized and irregular fashion. If left untreated, this will lead to sudden death. The most common arrhythmia leading to SCA is **Ventricular Fibrillation**. Another life-threatening arrhythmia is **Ventricular Tachycardia**. SCA is a medical emergency and can be reversed in many instances with the use of a **Defibrillator**, a device which provides an electric shock to the heart, in addition to immediate and efficient CPR.



- A heart attack is different from a Sudden Cardiac Arrest. Remember, a heart attack is when blood flow is completely blocked from reaching parts of the heart but the heart is still beating. In a Cardiac Arrest, the heart no longer beats.
- Common causes of a Cardiac Arrest are **Ischemic Heart Disease** (decreased blood flow to the heart muscle) which can lead to a heart attack, **low blood volume** (hypovolemia), lack of oxygen (hypoxia), **electrolyte imbalances** (generally low potassium levels), **low blood sugar** (hypoglycemia), **electrocution, drug overdose, hypothermia, trauma**…

### Common Causes of Cardiac Arrest

There are numerous causes of Cardiac Arrest. Most often, causes of Cardiac Arrest are due to heart disease which leads to a heart attack and subsequent Cardiac Arrest. There are often other types of heart conditions which can lead to Cardiac Arrest such as: structural heart abnormalities and irregular heart beats/rhythms (Ventricular Tachycardia and Ventricular Fibrillation). Non-cardiac conditions which lead to Cardiac Arrest are cancer, low blood volume (hypovolemia), lack of oxygen (hypoxia) for example: asphyxia and drowning, electrolyte imbalances (generally low potassium levels), low blood sugar (hypoglycemia), electrocution, drug overdose, hypothermia and trauma.

## Signs and Symptoms of Cardiac Arrest

An individual who has suffered a Sudden Cardiac Arrest will have **no** vital signs present, AKA, **Vital Signs Absent** (VSA). The casualty will be unconscious, not breathing and without a heart beat. Other signs which may lead you to suspect someone is in Cardiac Arrest would be cool, pale and moist skin.

If you come across an individual who is unconscious and not breathing then your immediate action should be to **call 9-1-1** and begin CPR.

# *One Rescuer CPR on an Adult Casualty*



## The Chain of Survival

The **Chain of Survival** provides a casualty in Sudden Cardiac Arrest (SCA), the greatest chance of survival if all 5 links in the chain are implemented in a timely fashion.

The first three steps are the most vital and will be accomplished by a competent and responsive First Aider. You are the ones who are saving lives by recognizing that a casualty is in a Sudden Cardiac Arrest state with the subsequent calling of 9-1-1, the administration of immediate and proper CPR and rapid defibrillation. Any break or delay in the Chain of Survival will make it that much harder to reverse the state of the casualty experiencing the Cardiac Arrest.

1. **Immediate Recognition and Activation of EMS:** This is the most important link. The earlier the recognition of a medical emergency with the subsequent calling of 9-1-1, the greater the chance of survival for a casualty in Sudden Cardiac Arrest (SCA). When in doubt, always **call 9-1-1**.

2. **Early CPR:** After you have assessed and deemed a casualty to be unconscious and not breathing, breathing irregularly or gasping, **chest compressions must be started immediately.** This will provide a casualty with the greatest chance of survival after suffering from a SCA, and will make his/her heart more receptive to receiving a shock from a Defibrillator.

- CPR can triple a casualty's chance of survival.
- CPR provides oxygen and nutrients to the heart muscle and brain. After 4-6 minutes of oxygen deprivation, brain cells begin to die and permanent brain damage may result.
- CPR alone will not save lives, however, when CPR is started immediately after a casualty has suffered a SCA, and a Defibrillator is applied in less than 5 minutes, a casualty has upwards of 76% chance of survival.
- When performing CPR, push hard, push fast and allow for the chest to fully recoil.

3. **Rapid Defibrillation:** SCA's are most often the result of irregular heart rhythms caused by disorganized and irregular electrical activity within the heart itself. This irregularity can cause the heart to stop beating, resulting in Cardiac Arrest. A Defibrillator, often referred to as an Automated External Defibrillator (AED), delivers electrical energy to the heart muscle often times reversing this electrical chaos and restarting the heart. The sooner the AED is attached to a casualty in SCA, the greater the chance of survival.

4. **Effective Advanced Life Support (ALS):** Paramedics who have advanced skills delivering advanced airway support and administration of advanced cardiac medications.

**5. Integrated Post-Cardiac Arrest Care:**

Sudden Cardiac Arrest is the leading cause of death in both Canada and the United States with approximately 35,000-45,000 Canadians succumbing to it annually. SCA does not discriminate against age, gender, race or physical fitness level. More people die from SCA each year than from breast cancer, prostate cancer, colorectal cancer, traffic accidents, gun-related deaths and AIDS combined

CPR circulates vital blood and oxygen to both the brain and heart itself, slowing down the progression of brain damage/brain death and increasing the amount of time the heart is viable for an Automated External Defibrillator (AED) to shock it back to life.

**In 2015, new guidelines for CPR came into effect whereby there was a change in the Basic Life Support (BLS) sequence from Airway, Breathing, Circulation/Compressions (A,B,C) to Compressions, Airway, Breathing (C,A,B).** In the A,B,C sequence, chest compressions were being delayed while the First-Aider was opening the airway, look, listening and feeling for breaths, delivering mouth-to-mouth ventilations or retrieving and assembling a barrier device. This delay in chest compressions was proving detrimental to casualties

in Sudden Cardiac Arrest and decreasing chance of survival. By changing the sequence, chest compressions can be delivered sooner and the delay in ventilations should be minimal (time required to deliver 30 compressions, approximately 18 seconds).



**Once a First Aider determines a casualty is unresponsive /unconscious, and not breathing, breathing irregularly, or gasping, one should immediately begin chest compressions followed by rescue breaths at a ratio of 30 compressions to 2 ventilations.**







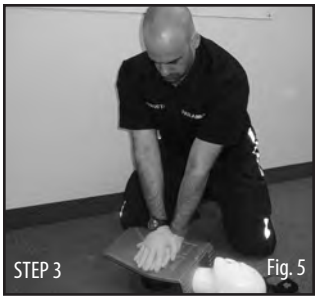






**Fig. 3-6**
**Primary Survey Sequence**

**STEP 1:**
**Open Airway**

**STEP 2:**
**Breathing Scan**

**STEP 3:**
**Chest Compressions**

**STEP 4:**
**Ventilations**

## One-Rescuer CPR for an Adult Casualty

### AIRWAY: (Refer to Fig. 3)

This is the most important of the three priorities. If a casualty does not have an open airway, death is inevitable. Air we breathe enters through both the mouth and nose. In order to breathe, we must have an open/unobstructed airway. In an unconscious/unresponsive casualty the most common cause of an obstruction of the airway is the tongue. An unconscious/unresponsive casualty cannot protect the airway. It is in these situations where a First Aider must react immediately. There are two methods for opening up a casualty's airway and they are:

1. **Head-tilt-chin lift** (No suspected Head and/or Spinal injury). **(Refer to Fig. 3)**
2. **Jaw-thrust without head-tilt** (Suspected Head and/or Spinal injury. [Health Care Providers Only] **(Refer to Fig. 8 & 9)**

**Fig. 3 - Head-Tilt-Chin Lift:** Place one hand on the casualty's forehead and the other hand under his/her chin and tilt the head back. Be careful not to hyperextend the neck.

## BREATHING:

An average adult breathes between 12-20 times per minute. Anything less than 12 or greater than 24 is considered a sign of respiratory distress, if other signs and symptoms are present. Breathing can only be assessed after the airway has been opened. In order to **"assess"** for breathing, the First Aider must initiate and maintain either the Head-tilt-chin lift or Jaw-thrust without head-tilt (Healthcare Providers Only) to prevent the tongue from falling back overtop of the airway thus preventing breathing. **Breathing is to be checked over a 5 second period.** Check to see if the casualty is in fact breathing, and whether it is effective or ineffective.

Often in situations of Sudden Cardiac Arrest a casualty will seem to have an odd breathing pattern referred to as **agonal respirations** ("gasping-like"). This type of breathing pattern is characterized by shallow, irregular respirations, generally 3-4 respirations/minute and with irregular pauses between the respirations. This type of "irregular" breathing pattern is **not** sufficient to sustain life and **chest compressions must be initiated immediately. In addition some casualties may present with a period of short seizure-like activity with abnormal or lack of breathing. Begin chest compressions immediately.**

**Fig. 4 - Breathing Assessment ( 5 seconds max.):** While maintaining a Head-tilt-chin lift, assess as to whether or not breathing is present or absent or if there is abnormal breathing/gasping.

**A) Unconscious/unresponsive casualty who is spontaneously breathing→** Place the casualty in the Recovery Position and monitor A,B,C's every 30 Seconds **(Refer to Fig. 7).**


Fig.7

**Fig. 7 - Recovery Position:** This is a life-saving position, utilized when a casualty is unconscious and breathing on his/her own.

**B) Unconscious/unresponsive casualty who is not spontaneously breathing, breathing irregularly or gasping → Begin Chest Compressions (Refer to Fig. 5).**

- Scientific evidence has clearly demonstrated the sooner chest compressions are initiated, the greater the chance of survival in a casualty in Sudden Cardiac Arrest.

## CIRCULATION: (Refer to Fig. 5)

In order to have a pulse, one needs a pumping heart, adequate blood volume and a closed circulatory system. CPR guidelines **DO NOT** have First Aiders check pulses! Circulation can however be assessed by checking the casualty's skin temperature, skin colour and looking for the presence of sweating. **If a casualty is Unconscious, Not Breathing, Breathing Irregularily or Gasping, Begin Chest Compressions at a rate of 30 Compressions: 2 Ventilations.**

**Fig. 5 - Chest Compressions:** Look for signs of circulation. Place heel of hand in centre of sternum and interlock hands, keeping elbows locked and arms rigid. Begin compressions.

- Individuals who have poor circulation may have bluish colour around the lips (cyanosis), in addition to cool, pale and moist skin.
- Circulation can be assessed by checking the casualty's skin temperature, skin colour and looking for the presence of sweating.
- Only major/deadly bleeds will require the application of dressings and bandages prior to CPR; minor bleeds do not require attention.

**CHECKING FOR BLOOD: Prior to performing Chest Compressions, a First Aider must perform a quick visual check for blood; looking for blood-soaked clothing, blood pooling etc… If deadly bleeding is present, address this immediately (application of dressings and bandages) prior to initiating CPR.**

**The Chest Compression Technique and Other Pointers**

1. Landmark using the "Armpit" method. Locate the casualty's armpit with your hand. Move your hand across the casualty's chest until the heel of your hand is in the centre (sternum) of his/her chest.
2. With arms out in front of you, interlock your fingers, keeping your elbows locked and rigid, and place one hand's heel directly over the casualty's sternum (breastbone). You should be positioned on the lower half of the casualty's breast bone.
3. Harness the energy from your shoulders and upper body and push straight down with each chest compression. Make sure your arms do not bounce off the casualty's chest after each compression and allow for the chest to fully recoil.

4. You may feel and hear cracking and popping sounds. This is completely normal and you should continue with chest compressions. **DO NOT STOP!**
5. The first few chest compressions (initial 2 minutes) are vitally important as they prime the heart, providing it with blood, oxygen and nutrients increasing the likelihood of a successful Defibrillation shock from a Defibrillator. **Avoid interruptions in chest compressions!**
6. Limit interruptions in CPR when the Defibrillator (AED) arrives and when switching chest compressors.
7. Compress the adult's chest at least 5 cm (2 inches) deep.
8. Perform 30 chest compressions: 2 ventilations administering **at least 100-120** chest compressions/minute. This equates to roughly 30 chest compressions in 18-23 seconds, depending on whether you are administering 1 or 2 rescuer CPR.
9. Perform 5 cycles of 30:2 in two minutes.
10. It is imperative to switch "chest compressors" at a maximum of every 2 minutes. Studies reveal that the effectiveness of chest compressions greatly declines when a single compressor extends beyond the 2 minute mark.
11. Recruit as many bystanders as possible to help with chest compressions.



**REMEMBER: WHEN PERFORMING CPR PUSH HARD, PUSH FAST, AND ALLOW FOR THE CHEST TO FULLY RECOIL.**

Recoil of the chest after each chest compression allows the coronary arteries (arteries which deliver oxygen and nutrients to the heart muscle itself) to receive vital blood, oxygen and nutrients, thereby priming the heart and increasing the likelihood of a successful Defibrillation shock from a Defibrillator (AED)



**NOTES:**

- **If you find an unconscious casualty lying face down, check for breathing prior to moving the casualty.**
- **If you see a deadly bleed, dress and bandage it prior to administering chest compressions, in order to keep the blood inside the body and prevent it from being forced out after each compression.**

- **For a pregnant Sudden Cardiac Arrest casualty who is in the latter stages of pregnancy, it is advised to put a pillow or rolled up blanket underneath her right hip (approximately 2 inches in height), tilting her body to the left. The fetus can physically prevent blood from returning to the casualty's heart when lying on her back.**

**VENTILATIONS:** Once 30 compressions have been administered, deliver 2 ventilations and continually repeat (30:2).

Use a barrier device, make a proper face-mask seal over the casualty's mouth and nose and deliver two breaths/ventilations.

**Fig. 6 - Delivering Ventilations**

- If no barrier device is available, pinch the nose, put your mouth over the casualty's mouth, making a seal, and deliver two breaths.
- **Each breath should last a maximum of 1 second in duration while producing visible chest rise and fall.**

- Never force air into a casualty.
- Breaths/Ventilations should be no longer than 1 second in duration and discontinued once you see noticeable chest rise and fall (In this situation, there will be no chest rise and fall but the cheeks may puff out due to the obstruction preventing air from entering the lungs).

**Mouth-to-Nose Ventilations:** Certain injuries or situations will not allow you to make a proper mouth-to-mouth seal, so another option to provide ventilations is to use mouth-to-nose ventilations. Close the casualty's mouth, maintain a head-tilt-chin lift and make a seal around their nose. Deliver ventilations as mentioned above.

**Mouth-to-Stoma Ventilations:** Certain individuals, for varying reasons, have had a portion of their windpipe or larynx removed. In order to breathe effectively a hole is constructed in the front of their neck called a **stoma**. In this situation, air travels directly from the neck into the lungs and not via the mouth and nose. Air must be delivered directly into the stoma to deliver ventilations to these individuals.

- Assess for breathing directly over the stoma.
- Remove your mouth from atop the stoma between breaths to allow for air to escape.

**Jaw-Thrust Without Head-Tilt**

Throughout this manual, you will notice mention of the Jaw-thrust without head-tilt for suspected Head and/or Spinal injuries. This is only a Health Care Providers skill and is referenced in this manual specifically for the Health Care Providers course. Lay Rescuers/First Aiders will leave the casualty in the position found and secure both the head and neck for a casualty with a suspected Head and/or Spinal injury.

## When to use the Jaw-Thrust without Head-Tilt to Open a Casualty's Airway

The **Jaw-thrust without Head-Tilt (Fig. 8, Fig. 9)** is the most appropriate technique to employ in order to open a casualty's airway who you suspect has suffered a potential Head and/or Spinal injury. In this technique, the casualty must be laying on his/her back (supine) as the rescuer positions his/her hands in a manner to both stabilize the head and move the jaw (mandible) up and out in order to open the airway without tilting the head. This technique is only to be used by Healthcare Providers.


Fig. 8


Fig. 9

**Fig. 8, 9 - Jaw-thrust without Head Tilt**

Below are frequently asked questions students have asked on the topic of CPR. Following each question is the respective answer.

### What percentage of Cardiac Arrest casualties survive?

**A:** 75%-80% of all Cardiac Arrests occur at home with a survival rate of 3%-5%.

- For a casualty in Sudden Cardiac Arrest (SCA), with every minute that passes, his/her chance of survival decreases by 10%.



- Approximately 95% of Cardiac Arrest casualties die before making it to the hospital.
- On average, only 27.4% of Sudden Cardiac Arrest casualties receive bystander CPR.

**Does CPR save lives?**

**A:** CPR on its own does not save lives; however, it can triple a casualty's chance of survival.



- Immediate CPR in combination with Defibrillation (If a Defibrillator is applied to a SCA casualty's chest in less than 5 minutes) can increase a casualty's chance of survival up to 76%.

**If we breathe in oxygen and breathe out carbon dioxide, then what is the purpose of rescue breaths?**

**A:** Atmospheric air we breathe contains 21% oxygen. We utilize 5% and exhale the difference which is 16%. When administering Rescue Breaths the casualty therefore receives 16% oxygen.

**Will I break ribs when performing CPR?**

**A:** When performing proper CPR techniques it is quite common to break ribs, fracture the sternum and/or separate cartilage from bone. **Even if this occurs, keep pumping.** This is not as common in children and infants as their bones have not fully calcified. Remember, you are not making the casualty worse by breaking ribs. Not to be morbid, but you cannot be worse off than dead.

**Will I injure or hurt the casualty if I perform CPR?**

**A:** The casualty will not feel you doing chest compressions if they are unconscious and not breathing. They are deemed Vital Signs Absent and need all the help they can get.

**When do I stop administering CPR?**

**A:** You can discontinue CPR when:

**1.** You feel ill or get too exhausted to continue.

**2.** The casualty starts to cough or spontaneously breathe on his/her own.

**3.** The casualty gets up and yells at you to stop pumping on his/her chest.

**4.** The environment becomes too dangerous to continue.

**5.** EMS or other trained personnel arrive. (Only stop CPR when EMS directs you to).

**Do we assess for a Carotid Pulse before performing CPR?**

**A:** No, pulse checks have been taken out of the CPR algorithm. If the casualty is unconscious and not breathing or breathing irregularly, gasping, begin chest compressions.

**What if I don't feel comfortable doing rescue breaths, is there another way I can help?**

**A:** It is acceptable, according to the Heart and Stroke Foundation, to perform **Hands-Only (Compression only) CPR, Without Rescue breaths.**

**Can I administer CPR on a couch or bed?**

**A:** CPR should ideally be administered on a hard, flat surface. If you have a casualty that you simply cannot move and he/she is not on a hard flat surface, start CPR and move him/her when help arrives.

**What do I do if I need to call 9-1-1 and the phone is in the other room, or I am home alone?**

**A:** If you need to **call 9-1-1** and the phone is in the other room, or you are alone with an adult casualty, place him/her in the Recovery Position and go make the call. Upon return, roll him/her onto his/her back and assess A,B,C's. For a child or infant who is found unconscious and not breathing, according to the Heart and Stoke Foundation, perform two full minutes of CPR, then **call 9-1-1**. Note: for children and infants, if there is a bystander, have him/her immediately **call 9-1-1**. **DO NOT** wait for two minutes prior to calling 9-1-1. Have him/her call while you start CPR!



**If you do not feel comfortable getting involved in an emergency situation, REMEMBER, you can always help by calling 9-1-1**

**Why is depth of compression so important?**

**A.** Compression depth has an impact on blood flow. Deeper compressions result in better blood flow to the heart and brain.

**Table 2** Summary of High-Quality CPR Components for BLS Providers

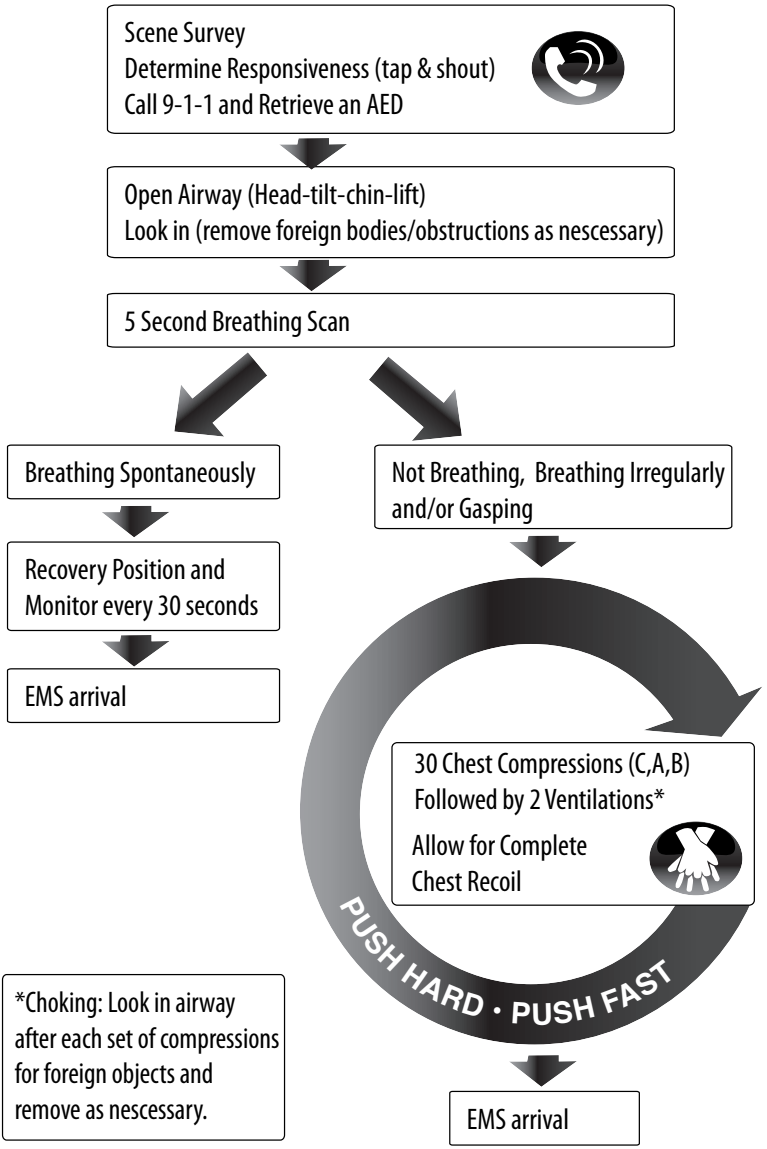
| Component | Adults and Adolescents | Children (Age 1 Year to Puberty) | Infants (Age Less Than 1 Year, Excluding Newborns) |
|---|---|---|---|
| **Scene safety** | Make sure the environment is safe for rescuers and victim | | |
| **Recognition of cardiac arrest** | Check for responsiveness<br>No breathing or only gasping (ie, no normal breathing)<br>No definite pulse felt within 10 seconds<br>(Breathing and pulse check can be performed simultaneously in less than 10 seconds) | | |
| **Activation of emergency response system** | If you are alone with no mobile phone, leave the victim to activate the emergency response system and get the AED before beginning CPR<br>Otherwise, send someone and begin CPR immediately; use the AED as soon as it is available | ***Witnessed collapse***<br>Follow steps for adults and adolescents on the left<br>***Unwitnessed collapse***<br>Give 2 minutes of CPR<br>Leave the victim to activate the emergency response system and get the AED<br>Return to the child or infant and resume CPR; use the AED as soon as it is available | |
| **Compression-ventilation ratio *without advanced airway*** | ***1 or 2 rescuers***<br>30:2 | ***1 rescuer***<br>30:2<br>***2 or more rescuers***<br>15:2 | |
| **Compression-ventilation ratio *with advanced airway*** | Continuous compressions at a rate of 100-120/min<br>Give 1 breath every 6 seconds (10 breaths/min) | | |
| **Compression rate** | 100-120/min | | |
| **Compression depth** | At least 2 inches (5 cm)* | At least one third AP diameter of chest<br>About 2 inches (5 cm) | At least one third AP diameter of chest<br>About 1½ inches (4 cm) |
| **Hand placement** | 2 hands on the lower half of the breastbone (sternum) | 2 hands or 1 hand (optional for very small child) on the lower half of the breastbone (sternum) | ***1 rescuer***<br>2 fingers in the center of the chest, just below the nipple line<br>***2 or more rescuers***<br>2 thumb–encircling hands in the center of the chest, just below the nipple line |
| **Chest recoil** | Allow full recoil of chest after each compression; do not lean on the chest after each compression | | |
| **Minimizing interruptions** | Limit interruptions in chest compressions to less than 10 seconds | | |

*Compression depth should be no more than 2.4 inches (6 cm).

Abbreviations: AED, automated external defibrillator; AP, anteroposterior; CPR, cardiopulmonary resuscitation.

# CPR Assessment Algorithm (Child)

- Scene Survey
- Determine Responsiveness (tap & shout)
- Call 9-1-1 and Retrieve an AED
- Primary Survey A,B,C's



# Chapter 10
## CPR - Child

Cardiac Arrests in children and infants are rare but when they do occur, they are usually as a result of respiratory/breathing complications. Common causes of child and infant Cardiac Arrests are foreign body obstructions and other breathing related issues. Children generally experience respiratory distress or respiratory failure which can lead to complete respiratory and circulatory failure and eventual collapse. Respiratory Arrest (cessation of breathing) is far more common in children than is Cardiac Arrest. Respiratory Arrest in children will lead to eventual Cardiac Arrest. If respiratory distress or arrest is detected early, while the child still has a heart beat, in addition to prompt and appropriate First Aid and medical interventions, the survival rate is 60%-70%. Prompt recognition and treatment via bystander CPR along with necessary medical interventions is vital for survival.

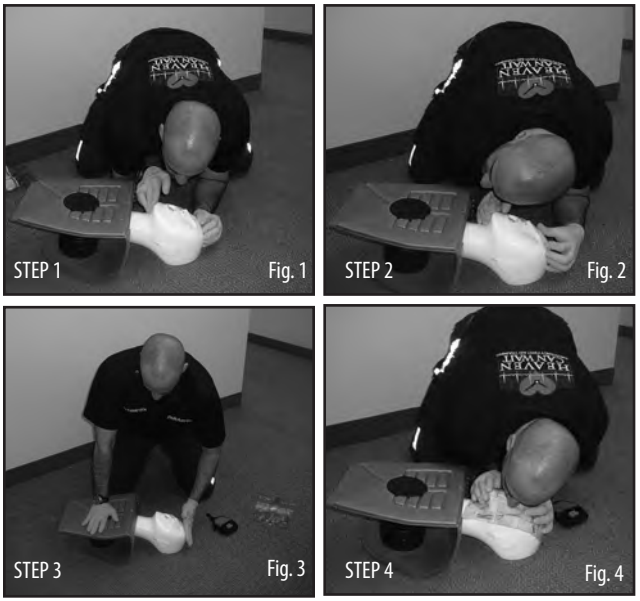



**Fig. 1-4**
**Primary Survey Sequence**

**STEP 1:**
**Open Airway**

**STEP 2:**
**Breathing Scan**

**STEP 3:**
**Chest Compressions**

**STEP 4:**
**Ventilations**

## AIRWAY: (Refer to Fig. 1)

This is the most important of the three priorities. If a casualty does not have an open airway, death is inevitable. Air we breathe enters through both the mouth and nose. In order to breathe, we must have an open/unobstructed airway. In an unconscious/unresponsive casualty the most common cause of an obstruction of the airway is the tongue. An unconscious/unresponsive casualty cannot protect the airway. It is in these situations where a First Aider must react immediately. There are two methods for opening up a casualty's airway and they are:

1. **Head-tilt-chin lift** (No suspected Head and/or Spinal injury). **(Refer to Fig. 1)**
2. **Jaw-thrust without head-tilt** (Suspected Head and/or Spinal injury. [Health Care Providers Only] **(Refer to Chapter 12.)**

**Fig. 1 - Head-Tilt-Chin Lift:** Place one hand on the casualty's forehead and the other hand under his/her chin and tilt the head back. Be careful not to hyperextend the neck.

## BREATHING:

An average adult breathes between 12-20 times per minute. Anything less than 12 or greater than 24 is considered a sign of respiratory distress, if other signs and symptoms are present. Breathing can only be assessed after the airway has been opened. In order to **"assess"** for breathing, the First Aider must initiate and maintain either the Head-tilt-chin lift or Jaw-thrust without head-tilt (Healthcare Providers Only) to prevent the tongue from falling back overtop of the airway thus preventing breathing. **Breathing is to be checked over a 5 second period.** Check to see if the casualty is in fact breathing, and whether it is effective or ineffective.



Often in situations of Sudden Cardiac Arrest a casualty will seem to have an odd breathing pattern referred to as **agonal respirations** ("gasping-like"). This type of breathing pattern is characterized by shallow, irregular respirations, generally 3-4 respirations/minute and with irregular pauses between the respirations. This type of "irregular" breathing pattern is **not** sufficient to sustain life and **chest compressions must be initiated immediately. In addition some casualties may present with a period of short seizure-like activity with abnormal or lack of breathing. Begin chest compressions immediately.**

**Fig. 2 - Breathing Assessment ( 5 seconds max.):** While maintaining a Head-tilt-chin lift, assess as to whether or not breathing is present or absent or if there is abnormal breathing/gasping.

**A) Unconscious/unresponsive casualty who is spontaneously breathing→** Place the casualty in the Recovery Position and monitor A,B,C's every 30 Seconds **(Refer to Fig. 5).**


Fig.5

**Fig. 5 - Recovery Position:** This is a life-saving position, utilized when a casualty is unconscious and breathing on his/her own.

**B) Unconscious/unresponsive casualty who is not spontaneously breathing, breathing irregularly or gasping → Begin Chest Compressions (Refer to Fig. 3).**

- Scientific evidence has clearly demonstrated the sooner chest compressions are initiated, the greater the chance of survival in a casualty in Sudden Cardiac Arrest.

## CIRCULATION: (Refer to Fig. 3)

In order to have a pulse, one needs a pumping heart, adequate blood volume and a closed circulatory system. CPR guidelines **DO NOT** have First Aiders check pulses! Circulation can however be assessed by checking the casualty's skin temperature, skin colour and looking for the presence of sweating. **If a casualty is Unconscious, Not Breathing, Breathing Irregularily or Gasping, Begin Chest Compressions at a rate of 30 Compressions: 2 Ventilations.**

**Fig. 3 - Chest Compressions:** Look for signs of circulation. Place heel of hand in centre of sternum and interlock hands, keeping elbows locked and arms rigid. Begin compressions.

- Individuals who have poor circulation may have bluish colour around the lips (cyanosis), in addition to cool, pale and moist skin.
- Circulation can be assessed by checking the casualty's skin temperature, skin colour and looking for the presence of sweating.
- Only major/deadly bleeds will require the application of dressings and bandages prior to CPR; minor bleeds do not require attention.

**CHECKING FOR BLOOD: Prior to performing Chest Compressions, a First Aider must perform a quick visual check for blood; looking for blood-soaked clothing, blood pooling etc… If deadly bleeding is present, address this immediately (application of dressings and bandages) prior to initiating CPR.**

**The Chest Compression Technique and Other Pointers**

**1.** Landmark using the "Armpit" method. Locate the casualty's armpit with your hand. Move your hand across the casualty's chest until the heel of your hand is in the centre (sternum) of his/her chest.

**2.** With arms out in front of you, interlock your fingers, keeping your elbows locked and rigid, and place one hand's heel directly over the casualty's sternum (breastbone). You should be positioned on the lower half of the casualty's breast bone. (You may use 1 or 2 hands for a child casualty.)

**3.** Harness the energy from your shoulders and upper body and push straight down with each chest compression. Make sure your arms do not bounce off the casualty's chest after each compression and allow for the chest to fully recoil.

**4.** You may feel and hear cracking and popping sounds. This is completely normal and you should continue with chest compressions. **DO NOT STOP!**

**5.** The first few chest compressions (initial 2 minutes) are vitally important as they prime the heart, providing it with blood, oxygen and nutrients increasing the likelihood of a successful Defibrillation shock from a Defibrillator. **Avoid interruptions in chest compressions!**

**6.** Limit interruptions in CPR when the Defibrillator (AED) arrives and when switching chest compressors.

**7.** Compress the child's chest about 2 inches deep.

**8.** Perform 30 chest compressions: 2 ventilations administering **at least 100-120** chest compressions/minute. This equates to roughly 30 chest compressions in 18-23 seconds, depending on whether you are administering 1 or 2 rescuer CPR.

**9.** Perform 5 cycles of 30:2 in two minutes.

**10.** It is imperative to switch "chest compressors" at a maximum of every 2 minutes. Studies reveal that the effectiveness of chest compressions greatly declines when a single compressor extends beyond the 2 minute mark.

**11.** Recruit as many bystanders as possible to help with chest compressions.



**REMEMBER: WHEN PERFORMING CPR PUSH HARD, PUSH FAST, AND ALLOW FOR THE CHEST TO FULLY RECOIL.**

Recoil of the chest after each chest compression allows the coronary arteries (arteries which deliver oxygen and nutrients to the heart muscle itself) to receive vital blood, oxygen and nutrients, thereby priming the heart and increasing the likelihood of a successful Defibrillation shock from a Defibrillator (AED)

**NOTES:**



- **If you find an unconscious casualty lying face down, check for breathing prior to moving the casualty.**
- **If you see a deadly bleed, dress and bandage it prior to administering chest compressions, in order to keep the blood inside the body and prevent it from being forced out after each compression.**
- **For a pregnant Sudden Cardiac Arrest casualty who is in the latter stages of pregnancy, it is advised to put a pillow or rolled up blanket underneath her right hip (approximately 2 inches in height), tilting her body to the left. The fetus can physically prevent blood from returning to the casualty's heart when lying on her back.**

**VENTILATIONS:** Once 30 compressions have been administered, deliver 2 ventilations and continually repeat (30:2).



Use a barrier device, make a proper face-mask seal over the casualty's mouth and nose and deliver two breaths/ventilations.

**Fig. 4 - Delivering Ventilations**

- If no barrier device is available, pinch the nose, put your mouth over the casualty's mouth, making a seal, and deliver two breaths.

- **Each breath should last a maximum of 1 second in duration while producing visible chest rise and fall.**



- Never force air into a casualty.
- Breaths/Ventilations should be no longer than 1 second in duration and discontinued once you see noticeable chest rise and fall (In this situation, there will be no chest rise and fall but the cheeks may puff out due to the obstruction preventing air from entering the lungs).

**Mouth-to-Nose Ventilations:** Certain injuries or situations will not allow you to make a proper mouth-to-mouth seal, so another option to provide ventilations is to use mouth-to-nose ventilations. Close the casualty's mouth, maintain a head-tilt-chin lift and make a seal around their nose. Deliver ventilations as mentioned above.

**Mouth-to-Stoma Ventilations:** Certain individuals, for varying reasons, have had a portion of their windpipe or larynx removed. In order to breathe effectively a hole is constructed in the front of their neck called a **stoma**. In this situation, air travels directly from the neck into the lungs and not via the mouth and nose. Air must be delivered directly into the stoma to deliver ventilations to these individuals.



- Assess for breathing directly over the stoma.
- Remove your mouth from atop the stoma between breaths to allow for air to escape.
- Refer to CPR Table and CPR Algorithm for CPR specifics.
- One or two hands may be used for compressions, depending on the size of the child and/or the capabilities of the first aider to provide proper and effective first aid compressions.

**Table 2** Summary of High-Quality CPR Components for BLS Providers

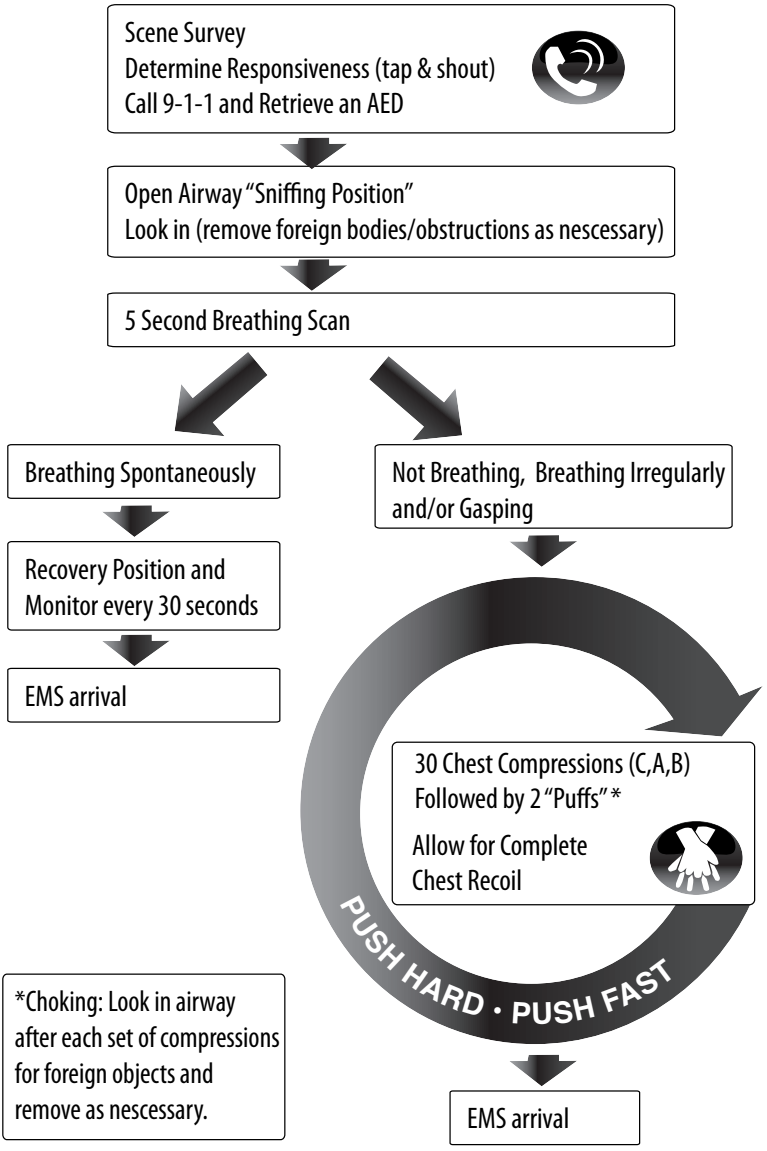
| Component | Adults and Adolescents | Children (Age 1 Year to Puberty) | Infants (Age Less Than 1 Year, Excluding Newborns) |
|---|---|---|---|
| **Scene safety** | Make sure the environment is safe for rescuers and victim | | |
| **Recognition of cardiac arrest** | Check for responsiveness<br>No breathing or only gasping (ie, no normal breathing)<br>No definite pulse felt within 10 seconds<br>(Breathing and pulse check can be performed simultaneously in less than 10 seconds) | | |
| **Activation of emergency response system** | If you are alone with no mobile phone, leave the victim to activate the emergency response system and get the AED before beginning CPR<br>Otherwise, send someone and begin CPR immediately; use the AED as soon as it is available | ***Witnessed collapse***<br>Follow steps for adults and adolescents on the left<br>***Unwitnessed collapse***<br>Give 2 minutes of CPR<br>Leave the victim to activate the emergency response system and get the AED<br>Return to the child or infant and resume CPR; use the AED as soon as it is available | |
| **Compression-ventilation ratio *without advanced airway*** | ***1 or 2 rescuers***<br>30:2 | ***1 rescuer***<br>30:2<br>***2 or more rescuers***<br>15:2 | |
| **Compression-ventilation ratio *with advanced airway*** | Continuous compressions at a rate of 100-120/min<br>Give 1 breath every 6 seconds (10 breaths/min) | | |
| **Compression rate** | 100-120/min | | |
| **Compression depth** | At least 2 inches (5 cm)* | At least one third AP diameter of chest<br>About 2 inches (5 cm) | At least one third AP diameter of chest<br>About 1½ inches (4 cm) |
| **Hand placement** | 2 hands on the lower half of the breastbone (sternum) | 2 hands or 1 hand (optional for very small child) on the lower half of the breastbone (sternum) | ***1 rescuer***<br>2 fingers in the center of the chest, just below the nipple line<br>***2 or more rescuers***<br>2 thumb–encircling hands in the center of the chest, just below the nipple line |
| **Chest recoil** | Allow full recoil of chest after each compression; do not lean on the chest after each compression | | |
| **Minimizing interruptions** | Limit interruptions in chest compressions to less than 10 seconds | | |

*Compression depth should be no more than 2.4 inches (6 cm).

Abbreviations: AED, automated external defibrillator; AP, anteroposterior; CPR, cardiopulmonary resuscitation.

# CPR Assessment Algorithm (Infant)

- Scene Survey
- Determine Responsiveness (tap & shout)
- Call 9-1-1 and Retrieve an AED
- Primary Survey A,B,C's








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# Chapter 11
## CPR - Infant

Cardiac Arrests in children and infants are rare but when they do occur, they are usually as a result of respiratory/breathing complications. Common causes of child and infant Cardiac Arrests are foreign body obstructions and other breathing related issues. Children generally experience respiratory distress or respiratory failure which can lead to complete respiratory and circulatory failure and eventual collapse. Respiratory Arrest (cessation of breathing) is far more common in children than is Cardiac Arrest. Respiratory Arrest in children will lead to eventual Cardiac Arrest. If respiratory distress or arrest is detected early, while the child still has a heart beat, in addition to prompt and appropriate First Aid and medical interventions, the survival rate is 60%-70%. Prompt recognition and treatment via bystander CPR along with necessary medical interventions is vital for survival.



**Cardiopulmonary Resuscitation (CPR) for an Infant Casualty (Less than 1 year of age)**



**If you are alone with an infant or child casualty, who is unconscious/unresponsive and not breathing, prior to making the 9-1-1 call, administer 2 minutes of CPR.**

**INFANT CPR PROCEDURES**



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- Primary Survey: A,B,C's.

**1. AIRWAY:** Open the infant's airway by positioning his/her head in the "Sniffing Position" (Infant's head is placed in a neutral position); if there is no suspected Head and/or Spinal injury. If the infant is found face down, check for spontaneous breathing prior to moving the infant onto his/her back **(Refer to Fig. 1)**.

Another way to position an infant's head in the "Sniffing Position" is to place a towel underneath his/her shoulder blades.


Fig. 1

**Fig. 1- The "Sniffing Position"**

**2. BREATHING:** 5 Second Breathing Scan. While maintaining the "sniffing position", assess as to whether or not breathing is present or absent or if there is irregular breathing/gasping. **(Refer to Fig. 2)**.


Fig. 2

**Fig. 2 - Breathing Assessment: Maintain the "Sniffing Position"** while listening for breathing for 5 seconds.

**a) Unconscious/unresponsive infant who is spontaneously breathing→** Place the infant in the Recovery Position and monitor A,B,C's every 30 seconds.


Fig. 3

**Fig. 3 - Infant Chest Compression Techniques**

**b) Unconscious/unresponsive infant who is not spontaneously breathing→ BEGIN CHEST COMPRESSIONS**

**3. CIRCULATION: If an infant is unconscious/unresponsive and not breathing, Begin Chest Compressions at a ratio of 30 Compressions: 2 Ventilations (Refer to Fig 3).**

- To figure out where on the infant's body to do chest compressions, draw a line directly from the infant's armpits into the center of the chest. Perform CPR using both thumbs, or the heel-of-one-hand technique.

- To deliver compressions you can either use heel-of-one-hand technique or two thumbs **(Fig. 3)**.
- Compression depth (Refer to CPR Table)

- **Push hard, push fast and allow for the chest to fully recoil.**

- Circulation can be assessed by checking the infant's skin temperature, skin colour and looking for the presence of sweating.
- Infant's who have poor circulation **may** have bluish colour around the lips (cyanosis), in addition to cool, pale and moist skin.

**CHECKING FOR BLOOD: Prior to performing Chest Compressions, a First Aider must perform a quick visual check for blood; looking for blood-soaked clothing, blood pooling etc… If deadly bleeding is present, address this immediately (application of dressings and bandages) prior to initiating CPR.**


Fig. 4

**4. ADMINISTER VENTILATIONS:**
Once 30 ventilations have been administered, Attempt to ventilate (e.g. mouth-mouth-and-nose, mouth-barrier device etc…). The First Aider places his/her mouth over both the infant's mouth and nose and delivers 2 slow "puffs" (Whatever air is in your mouth/cheeks at that time) each lasting 1 second in duration. Discontinue "puff" once you see noticeable chest rise and fall (Refer to Fig. 4).

**c) If the first "puff" does not go in (no chest rise and fall),** reset and reposition the airway and attempt a second "puff".

- Never force air into an infant.
- Watch for gastric distension (belly bloating from air entering the stomach during CPR) and vomiting.

# Chapter 12
## Two-Rescuer CPR

## *Performing Two-Rescuer CPR In An Unattended Cardiac Arrest*

A casualty who has suffered a Cardiac Arrest is not always going to be in the presence of witnesses or bystanders; this is deemed an **Unwitnessed Cardiac Arrest.** This, unfortunately further delays the resuscitation process until the casualty is found, 9-1-1 informed and the rest of the Chain of Survival initiated.

Speaking from experience, CPR is both physically and mentally demanding. In many situations there will only be one bystander available to perform CPR (One-Rescuer CPR) and in these instances, they have the responsibility of performing both compressions **and** ventilations. Studies have shown that after approximately 2 minutes of CPR at a ratio of 30:2, (which equals approximately 100-120 compressions/minute), the effectiveness of the compressions declines significantly due to physical exhaustion of the compressor. This has detrimental effects for the casualty because blood will not be pumped nearly as effectively to the heart and brain.

It is for this reason that **Two-Rescuer CPR (Refer to Fig. 1)** is the preferred method of resuscitation. This method provides the casualty with strong and effective compressions from bystanders who have the ability to switch roles when the other(s) is/are tiring. Two-Rescuer CPR improves the circulation of oxygenated blood to the heart and brain, greatly benefiting the casualty. It is also much less trying than One-Rescuer CPR.




**Fig. 1 - Two-Rescuer CPR**

## Protocol for Two-Rescuer CPR in an Unwitnessed Cardiac Arrest When One-Rescuer CPR in Not is Progress

**1.** Begin Emergency Scene Management (ESM)

- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- Primary Survey (Airway, Breathing, Circulation).

**2.** Once the casualty is deemed unresponsive/unconscious, send a bystander to call 9-1-1 if one is available. If a bystander is not available, and there is no cell phone to use, **Rescuer A** must leave to **call 9-1-1**. Meanwhile, **Rescuer B** initiates One-Rescuer CPR.

If casualty is not breathing, breathing irregularly or gasping begin CPR immediately. (C,A,B)

**3.** Once **Rescuer A** has returned from calling 9-1-1, he/she should assess the situation and be ready to take over chest compression duties from **Rescuer B. Rescuer B** will now be responsible for delivering ventilations as **Rescuer A** has taken over the job of delivering chest compressions.

**4.** If additional bystanders become available and are willing to help, utilize them and incorporate them into the resuscitation effort.

- If you have just finished chest compressions and are switching roles, allow the ventilator to administer the two breaths, prior to him/her taking over the chest compression duties.
- The First Aider positioned at the airway is in control of the casualty.

- If the casualty vomits, the chest compressor will roll the casualty towards him/her and clear the airway and immediately continue with chest compressions.

**Important Points**

- Providing ventilations is not as physically demanding as performing chest compressions.
- Chest compressors generally switch roles after providing 5 sets of compressions (2 minutes), equaling approximately 100-120 compressions/minute.
- If you become physically exhausted before the 5 sets or 2 minutes, inform the ventilator you want to switch after your current set of 30 compressions.
- Perform Two-Rescuer CPR until EMS arrival.
- Effective communication is essential between rescuers. Always count compressions aloud and arrange to switch roles when you are getting tired.
- Limit interruptions in CPR when switching roles.
- Remember, 30 Compressions: 2 Ventilations.

# *Perform Two-Rescuer CPR on a Casualty in an Attended Cardiac Arrest*

If you encounter a situation where a First Aider is already initiating One-Rescuer CPR and they ask for assistance, you must now work in coordination with the first rescuer to hand over responsibilities by following the protocol below:

**1.** Begin Emergency Scene Management (ESM)

- Perform a Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Activate EMS by calling 9-1-1, if this has not already been initiated. It would be wise to send the initial rescuer as they would have more information to relay based upon the fact they arrived on scene first.

• Begin a Primary Survey (Airway, Breathing, and Circulation).

**2.** If the casualty is unconscious and not breathing, breathing irregularly or gasping, one rescuer will begin chest compressions (C,A,B). The other rescuer will administer 2 ventilations after the 30 compressions. Continue the cycle until EMS arrival, switching compressors when appropriate.



Remember, switch over of duties generally occurs after 5 sets of compressions (2 minutes), approximately 100-120 compressions/minute.

**3.** Switch roles as necessary until EMS arrival. Compressor to ventilator and ventilator to compressor, approximately every 2 minutes or sooner, if the compressor is tiring.

**This two-rescuer CPR layout applies to adults, children, and infants, but it's important to remember a few key differences based on age and size:**

These adjustments help prevent injury and ensure that compressions and ventilations are appropriate for the patient's size and anatomy.

### CPR for Adults

When performing CPR on adults, use two hands for chest compressions. Ensure that each compression is deep and steady to maintain proper blood flow. Additionally, provide full breaths to deliver adequate oxygen to the patient. These techniques are crucial for effectively supporting an adult's larger anatomy during resuscitation.

### CPR for Children

For children, use one hand for chest compressions to avoid excessive force. Compressions should still be firm but adjusted for the smaller size of the child. Gentle breaths are recommended to prevent overinflation of the lungs. If performing rescue breaths with two trained responders, switch from 30 compressions 2 breaths to 15 compressions 2 breaths. These modifications help ensure the safety and effectiveness of CPR for children.

### CPR for Infants

When performing CPR on infants, use two thumbs or heel-of-one-hand technique for chest compressions. The compressions should be gentle and shallow to match the infant's delicate anatomy. Instead of full breaths, provide small puffs of air to avoid causing harm. If performing rescue breaths with two trained responders, switch from 30 compressions 2 breaths to 15 compressions 2 breaths These adjustments are essential for delivering appropriate care to an infant during resuscitation.

# Chapter 13
## Airway Management

### Definition

Airway manoeuvres are hands-on techniques used to open a person's airway. When someone is unconscious and unresponsive, and laying on their back, the muscles that keep the airway open relax. The tongue and other soft tissues tend to relax and collapse into the throat blocking off some or all airflow to the lungs. Things like blood, vomit, saliva or food can also cause obstructions in the airflow.

Obstructions to the airflow can be identified by hearing abnormal sounds on inhalation and/or exhalation as well as visually seeing secretions or foaming at the mouth. The recovery position is generally a safe and effective position to put a patient in that will allow the airway to remain open, but when someone is unable to safely be placed into the recovery position (which also opens the airway, and is having any indication of a closed airway we must perform an airway manoeuvre.

Situations when recovery position would be suitable and effectively keep the airway open:

- Unconscious but breathing normally (e.g., fainting, seizure recovery, post-overdose)
- After a seizure once convulsions stop but the person remains unresponsive
- Alcohol or drug intoxication - helps keep the airway clear and prevents choking on vomit
- Head injury with normal breathing - keeps airway open while protecting from aspiration
- Drowning/near-drowning - once breathing resumes but person is still unresponsive
- Diabetic emergency after regaining spontaneous breathing but still unconscious

- Shock (responsive but weak) - can be placed on their side to maintain airway and comfort
- Most situations with risk of vomiting or fluid in mouth - recovery position helps drainage
- While waiting for EMS when no CPR or spinal precautions are needed

**Examples of when the recovery position is not suitable:**

- Possible injury to the neck or spine - reasoning: we do not want to move the person because they are at risk of further injury or paralysis if rolled into recovery, we need to keep them as still and stable as possible
- Bleeding that is easier to hold pressure on when the patient is on their back - example: Bleeding to the front side of their body - reasoning: it will be much more difficult to hold pressure if they are laying on their side, in order to stop the bleeding efficiently we need to keep them on their back
- Cardiac arrest - reasoning: we need to keep the patient on their back to perform chest compressions
- Multiple traumatic injuries - reasoning: if the person has sustained injuries to multiple parts of their body, rolling them can cause further injury so the best practice is to keep them on their back

**When to do it (indications)**

- If the person is **unconscious** and not responding.
- If the person is **not breathing normally** or their breathing sounds blocked.
- If you notice **snoring, gurgling, or silence** when they should be breathing.

**When NOT to do it (contraindications)**

- If the person is awake and able to talk, cough, or breathe strongly, they are protecting their own airway.
- If there is a clear injury to the face, jaw, or neck that moving might make them worse.
- If you suspect a spinal or neck injury, avoid the head tilt–chin lift and instead use the jaw thrust.

**Precautions (things to be careful about)**

- Always move the head and jaw gently, never forcefully.
- Do not press on the soft tissues under the chin or in the throat, as this can block the airway.
- When doing a Jaw thrust do not put any pressure on the sides of the neck, as this can interrupt blood flow to the brain
- Keep the person's mouth open just enough to allow airflow, but do not overextend.
- Re-check breathing often, because the airway can close again.

**Why it helps**

These manuevers move the tongue and soft tissues away from the back of the throat. This creates a clear passage for air to move in and out of the lungs, which is essential for life and for giving rescue breaths if needed.

**Common mistakes to avoid**

- Tilting the head too far back, especially in infants and small children (this can actually close the airway).
- Letting go too soon, the airway will often collapse back down if you don't maintain the position.
- Blindly sticking fingers in the mouth to "sweep", this may push objects further down.

**Remember: The recovery position is only used for someone who is breathing effectively. If a person is not breathing, CPR and an AED are the top priorities, and airway manoeuvres may be considered as appropriate. If a person is breathing but shows signs of a blocked airway, this is also the time to consider airway manoeuvres.**

**Breathing effectively:**

- Place the person in the recovery position.

**Breathing, but the airway may not be fully open:**

- Consider an airway manoeuvre.

**Not breathing:**

- Begin CPR and use an AED as soon as possible; perform airway manoeuvres when giving rescue breaths.

## Procedures for opening, clearing, and maintaining an airway:

**Definition**

Opening, clearing, and maintaining an airway are the steps that make sure air can travel freely in and out of a person's lungs.

**When to do it**

- Anytime a person is unconscious and not breathing normally.
- If the person's breathing sounds blocked (snoring, gurgling, gasping).
- Before giving rescue breaths.

## Step 1: Opening the Airway

**Head tilt–chin lift (most common method):**

1. Kneel beside the person's head.
2. Place one hand on their forehead.
3. Place two fingers of your other hand under the bony part of the chin (not the soft tissue).
4. Gently tilt the head back while lifting the chin upward.

**If the manoeuvre is done properly, you should notice:**

- The mouth falls slightly open.
- Breathing sounds become clearer (no more snoring or gurgling)
- The chest rises and falls evenly with each breath.

**Jaw thrust (use if you suspect spinal/neck injury):**
**for healthcare providers only**

1. Position yourself at the top of the person's head.
2. Place the heels of both hands on either side of the person's head, just above the ears with both thumbs on the cheekbones.

3. Place your index and middle fingers, or middle and ring fingers behind the angles of the lower jaw (the hard bony part).
4. Gently push the jaw straight up and forward, without tilting the head.

**If done properly, you should notice:**

- The lower jaw and chin move upwards, sometimes giving them an "underbite" look.
- The tongue moves away from the back of the throat.
- Chest rises and falls with breathing, and sounds are clear.

**Step 2: Clearing the Airway**

1. Look inside the mouth for obvious objects (food, vomit, blood).
2. If you see fluid, roll the person onto their side to let it drain.
3. If an object is visualized and they are not breathing, begin chest compressions.

**Step 3: Maintaining the Airway**

1. Keep holding the head tilt–chin lift or jaw thrust in place.
2. Watch for chest rise and fall to confirm breathing is ongoing.
3. Wait for EMS arrival and wait in that position for them to take over.
4. If you must leave the person, place them in the recovery position (on their side, head tilted back, mouth slightly open so fluids can drain).

**Why it helps**

- The head tilt–chin lift and jaw thrust move the tongue and tissues away from the airway.
- Rolling them onto their side allows fluids to drain, ensuring they don't aspirate (inhale) the fluid into their lungs
- Chest compressions can help force the object out and maintain blood flow to the brain if their heart is not beating properly.

Keeping the airway open allows oxygen to reach the lungs, preventing brain damage and death.

**Common mistakes to avoid**

- Pushing on the soft tissue under the chin, which can block the airway further.
- Tilting the head too far in infants or children.
- Forgetting to check that breathing continues after opening the airway.
- Airway Obstructions from Drowning, Trauma, and Other Causes

**Definition**

Not all airway obstructions are caused by choking. Sometimes, the airway becomes blocked by fluids, swelling, or injury, or when an unconscious person's tongue relaxes and collapses into the throat.

These types of airway emergencies require the same principles of opening, clearing, and maintaining the airway, but with special attention to the underlying cause.

**Why it happens**

An airway obstruction means air cannot move freely in or out of the lungs.

Beyond choking, this can happen when:

- Water or other fluids fill the mouth and throat (as in drowning)
- The tongue or soft tissues relax backward (in unconsciousness)
- Swelling or bleeding narrows the airway (after trauma or allergic reaction)
- The airway is directly injured (crush or penetrating wounds to the neck or face)

When airflow is blocked, oxygen can't reach the lungs or brain, making airway management the first and most important priority.

## Common causes and what's happening inside the body

**1. Drowning or Near-Drowning**

When a person inhales water, the airway becomes blocked and a reflex spasm from the throat (laryngospasm) may close the throat completely. Even small amounts of water can stop oxygen from entering the lungs.

After rescue, water or vomit may still be present and continue to block airflow.

**Signs:**

- Unresponsive or not breathing normally
- Foaming or water coming from the mouth or nose
- Pale, blue, or cold skin
- Gurgling or coughing up fluid

**What to do:**

- **Call 9-1-1** and retrieve an AED.
- If the person is not breathing, begin rescue breaths first, followed by chest compressions.
- Roll the person slightly to the side if fluid or vomit is visible, then continue care.
- If breathing returns, place them in the recovery position and monitor closely. Breathing problems can return even after they start breathing again.

**2. Neck or Throat Trauma**

Direct blows, crush injuries, or strangulation can cause swelling, bleeding, or damage to the airway that makes breathing difficult or impossible.

**Signs:**

- Hoarse or gurgling voice
- Swelling or bruising on the neck
- Coughing up blood
- Trouble breathing or speaking

**What to do:**

- **Call 9-1-1** and retrieve an AED.
- Have the person sit upright and remain as still as possible.
- Do not tilt the head or apply pressure to the neck.

- Encourage them to spit out any blood and not to swallow it.
- If the person stops breathing, open the airway using a jaw thrust (no head tilt) and begin CPR if needed.

### 3. Facial or Jaw Injuries

Severe injuries to the face or jaw can block the airway with blood, swelling, or broken teeth. In an unconscious person, the tongue can also fall backward and close the throat.

**Signs:**

- Bleeding or visible damage to the face or mouth
- Gurgling, choking, or noisy breathing
- Difficulty keeping the mouth open
- Unresponsive or not breathing

**What to do:**

- **Call 9-1-1** and retrieve an AED.
- Use the jaw thrust manoeuvre to open the airway if a neck or spinal injury is suspected.
- Clear visible debris (blood, teeth, vomit) only if it can be reached easily.
- If the person is breathing, place them in the recovery position so fluids can drain.
- If they are not breathing, begin CPR and follow AED instructions.

### 4. Allergic Reaction (Anaphylaxis)

A severe allergic reaction can cause the airway, tongue, and throat to swell, blocking airflow within minutes. This can occur after contact with certain foods, insect stings, medications, or latex.

**Signs:**

- Swelling of the lips, tongue, or face
- Wheezing or difficulty breathing

- Rash or hives
- Dizziness, weakness, or collapse

**What to do:**

- **Call 9-1-1** and retrieve an AED.
- Help the person use their prescribed epinephrine auto-injector (EpiPen) if available.
- Have them sit upright if breathing is difficult, or lie flat if feeling faint.
- If they stop breathing, begin CPR immediately and use the AED when ready.

**5. Tongue Obstruction (Unconscious Patient)**

When a person becomes deeply unconscious, the muscles relax and the tongue may fall backward, blocking the throat and preventing air from entering the lungs.

**Signs:**

- Unresponsive
- Abnormal breathing (snoring, gurgling, silence)

**What to do:**

- **Call 9-1-1** and retrieve an AED.
- Open the airway using a head tilt–chin lift, or a jaw thrust if a spinal injury is suspected.
- Maintain that position and re-check for breathing.
- If breathing resumes, place the person in the recovery position to prevent the tongue or fluids from blocking the airway again.
- If they are not breathing, begin CPR and use the AED as soon as possible.

**Why it helps**

Airway maneuvers like the head tilt–chin lift and jaw thrust lift the tongue and soft tissues away from the back of the throat, creating space for air to flow.

Rolling a person on their side allows fluids to drain, preventing aspiration (inhalation of fluids into the lungs).

In drowning, trauma, or anaphylaxis, these steps can help maintain an open airway long enough for emergency responders to take over.

**Common mistakes to avoid**

- Tilting the head back when a neck or spinal injury is suspected.
- Reaching blindly into the mouth, which can push objects deeper.
- Applying pressure to the neck or soft tissues under the jaw.
- Using excessive force when moving the head or jaw.
- Failing to recheck breathing after opening the airway.
- Allowing fluids to remain pooled in the mouth instead of draining.

# *The Respiratory System*

A constant and steady flow of atmospheric oxygen is essential for human survival. Oxygen is a colourless, odorless gas and if cells of the body are deprived of oxygen (e.g. choking) death will result in less than six minutes. The process of exchanging oxygen and carbon dioxide between the body's cells and the atmosphere is termed **respiration**. The air we breathe contains 21% oxygen, the body's cells and tissues utilize only 5% of this available oxygen, leaving a difference of 16%. The remaining 16% oxygen gets exhaled, along with carbon dioxide, when we breathe out. The **Cardiovascular** and **Respiratory** systems are two major organ systems which work in conjunction with each other in order to accomplish the task of supplying all of the body's cells with oxygen and ridding the body of carbon dioxide. Credit should also be given to the brain, specifically the **brain stem**, as this is where the **Respiratory Control Centre** is housed. The Respiratory Control Centre is responsible for initiating breathing as well as controlling the rate and depth of our respirations.

The Cardiovascular System, which includes the heart, blood, and blood vessels, is responsible for the delivery of vital oxygen and nutrients to all cells of the body and for the clearing of waste products and carbon dioxide which accumulate from metabolic processes. There are thousands of kilometers of arteries, veins and capillaries which comprise this system. **Arteries** carry oxygenated blood (blood containing oxygen) and nutrients away from the heart, to the body's cells and tissues, and are strong, thick elastic blood vessels. **Veins**, which are thinner, less flexible, and which contain one way valves to prevent a backflow of blood, carry deoxygenated blood, carbon dioxide, and waste products from cellular metabolism back to the heart, lungs and liver for their removal.

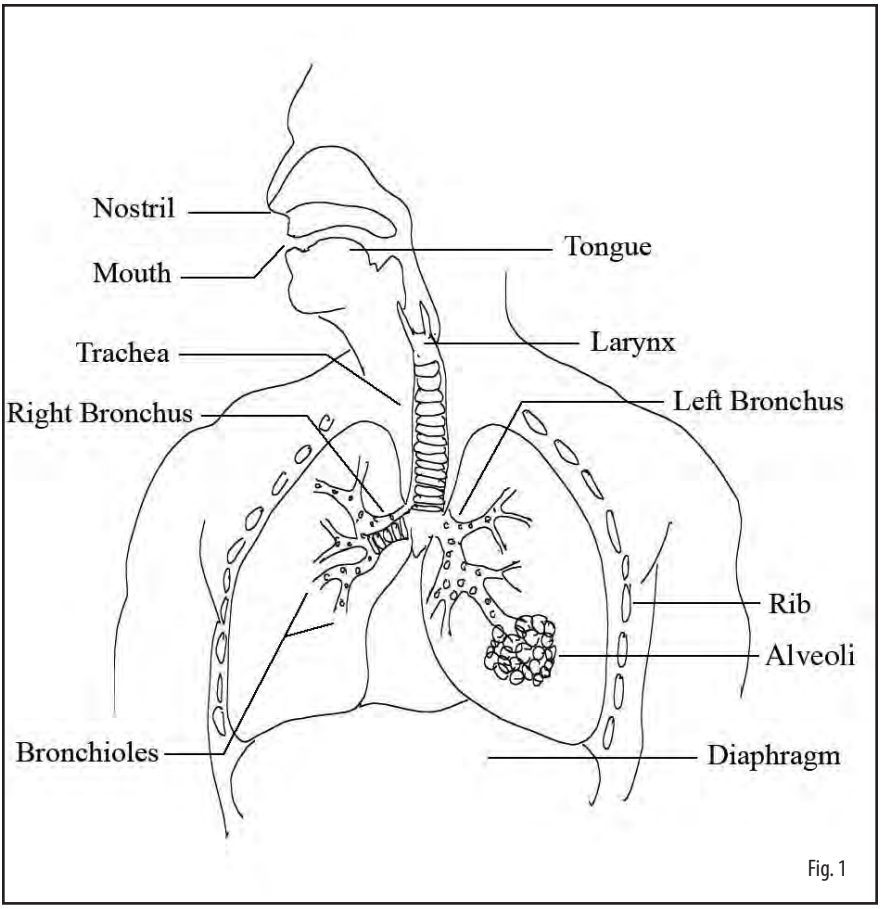



**Fig. 1 - Respiratory System**

The Respiratory System consists of a group of specialized cells and tissues with the collective goal of exchanging oxygen and carbon dioxide with the cells of the body and the external environment. The major components of the Respiratory System are the Upper and Lower Respiratory Tracts, the Lungs and the Diaphragm.

**Upper Respiratory Tract**

**Nose:** Air enters the nose and is warmed and filtered.

**Nasal Cavity:** Hollow space behind the nose which is filled with a mucous coating to help warm and moisten incoming air.

**Pharynx:** This is your throat and is made of muscle and lined with mucous.

**Lower Respiratory Tract**

**Larynx:** Portion of the lower airway which connects the throat (pharynx) with the trachea. The larynx prevents objects from entering the trachea and houses the vocal cords.

**Trachea:** Flexible hollow tube connecting the larynx with the bronchial tree. The trachea eventually divides and transforms into the left and right main bronchus.

**Bronchial tree:** A series of branched tubes which lead from the trachea to the tiny air sacs in the lungs (alveoli) which are responsible for gas exchange of oxygen and carbon dioxide with the blood.

**Lungs:** A pair of light spongy organs within the chest cavity. The lungs are the key components involved in respiration.

**Diaphragm**

The diaphragm is a dome-shaped muscle which not only separates the chest cavity from the abdominal cavity; it also plays an integral role in the breathing process. When an individual inhales, the diaphragm contracts and moves downward in order to increase the size of the chest cavity. This action allows inspired air to enter the lungs. When an individual exhales, the diaphragm relaxes and the space inside the chest cavity becomes smaller, aiding in the removal of air from the lungs.

# *Recognizing Breathing Emergencies*

## Breathing Emergencies can be Classified Into Three Major Groups:

### 1. Oxygen Depletion

- Carbon monoxide poisoning.
- Suffocation (e.g. drowning).
- Environments with low atmospheric oxygen (e.g. high altitudes).
- Environments in which oxygen is used up quickly and will not be replenished (e.g. trapped in a confined space).

**2. Obstructed Airway**

- Foreign body obstruction.
- Upper airway swelling (e.g. airway burn, anaphylaxis).
- Upper airway trauma (e.g. crushed trachea).
- Unconscious casualty who cannot protect his/her own airway.

**3. Loss of Effective Heart and Lung Function**

- Heart attack and heart failure.
- Chest trauma causing injury to the heart.
- Asthma, pneumonia, chronic bronchitis and emphysema.
- Head and spinal injuries which compromise heart and lung function.
- Drug overdoses leading to Respiratory and/or Cardiac Arrest.

## 21.2.2. Six Major Causes of Breathing Emergencies in Adults

**1.** Suffocation
**2.** Drowning
**3.** Illness
**4.** Injury
**5.** Burns
**6.** Poisoning

## Signs and Symptoms of Major Breathing Emergencies

- Anxiety
- Cool, moist skin.
- Wheezing
- Coughing
- Coughing that produces thick, clear or yellowish sputum.
- Chest tightness, pain or abnormal movement.
- Rapid, slow, or irregular breathing.

- Fatigue (getting tired of breathing).
- Quiet shallow breathing.
- Pale or bluish-coloured skin (lips, ears, fingernail beds).
- Accessory muscle use (e.g. Muscles which are not ordinarily involved in breathing such as those in the neck, between the rib cage and stomach muscles).
- Decreased level of awareness.
- Confusion
- Unconsciousness
- Gurgling or high pitched breathing sounds.
- Gasping

### The Period of Time in which Brain Damage May Occur from Oxygen Deprivation

Irreversible brain damage due to oxygen deprivation to the brain generally occurs after approximately 8-10 minutes. Brain cells (neurons) begin to die as early as 4-6 minutes in the absence of an oxygen-rich environment.

## *Perform Mouth-To-Mouth Artificial Respiration (AR) On An Adult Casualty*

### Artificial Respiration (AR)

**Artificial Respiration** is an emergency procedure in which oxygen is delivered to a casualty who has a pulse but is not breathing or breathing ineffectively. This is a manual technique in which air is forced, in a controlled fashion, into a casualty by means of mouth-to-mouth AR, mouth-to-nose AR, mouth-to-mouth and nose AR and finally mouth-to-stoma AR. Healthcare providers perform all the steps as would a lay-rescuer who is performing CPR, except with the addition of pulse checks. AR follows the same techniques as one would employ when delivering two rescue breaths to a casualty who is found unconscious and not breathing in the Primary Survey.

**Who Should Receive Artificial Respiration?**

- A casualty with an altered Level of Consciousness.
- A casualty who has bluish lips (cyanosis).
- A casualty who has a pulse but is not breathing.
- A casualty who is breathing ineffectively, whether too fast, too slow, or with agonal respirations.

## Sustaining a Casualty's Life through Direct Methods of Artificial Respiration

As noted earlier, we inhale 21% atmospheric oxygen, utilize 5% and exhale 16%. A casualty who is in respiratory arrest or respiratory distress can greatly benefit from the artificial method of oxygen delivery which a Healthcare worker can provide by means of AR. As you perform AR, you are administering 16% oxygen to a casualty, helping to supply the brain and heart with vital oxygen in order to help sustain his/her life until EMS arrival.

**Casualty Age Reminder**

**Adult** (Signs of puberty or older)

**Child** (1 year to signs of puberty)

**Infant** (Less than 12 months)

## The Rate of Force for Ventilations for an Adult Casualty

**Rescue Breathing Scenario for an Adult Casualty**

**1.** Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).

**2.** Determine Responsiveness (tap and shout).

**3. Call 9-1-1** and retrieve an AED.

**4. Airway:** (Head-tilt-chin lift or Jaw-thrust without Head-tilt).

**5. Breathing:** 5 Second Breathing Scan. Check Breathing while determining

responsiveness. If casualty is not breathing, breathing irregularly or gasping, the first aider can assume the casualty is in Sudden Cardiac Arrest: **BEGIN CHEST COMPRESSIONS**

6. **Circulation:** Carotid pulse check for 10 seconds. If no pulse is present, initiate CPR at a ratio of 30 Compressions: 2 Ventilations. If a pulse is present but the casualty is not breathing on his/her own or if breathing is inadequate to sustain life, begin AR.

7. Deliver 2 breaths, each lasting 1 second in duration. Discontinue once you see noticeable chest rise and fall.



Follow the C,A,B sequence.

**For an Adult Casualty who Requires AR, Deliver 12 breaths/minute, One Every 5 Seconds**



- Each breath should last no longer than 1 second and discontinued once you see noticeable chest rise and fall.
- Do not breathe/ventilate too forcefully as you will risk gastric distension.
- Perform carotid pulse checks every 2 minutes.

## When, Where and for how long the Signs of Circulation are Checked and Rechecked During AR for an Adult Casualty

**Signs of Circulation** for an adult casualty should always be assessed from the **Carotid Artery** (either side of the neck). Initial pulse checks in the Primary Survey should be 10 seconds in duration and every 2 minutes thereafter.



**If the casualty is not breathing, breathing irregularly or gasping, one should suspect the casualty is in SCA and should begin chest compressions (30:2).**



If no pulse is present after your initial 10 second pulse check, begin CPR.

# Perform Mouth-To-Mouth AR On An Adult Casualty With Suspected Head And/Or Spinal Injuries

## When to use the Jaw-Thrust without Head-Tilt to Open a Casualty's Airway


Fig. 2


Fig. 3

The **Jaw-thrust without Head-Tilt (Fig. 2, Fig. 3)** is the most appropriate technique to employ in order to open a casualty's airway who you suspect has suffered a potential Head and/or Spinal injury. In this technique, the casualty must be laying on his/her back (supine) as the rescuer positions his/her hands in a manner to both stabilize the head and move the jaw (mandible) up and out in order to open the airway without tilting the head. This technique is only to be used by Healthcare Providers.

**Fig. 2, 3 - Jaw-thrust without Head Tilt**

# Perform Mouth-To-Nose AR on an Adult Casualty

## When to use Mouth-To-Nose AR

Certain emergency situations will prevent a rescuer from ventilating a casualty using mouth-to-mouth ventilations. Such situations may include burns or poisoning to the mouth, trauma and trismus (inability of the mouth to open due to a number of causes).

The principles are the same as with mouth-to-mouth AR. Close the casualty's mouth, maintain a Head-tilt-chin lift and make a seal around his/her nose. Hold the casualty's mouth closed while you deliver the ventilations and open the casualty's mouth between breaths to allow exhaled air to escape.

**Mouth-to-Stoma Ventilations:** Certain individuals, for varying reasons have had a portion of his/her windpipe or larynx removed. In order to breathe effectively a hole is constructed in the front of his/her neck called a **stoma.** In this situation, air travels directly from the neck into the lungs rather than via the mouth and nose. Air must be delivered directly into the stoma to deliver ventilations to these individuals.

**Mouth-to-Stoma Ventilations Procedure**

**1.** Visualize and expose the stoma. Do not remove any connections or attachments.

**2.** Look, listen and feel for breathing directly over the stoma.

**3.** If available, place a pillow under the casualty's shoulders to allow for a slight elevation of the neck.

**4.** Raise the chin while making sure the head is in alignment with the body.

**5.** With one free hand, seal off the mouth and nose simultaneously.

**6.** Place a pocket mask, barrier device or your mouth directly over the stoma and deliver a breath over one second in duration.

**7.** Discontinue the breath once you see noticeable chest rise and fall.

**8.** Remove your mouth from atop the stoma in between breaths to allow exhaled air to escape.

# *Perform Mouth-To-Mouth Artificial Respiration On A Child*

## Differences in the Rate and Force of Ventilations Between an Adult and a Child with Respect to Artificial Respiration

Children are not "little adults" and they therefore require different care guidelines when receiving AR. A child's lung capacity is smaller than that of an adult, so they do not require as much air during AR. Deliver enough air, in a slow and constant fashion to the point where you begin to notice chest rise and fall and then discontinue.

A child's respiratory rate/demands are greater than that of an adult and they therefore require a greater number of AR/breaths/min.

**For a Child Casualty who Requires AR, Deliver 20 breaths/minute, One Every 3 Seconds**



- Each breath should last no longer than 1 second and discontinued once you see noticeable chest rise and fall.
- Do not breathe/ventilate too forcefully as you will risk gastric distension.
- Perform carotid pulse checks every 2 minutes.

## Resting Heart and Respiratory Rates

**AVERAGE VITAL SIGNS BY AGE**

| Age | Pulse Rate (breaths/minute) | Breathing Rate (beats/minute) |
|---|---|---|
| Newborn | 120-160 | 40-60 |
| 1 year | 80-140 | 30-40 |
| 3 years | 80-120 | 25-30 |
| 5 years | 70-115 | 20-25 |
| 7 years | 70-115 | 20-25 |
| 10 years | 70-115 | 15-22 |
| 15 years | 70-90 | 15-20 |
| Adult | 60-100 | 12-20 |

# *Perform Mouth-To-Mouth-And-Nose Artificial Respiration On An Infant*

### When and Where the Brachial Pulse is Checked and Rechecked During Mouth-To-Mouth-And-Nose Artificial Respiration and CPR

The **Brachial Pulse** (Brachial Artery), located on the inside of the upper arm, in between the bicep and tricep muscle, is the ideal location for assessing a pulse in an infant (less than 1 year of age). Initial pulse checks in the Primary Survey should be 10 seconds in duration and every 2 minutes thereafter.



If no pulse is present after your initial 10 second pulse check, begin CPR.

## Rate and Force of Ventilations for an Infant

Infants have very small lung capacities, equivalent to the amount of air you have in your mouth/cheeks while you read this sentence. Infants respiratory rates are also greater when compared to that of a child or an adult. With this information in mind, when administering AR to an infant casualty, be sure not to over inflate their lungs. Deliver "puffs" rather than breaths. A "puff" is equivalent to the amount of air you have in your mouth/cheeks at that time. Deliver enough air, in a slow and constant fashion to the point where you begin to notice chest rise and fall and then discontinue.

An infant's respiratory rate/demands are greater than that of an adult and they therefore require a greater number of AR/breaths/min.

**Rescue Breathing Scenario for an Infant Casualty**

**1.** Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).

**2.** Determine Responsiveness (tap and shout).

**3. Call 9-1-1** and retrieve an AED.

**4. Airway:** ("Sniffing Position").

**5. Breathing:** 5 Second Breathing Scan. Check Breathing while determining responsiveness. If casualty is not breathing, breathing irregularly or gasping, the first aider can assume the casualty is in Sudden Cardiac Arrest: **BEGIN CHEST COMPRESSIONS.**

**6. Circulation:** Brachial pulse check for 10 seconds. If no pulse is present, initiate CPR at a ratio of 30 Compressions: 2 Ventilations. If a pulse is present but the infant is not breathing on his/her own or if breathing is inadequate to sustain life, begin AR.

**7.** Deliver 2 "puffs", each lasting 1 second in duration. Discontinue once you see noticeable chest rise and fall.

**When Delivering AR to an Infant Casualty, Deliver 20 puffs/minute, One Every Three Seconds**



- Each "puff" should last no longer than 1 second and discontinued once you see noticeable chest rise and fall.



- Do not "puff" too forcefully as you will risk gastric distension.
- Perform brachial pulse checks every 2 minutes.



# *Complications Which May Occur When Administering AR*

## Two Complications Which May Occur When Administering Artificial Respirations

Several complications may arise when performing AR, **Gastric Distension** and **Vomiting**. There are two pipes located in the back of our mouth, one is our trachea (directs air into the lungs) and the other is the esophagus (delivers liquids and solids to the stomach). If a rescuer opens a casualty's airway improperly, blows too forcefully and/or too quickly, air may bypass the trachea and go directly into the stomach. If air enters the stomach, it begins to swell and distend (gastric distension). If pressure in the stomach continues to escalate, the casualty may vomit. It is next to impossible to prevent air from entering the stomach when performing AR and CPR but there are ways to minimize it

**1.** Ensure the casualty's airway is open using the most appropriate method for the situation.

**2.** Deliver breaths in a slowed and constant fashion.

**3.** Breaths should be delivered over 1 second in duration and discontinued once noticeable chest rise is evident.

# *Providing Assisted Breathing*



**(For Healthcare Providers Only)**

Certain emergency situations may require you to assist a casualty who is breathing ineffectively. A casualty may be breathing too fast, too slow, or too shallow. All are detrimental and will not supply the casualty with sufficient levels of oxygen to sustain brain and heart function. The goal of assisted breathing is help the casualty breathe more effectively while increasing his/her oxygen delivery.

## Effective and Ineffective Breathing

In order for one to breathe effectively several key elements must be present

- A sufficient, constant supply of oxygen.
- An intact and open airway.
- Functional and intact chest wall.
- Functioning lungs.
- Functioning brain and spinal cord.

An individual who is breathing effectively will be conscious, alert, breathing at a normal rate, rhythm and volume, and displaying no signs of respiratory distress. When effective breathing is present, the body is able to supply the tissues and cells with enough oxygen to meet its energy demands. Breathing becomes ineffective when the body cannot meet the oxygen demands placed on it. Whether from injury, illness, overdose, trauma etc…a variety of injuries and illnesses can place the body in an oxygen deficit. If the body is unable to compensate for this increase in oxygen demand, signs and symptoms of respiratory distress will become evident. If a casualty is presenting with signs and symptoms of respiratory distress, a Healthcare provider should attempt to provide suitable respiratory assistance using assisted breathing techniques.



**9-1-1 should always be called in situations which involve a casualty who is experiencing any form of respiratory distress.**

**Signs and Symptoms of Ineffective Breathing and Severe Respiratory Distress**

- Anxiety
- Cool, moist skin.
- Wheezing
- Coughing
- Coughing that produces thick, clear or yellowish sputum.
- Chest tightness, pain or abnormal movement.
- Rapid, slow, or irregular breathing.
- Fatigue (getting tired of breathing).
- Quiet shallow breathing.
- Pale or bluish-coloured skin (lips, ears, fingernail beds).
- Accessory muscle use (e.g. muscles which are not ordinarily involved in breathing such as those in the neck, between the rib cage and stomach muscles).
- Decreased level of awareness.
- Confusion
- Unconsciousness
- Gurgling or high pitched breathing sounds.
- Gasping

## Assisted Breathing Technique



**(Healthcare Providers Only)**

1. Inform the casualty what you are planning to do and why it will be of great benefit to him/her.
2. Calm and reassure the casualty.
3. Select the appropriate AR technique (e.g. mouth-to-mouth, mouth-to-stoma).
4. For a casualty who is breathing too slowly, assist the casualty with his/her own breath when he/she inhales and provide an additional breath in between his/her own. Deliver one breath every 5 seconds for a total of 12 breaths/minute.
5. Deliver a breath every second inhalation, for a casualty who is breathing too fast. The goal is to try and slow the breathing while delivering 12 breaths/minute.

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# Chapter 14
## Automated External Defibrillation

## *The Chain Of Survival*





### THE CHAIN OF SURVIVAL

The **Chain of Survival** provides a casualty in Sudden Cardiac Arrest (SCA), the greatest chance of survival if all 5 links in the chain are implemented in a timely fashion.

The first three steps are the most vital and will be accomplished by a competent and responsive First Aider. You are the ones who are saving lives by recognizing that a casualty is in a Sudden Cardiac Arrest state with the subsequent calling of 9-1-1, the administration of immediate and proper CPR and rapid defibrillation. Any break or delay in the Chain of Survival will make it that much harder to reverse the state of the casualty experiencing the Cardiac Arrest.

1. **Immediate Recognition and Activation of EMS:** This is the most important link. The earlier the recognition of a medical emergency with the subsequent calling of 9-1-1, the greater the chance of survival for a casualty in Sudden Cardiac Arrest (SCA). When in doubt, always **call 9-1-1**.

2. **Early CPR:** After you have assessed and deemed a casualty to be unconscious and not breathing, breathing irregularly or gasping, **chest compressions must be started immediately.** This will provide a casualty with the greatest chance of survival after suffering from a SCA, and will make his/her heart more receptive to receiving a shock from a Defibrillator.

- CPR can triple a casualty's chance of survival.
- CPR provides oxygen and nutrients to the heart muscle and brain. After 4-6 minutes of oxygen deprivation, brain cells begin to die and permanent brain damage may result.
- CPR alone will not save lives, however, when CPR is started immediately after a casualty has suffered a SCA, and a Defibrillator is applied in less than 5 minutes, a casualty has upwards of 76% chance of survival.
- When performing CPR, push hard, push fast and allow for the chest to fully recoil.

3. **Rapid Defibrillation:** SCA's are most often the result of irregular heart rhythms caused by disorganized and irregular electrical activity within the heart itself. This irregularity can cause the heart to stop beating, resulting in Cardiac Arrest. A Defibrillator, often referred to as an Automated External Defibrillator (AED), delivers electrical energy to the heart muscle often times reversing this electrical chaos and restarting the heart. The sooner the AED is attached to a casualty in SCA, the greater the chance of survival.

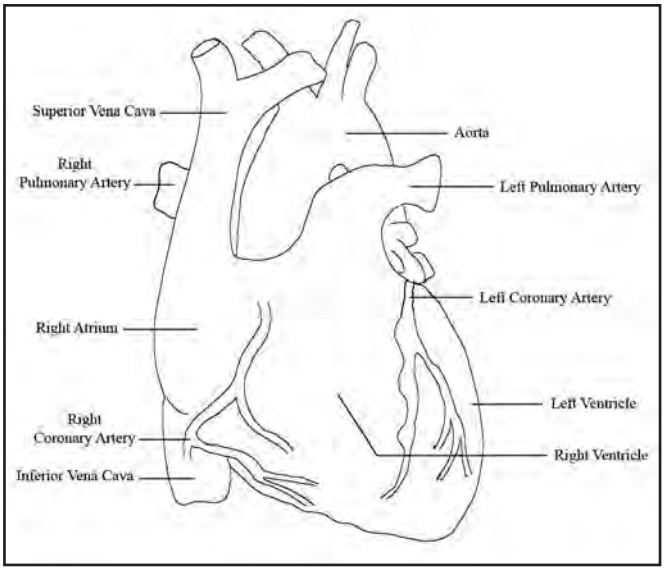
4. **Effective Advanced Life Support (ALS):** Paramedics who have advanced skills delivering advanced airway support and administration of advanced cardiac medications.

5. **Integrated Post-Cardiac Arrest Care:**



## Three First Aid Measures that are Priority for all Cardiovascular Emergencies

1. Get Medical Help quickly.
2. Place the casualty at rest.
3. Provide CPR if necessary.




**Anatomy of the Heart**



# *Anatomy And Physiology Of The Heart And Cardiovascular System*

The Cardiovascular System, which includes the heart, blood, and blood vessels, is responsible for the delivery of vital oxygen and nutrients to all cells of the body and for the clearing of waste products and carbon dioxide which accumulate from metabolic processes. There are thousands of kilometers of arteries, veins and capillaries which comprise this system. **Arteries** carry oxygenated blood (blood containing oxygen) and nutrients away from the heart, to the body's cells and tissues, and are strong, thick elastic blood vessels. **Veins**, which are thinner, less flexible, and which contain one way valves to prevent a backflow of blood, carry deoxygenated blood, carbon dioxide, and waste products from cellular metabolism back to the heart, lungs and liver for their removal.

The heart is a muscle as well as a pump, enabling the delivery of blood, oxygen and other essential nutrients, via blood vessels, to the body and its tissues. Heart size varies with body size, but on average, a human heart is approximately 14 centimeters long and 9 centimeters wide, or roughly the size of a clenched fist. The heart beats on average, 72 times per minutes and 104,000 times per day. The heart is hollow and has a cone-shaped appearance, weighing less than a pound. The heart is located directly behind the breast bone/sternum, is tipped

slightly to the left, rests above the diaphragm and is nestled between both lungs. The human heart circulates approximately 5 liters of blood per minute.

The heart is divided into four chambers; right and left atria and right and left ventricles. The atria are the receiving chambers for blood returning to the heart from the body and from the lungs, while the ventricles are the pumping chambers which propel blood through the lungs and subsequently out the aorta via the left ventricle (major blood vessel originating from the left ventricle) to the rest of the body.

The heart, as mentioned, is situated between both lungs. The heart and lungs have an intimate relationship with one other. There is no room for a bad break up as both must work in partnership for all the days of their lives in order to keep the body functioning normally and efficiently.

When blood returns to the heart it is devoid of oxygen (deoxygenated). The heart will pump this deoxygenated blood through the lungs to pick up more oxygen. The lungs then return this blood back to the heart, now oxygenated, and the heart now circulates this oxygen-rich blood to the rest of the body.





Your heart beats approximately 100,000 times/day and 35 million times/year.

The largest blood vessel in the human body is termed the **Aorta**, which arises from the left ventricle of the heart. The aorta has several subdivisions and is the primary branch artery through which oxygen-rich blood and nutrients get circulated through the complex highway of arteries and capillaries of the human body.

The heart muscle, like other cells and tissues in the body, requires a steady and uninterrupted supply of oxygen and nutrients to keep the cells happy and the heart pumping effectively and efficiently. For this reason, the heart has its own set of specialized arteries called **Coronary Arteries**, which feed the heart muscle directly.

The heart reminds me of an orchestra, with a conductor who conducts fellow musicians when to play and at what pace. The orchestra creates the beautiful music beating out the wonderful melodies. In physiologic terms, the heart is comprised of two types of cells, **electrical cells/nerve cells** (the conductor) and **mechanical cells/muscle cells** (musicians). In the orchestra analogy, both the conductor and the musicians are required to create the beautiful music. A proper functioning heart requires both electrical cells and mechanical cells. You can't have one without the other! Let's delve a bit deeper and try and understand the intricacies of the heart's conductions system and how the beat goes on…

In order for the heart to beat/pump the cardiac muscle cells (mechanical cells) must receive an electrical signal from "nerve-like" cells (electrical cells) which are strategically placed throughout the heart. Electrical cells initiate and disperse nerve impulses to stimulate the mechanical/muscle cells to contract, thus creating a heart beat. Organized electrical activity produced by the electrical cells in the heart is termed a **rhythm**. The first component of the electrical system is located in the wall of the right atrium and is termed the **sinoatrial node** (SA node). Impulses which are generated at the SA node eventually reach all parts of the heart through this specialized conduction pathway. The SA node is sometimes referred to as the pacemaker as it sets the pace for the heart beat. The **pacemaker** adjusts the rate, in accordance with the demands of the body.

In certain instances, the heart's rate and rhythm can become irregular (**arrhythmia**) and in some situations become life-threatening when:

**a)** Mechanical cells become deprived of oxygen, resulting in irregular heart beats,

**OR**

**b)** Cells which comprise the electrical conduction pathway become deprived of oxygen resulting in defective nerve impulses throughout the heart, generating both an abnormal electrical rhythm and irregular heart beat.



**A large proportion of heart attack casualties experience life-threatening arrhythmias. If these arrhythmias are not immediately treated, SCA is imminent.**



# *Heart Attacks*

## What Causes a Heart Attack?

**Heart Attack (Myocardial Infarction):** A **Heart Attack**, otherwise referred to as a **Myocardial Infarction** is the death of heart muscle cells in response to prolonged oxygen deprivation. Any phenomenon that completely interrupts the flow of blood through the coronary arteries will cause a heart attack. Culprits such as blood clots and fatty deposits lining the artery walls are common causes. When the heart muscle becomes completely deprived of blood and oxygen, the heart begins to fail and therefore, blood is not being adequately

circulated to the rest of the body. An oxygen-deprived heart muscle becomes susceptible to life-threatening electrical conduction disturbances called **arrhythmias**; the most common being **Ventricular Fibrillation**. Heart attacks are very serious and potentially life-threatening conditions which can ultimately lead to Cardiac Arrest.

## Heart Attack Effects on the Electrical Conduction Pathway of the Heart

When the heart muscle is deprived of oxygen and nutrients, it cannot efficiently beat/pump in a capacity which meets the requirements and demands of the body. When a casualty is suffering from a heart attack, heart muscle cells are negatively affected by the absence of blood, oxygen and nutrients and can begin to beat in a disorganized and chaotic fashion. These disorganized rhythms or arrhythmias, can have potentially life-threatening effects and if left untreated, will result in Cardiac Arrest.



**Increased Heart Rate:** If the heart is beating too fast, it cannot properly fill up with blood. This results in decreased blood and oxygen to the heart muscle itself and body tissues. Increasing the workload on an already damaged heart will have further damaging effects.

**Decreased Heart Rate:** If the heart is beating too slowly, there will be a decrease in the amount of blood reaching the brain and other vital organs. The diseased heart will not be able to meet the supply and demand requirements of the body.

**Conduction Pathway Disturbances:** If there is damage to the electrical conduction pathway through the heart, electrical chaos will result, producing two potentially lethal arrhythmias.

a) **Ventricular Fibrillation (VF, V-Fib) Fig. 1:** This is a lethal arrhythmia producing chaotic activity in the heart's ventricles, resulting in an inability of the heart muscle to contract and therefore circulate blood and oxygen to the heart and the rest of the body. This arrhythmia will always result in Cardiac Arrest.

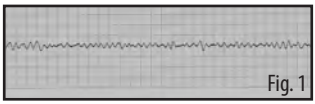



**Fig. 1 - Ventricular Fibrillation**

b) **Ventricular Tachycardia (VT, V-Tach) Fig. 2:** This is a potentially lethal arrhythmia where the heart's ventricles contract at a rate of 150-250 times/minute. This increased rate at which the heart is pumping, does not

allow for adequate filling of the hearts ventricles and results in a decrease in blood pumped to the rest of the body. A casualty cannot sustain this rhythm for very long and if left untreated, will result in what is called **Pulseless Ventricular Tachycardia** which is a state of Cardiac Arrest.

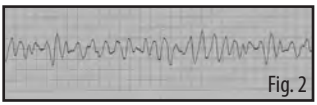



**Fig. 2 - Ventricular Tachycardia**

# *Applying The Principles Of Defibrillation*



Defibrillation is the delivery of an electric current or shock, from a Defibrillator. Current travels through the casualty's chest, reaching the heart muscle. The primary goal is to interrupt and discontinue a lethal arrhythmia, mainly that of Ventricular Fibrillation. This is an attempt to reset and restart the heart into a normal perfusing rhythm. If a normal heart rhythm is re-established, with the presence of a heart beat, the heart will now be able to circulate blood and oxygen throughout the body.

As noted earlier, the two most common lethal arrhythmias are **Ventricular Fibrillation** and **Pulseless Ventricular Tachycardia** both of which can be reversed with **prompt** Defibrillation. Therefore, as you can see, the proverbial medication for a casualty who is suffering from either of the two aforementioned lethal arrhythmias is that which comes from a Defibrillator.

**In order to provide a casualty of SCA the greatest chance of survival, the five key links in the Chain of Survival must be implemented as soon as possible.**

- Time to "first shock" is crucial and can be the difference between a successful resuscitation outcome and an unsuccessful one.
- With every minute that passes, a person who has suffered a SCA loses 10% chance of survival.
- CPR alone will not save lives, however, when CPR is started immediately after a casualty has suffered a SCA, and a Defibrillator is applied in less than 5 minutes, a casualty has upwards of 76% chance of survival.

- Survival rates from Sudden Cardiac Arrest can be very high if the Cardiac Arrest was witnessed by bystanders and prompt CPR and Defibrillation are initiated.

**How Automated External Defibrillators (AEDs) Work**

AEDs come equipped with

1. On/Off button
2. Display screen
3. Shock button
4. Battery
5. Defibrillator pads





AEDs are user friendly, computerized devices which evaluate the heart rhythm of a casualty who is in Cardiac Arrest. The AED uses verbal voice prompts guiding the First Aider every step of the way. In addition, display screens and indicator lights are utilized to allow for ease of use in these extraordinary and very stressful situations.

AEDs will **only** deliver a shock to a casualty who is in Ventricular Fibrillation or Pulseless Ventricular Tachycardia.

AED pads are to be immediately applied to a casualty's chest who is **unconscious/unresponsive** and **not breathing, breathing irregulary or gasping**. The First Aider will apply the two Defibrillator pads in the appropriate orientation on the casualty's chest. These two pads are the "eyes" of the AED and will analyze what specific electrical heart rhythm the casualty is in. If the AED detects the casualty to be in one of two lethal arrhythmias, Ventricular Fibrillation, or Pulseless Ventricular Tachycardia, then the AED will "charge up", as the casualty is in a "**Shock Advised**" rhythm and either:

**a)** Deliver a shock on its own, excluding the rescuer from actually administering the shock, termed "**Fully Automated**" Defibrillation,

**OR**

**b)** Prompt the rescuer to push the "shock button", specific to that device. "**Semi-Automated**".

**"No Shock Advised Rhythm":** If the casualty is **not** in one of the two lethal arrhythmias, V-Tach, or V-Fib then the device **will not** deliver a shock and will prompt the First Aider to begin CPR. A "No shock advised" voice prompt does

not mean the casualty has a pulse.

AED cabinets often sound an alarm when opened. This is normal and is meant to alert others that there is a medical emergency. The alarm can help summon help from people nearby and should not stop you from using the AED. If the cabinet alarms, continue with the AED and follow the device's instructions.

## Two Common Rhythms AEDs will Not Shock

If the AED determines a shock is not advised, it is likely the casualty is in an electrical rhythm that is not receptive to a Defibrillation shock. Two of these rhythms are;

**a)** Pulseless Electrical Activity (PEA)

**b)** Asystole (flatline)

Remember, as First Aiders, you are not responsible for determining what electrical heart rhythm a casualty is in. Your job is to attach Defibrillator pads to a casualty who is **unconscious/unresponsive and not breathing or gasping** and follow the voice prompts. If "no shock is advised" begin CPR.

## The Three Main Principles of Defibrillation

**1.** To determine whether a casualty is in a "Shock advised" or "No shock advised" rhythm.

**2.** To prompt the First Aider when an appropriate shock is advised, via voice prompts directed by the AED.

**3.** To have the First Aider deliver a Defibrillation shock in a safe and timely manner in an attempt to reset the heart into a normal electrical and perfusing (flowing) rhythm.

## Casualty Situations in Which an AED is Appropriate:

**1.** A casualty who has suffered a Sudden Cardiac Arrest.

**2.** A casualty who has suffered a drowning or near-drowning.

**3.** A pregnant casualty. It is safe to defibrillate a pregnant casualty. Follow procedures as you normally would with any SCA casualty. Remember to

place a towel, pillow or other object underneath the casualty's right hip, placing the pregnant SCA casualty slightly onto her left side, promoting an unobstructed return of blood to the heart.

### Situations in Which an AED May Not be Appropriate or Effective:

**1.** A casualty who is in Cardiac Arrest due to a major trauma generally responds poorly to Defibrillation. This casualty is generally not in Ventricular Fibrillation and requires full CPR, spinal immobilization, control of blood loss and prompt access to a trauma facility.

**2.** A casualty who is obviously dead should not have an AED applied.

**3.** An AED should not be attached to a casualty who is conscious and alert.

**4.** A casualty who is in a suspected hypothermic state generally does not respond well to Defibrillation. AEDs should still however be attached to a casualty who is suspected of having hypothermia, who is unconscious /unresponsive and not breathing. This casualty requires re-warming in order to have a chance of survival.



# *Applying The Knowledge Of Automated External Defibrillators (AEDs)*

### Three Functions of an AED

**1.** Assess the heart rhythm of a Sudden Cardiac Arrest casualty.

**2.** Prompt the First Aider to deliver a shock when indicated.

**3.** To have the First Aider deliver a Defibrillation shock in a safe and timely manner in an attempt to reset the heart into a normal electrical and perfusing rhythm.

## Necessary Steps Required to Safely and Effectively Operate an AED for a Sudden Cardiac Arrest Casualty

**1.** Determine Scene Safety (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).

**2.** Tap and shout and Determine Responsiveness.

**3.** If the casualty is unconscious, **call 9-1-1** and retrieve the AED.

**4.** A,B,C's.

**5.** If the casualty is unconscious and not breathing, breathing irregularly or gasping, begin CPR at a ratio of 30 compressions to 2 ventilations.



Recruit as many bystanders as you can to help with CPR.

**6.** Upon AED arrival, **DO NOT STOP CPR!**

**7.** The AED operator will now **Turn on the device.** **(Refer to Fig. 3)**

**8.** Prepare the casualty's chest by:

- **a)** Removing the casualty's clothes and bra, if necessary, with scissors.
- **b)** Removing any jewellery, medication patches, or anything that will interfere with defibrillator pad placement.
- **c)** Shave the casualty's chest with a razor in areas where pads are to be placed.
- **d)** Wipe the casualty's chest with a cloth ensuring it is dry.



**Defibrillator pads must be applied to a dry, bare, chest!**

**9.** Apply Defibrillator pads to the casualty's chest in the correct orientation **(Refer to Fig. 4).**

**10.** The AED will begin to "**analyze**" the casualty's rhythm once the pads are in place. If a shock is advised, the AED will prompt bystanders to "stay clear" and the device will begin charging.

**11.** Once the device is fully charged, the First Aider will conduct a quick survey of the immediate area, making sure no one is touching the casualty. The First Aider will shout, "I'm clear, everyone clear!", while simultaneously sweeping one hand overtop of the casualty **(Refer to Fig. 5)**. Once the sweep is complete and no one is touching the casualty, the First Aider will depress the "flashing shock button" **(Refer to Fig. 6).**

A First Aider should never be looking directly at the shock button when delivering a shock. Place your finger atop of the button and look at the casualty while you depress it. This will make sure no one touches the casualty while you are Defibrillating.

**12.** The AED will give a voice prompt stating it is now safe to touch the casualty. Begin CPR for a period of 2 minutes, approximately 5 cycles of 30 compressions: 2 ventilations.

**13.** After 2 minutes, the AED will reanalyze the casualty's heart rhythm and determine whether another shock is advised.

**14.** If "No shock is advised" the AED will prompt you to continue CPR. This does not mean the casualty has a return of spontaneous circulation and therefore, a pulse.



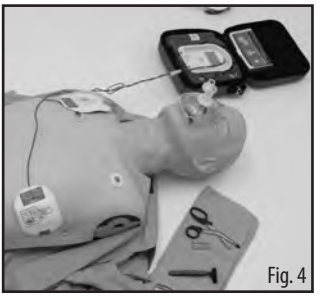
- If the casualty begins to cough or breath normally but remains unconscious, place the casualty in the Recovery Position, monitor A,B,C's every 30 seconds and make sure to leave the Defibrillator pads on the casualty in case he/she re-arrests.
- If the casualty is breathing but the rate and depth are not sufficient to sustain life, begin **CPR**.

**STEP 1**

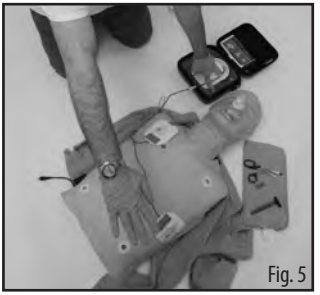


Fig. 3

**STEP 2**


Fig. 4

**STEP 3**


Fig. 5

**STEP 4**


Fig. 6

**Fig. 3 - Power on the AED**

**Fig. 4 - Defibrillator pads attached to a casualty's chest in the correct orientation**

**Fig. 5 - Ensuring no one is touching the casualty prior to depressing the flashing shock button**

**Fig. 6 - Do not take your eyes off the casualty while you depress the flashing shock button.**

## How to Use the AED in the Following Situations

**a) The casualty is lying on a wet or metal surface:** Both water and metal are conductors of electricity. If you encounter a situation in which a casualty is wet or found in a puddle of water, safely move the casualty to a dry area and dry as much of the casualty's chest as possible. If you encounter a situation in which a casualty is on a metal surface, (such as the case on a First Aid table), then no one should be touching the metal surface while the device is in use.

**b) Implantable Cardioverter-Defibrillators (ICD's)/Pacemakers:** These devices are generally located beneath the left collarbone/clavicle. AED pads must never be placed directly overtop these devices and should ideally be placed approximately 2 inches away from the device.

**c) A casualty wearing a medication patch:** You may encounter a casualty with a prescribed medication patch which adheres to his/her skin. Defibrillation pads should never be placed overtop of these patches. If the medication patch is interfering with pad placement, with a gloved hand, remove the patch, wipe the skin dry and then apply the Defibrillator pads.

**d) Hypothermic casualty:** A casualty who is in a suspected hypothermic state generally does not respond well to Defibrillation. AEDs should still however be attached to a casualty who is suspected of having hypothermia who is unconscious and not breathing. This casualty needs to be re-warmed in order to have a chance of survival.

**e) Pregnant casualty:** It is safe to defibrillate a pregnant casualty. Follow procedures as you normally would with any SCA casualty. Remember to place a towel, pillow or other object underneath the casualty's right hip. Place the pregnant SCA casualty slightly onto her left side, promoting an unobstructed return of blood to the heart.

**f) Child casualty:** AED use in children now includes infants (less than 1 year of age). For children 1-8 years of age, use a pediatric attenuator system if one is available or pediatric pads. If a First Aider provides CPR to a child in Sudden Cardiac Arrest and does not have an AED with pediatric capabilities or supplies then the First Aider should use the standard adult pads and place them in the anterior/posterior position. For infants less than 1 year of age, a manual defibrillator is the preferred device. If one is not available, an AED with a pediatric dose-attenuator system is the most desireable. If neither is available, use the standard adult pads and place them in the anterior/posterior position.



Reminder, most infant and child cardiac arrests are caused by asphyxia (lack of oxygen), therefore, quick recognition and the immediate initiation of compressions and ventilations (C,AB) can be extremely beneficial to the casualty.

**g) Electrocution:** If you suspect a casualty has been electrocuted, you must first ensure the scene is safe to approach. When you are convinced the scene is safe to approach (e.g. The source of the electrocution is turned off) begin normal AED protocols.



# *Applying The Knowledge Of AED Protocols*



**If the First Aider is uncertain as to whether the casualty is or is not breathing, begin chest compressions immediately.**

## AED Protocol for a "Shockable" Rhythm

**1.** Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).

**2.** Tap and shout and Determine Responsiveness.

**3. Call 9-1-1** and retrieve the AED.

**4.** Open the **Airway** if there is no suspected Head and/or Spinal injury.

5. Begin 5 second breathing scan. If the casualty is not breathing, breathing irregularly or gasping, begin chest compressions immediately. (C, A, B)
6. Begin CPR at a ratio of 30 compressions: 2 ventilations.
7. **Power on** AED.
8. Follow voice and visual prompts from the AED.
9. Prepare the chest appropriately and apply Defibrillation pads to dry bare skin.
10. AED analysis will now take place.
11. AED determines that a "**shock is advised**".
12. Perform a visual check and **clear everyone away from the casualty prior to shocking.**
13. While watching the casualty, **depress the flashing shock button.**
14. When the AED advises, **"it is safe to touch the casualty"** begin CPR at a ratio of 30:2 for 2 minutes, approximately 5 cycles.
15. After 2 minutes, the AED will re-analyze and determine if another shock is advised.
16. Continue previous steps until EMS arrival or casualty begins to move.

## AED Protocol for a "Non-Shockable" Rhythm

1. Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
2. Tap and shout and Determine Responsiveness.
3. **Call 9-1-1** and retrieve the AED.
4. Open the **Airway** if there is no suspected Head and/or Spinal injury.
5. Begin 5 second breathing scan. If the casualty is not breathing, breathing irregularly or gasping, begin chest compressions immediately. (C, A, B)
6. Begin CPR at a ratio of 30 compressions: 2 ventilations.
7. **Power on** AED.
8. Follow voice and visual prompts from the AED.
9. Prepare the chest appropriately and apply Defibrillation pads to dry bare skin.
10. AED analysis will now take place.

**11.** AED determines a **shock is "not advised"**

**12. Begin CPR immediately** at a ratio of 30:2 for 2 minutes, approximately 5 cycles.

**13.** AED will re-analyze the rhythm after 2 minutes and determine whether a shock is or is not advised.

**14.** Continue previous steps until EMS arrival or casualty begins to move.



# *Applying The Knowledge Of Casualty Transport When Using The AED*

## There are Four Principles when Transporting a Casualty who is Attached to an AED:

**1.** Vibrations created when a vehicle is in motion, as well as radio transmission/communication can both interfere with AED analysis of a casualty's rhythm and can be incorrectly interpreted as VF or VT.

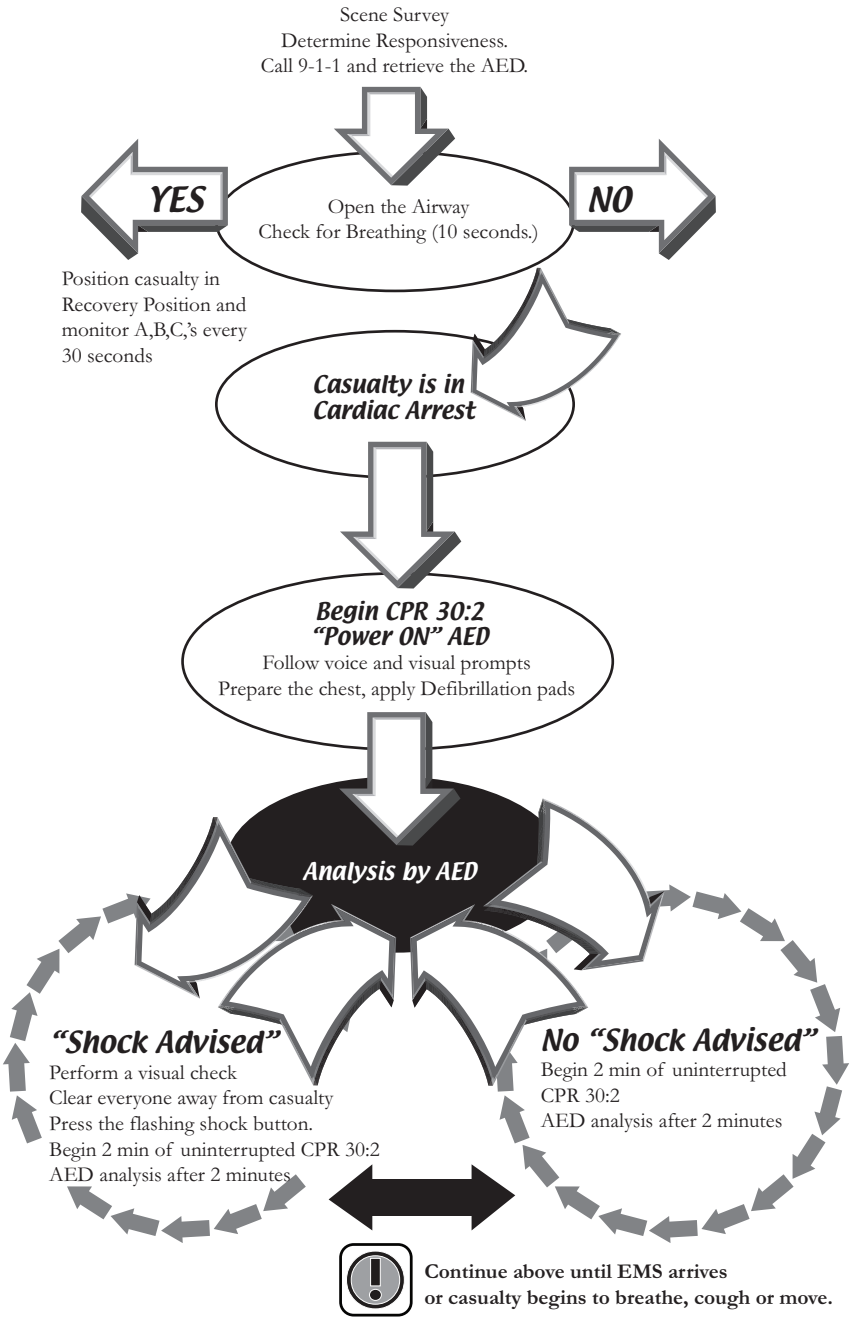
**2.** If you are transporting a casualty who is in Cardiac Arrest and the AED begins to analyze the casualty's rhythm, you must pull the vehicle over and cease all radio communication to allow for accurate AED analysis.

**3.** Once the vehicle has been stopped, ideally with the engines turned off, the AED can precisely analyze the casualty's rhythm indicating whether a shock is or is not advised.

**4.** If a shock is advised, it is safe to deliver a shock in the vehicle with no risk to other occupants.

# Automated External Defibrillation

## Algorithm for "Shockable" & "Non-Shockable" Rhythms



# *Applying The Knowledge Of Handover To EMS When Using An AED*

## Information Necessary to Have on the Casualty Record when Handing a Casualty over to EMS

As soon as a First Aider decides to help a person in need by getting involved in an emergency situation, the information gathering process begins. EMS and other emergency personnel will ask the First Aider(s) specific pertinent information related to the event and if known, events leading up to the emergency situation. Information which should be available to EMS is:

**1.** Whether the Cardiac Arrest was or was not witnessed by a bystander.

**2.** The approximate time of the Cardiac Arrest.

**3.** Whether and when CPR was initiated.

**4.** Number of shocks delivered by the AED.

**5.** Was there any change in the casualty's condition at any time throughout the emergency?

**6.** Was there a return of spontaneous Breathing and Circulation?

**7.** The events leading up to the Cardiac Arrest?

# Applying The Knowledge Of Delegated Medical Acts

## The Lines of Authority Which Must be in Place in Order for a Provider to use an AED On a Cardiac Arrest Casualty

Because of the ease and user-friendliness of AEDs, anyone with a basic understanding of how these devices operate may have the confidence to use one on a casualty who has suffered a Sudden Cardiac Arrest. The Good Samaritan Act (2001) as well as the recently enacted Chase McEachern Act (2007) protects First Aiders from liability when operating such devices. Ideally, those who are specifically trained and/or have taken certification courses specific to AEDs should use these devices in situations which warrant their use.



# Applying The Knowledge Of AED Maintenance

## Important Principles of AED Maintenance

AEDs are smart devices which conduct daily, weekly and monthly self checks ensuring the device is working properly and ready for use when called upon. Visual indicators, on the AED itself, are another way to check whether the device is functioning properly.

It is essential to get into a routine in which periodic self checks of the AED and its associated equipment are initiated.

# Applying The Knowledge Of Quality Assurance When Using AEDs

### Steps to Follow to Help Ensure AED Protocols are Met

**1.** Appropriately trained personnel with current CPR & AED certification.

**2.** Ensuring AED and equipment are maintained and ready for use.

**3.** Proper medical oversight.

**4.** Proper event recording and documentation if AED used in an event.

**5.** Ensuring AED is operational and supplies restocked after use with AED.



# Using an AED in the workplace

Indications for using an AED in the workplace are the same as anywhere else, if you need it, or think you could need it, get it!

Most medical emergencies, if severe enough or left untreated can lead to cardiac arrest, in this case you will need to have an AED present.

If you have any indication that the event may become worse, lose consciousness, or go into cardiac arrest, it is always best to retrieve the AED, you can always put it back if you don't need it.



**Major highlight: retrieving the AED is NOT the same as putting it on the person. Unless chest compressions have been started do not ever put the AED on someone who is awake or breathing. Putting the AED pads on someone is your very last**

**case scenario, and only happens AFTER CPR has been started. An AED is great to have on hand in emergencies in case it is needed, but not always necessary to put on the person**

## AED equipment inspection

**Automated External Defibrillator (AED) Equipment Inspection:**

**Purpose:** Regular inspections make sure the AED is ready to use in a sudden cardiac emergency. An AED that is missing parts, has expired pads, or shows a warning light may not work when needed.

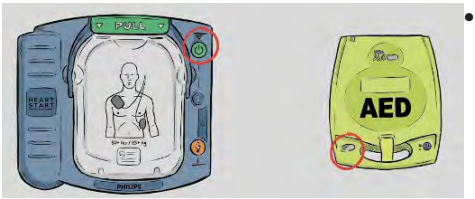
**Frequency:** At least once a month, after each use, or according to manufacturer instructions.



### Step 1. Locate and Check the AED Unit

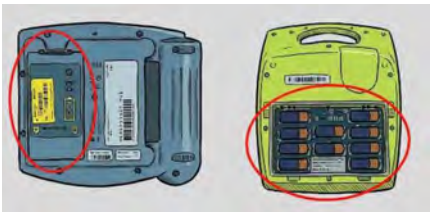
Confirm the AED is in its designated location. It should be stored in a visible, easily accessible place (such as a wall cabinet or mounted case).

1. Make sure the unit is clean, free of cracks, and not damaged.
2. Look at the status indicator light or screen:




- Most AEDs have a small light or symbol that flashes green when the device is ready, others may have a stable green checkmark, there are typically located in the top corner of the AED
- If the light is red, blank, or flashing an error symbol, or you see a red "X" the AED may not work.

### Step 2. Inspect the Battery



1. Confirm the battery is securely installed in the AED.
2. Check the battery's expiration date if applicable, usually printed on a sticker or label.
3. If your workplace requires it, confirm there is a spare battery stored nearby and that it is also within its expiration date.
4. Never use a battery that is expired, damaged, or missing.

### Step 3. Inspect the Electrode Pads




1. Locate the adult electrode pads inside the AED case or pouch.
2. Confirm they are in sealed, original packaging with no tears, punctures, or signs of moisture.
3. Check the expiration date on the pad package. Expired pads may not stick properly to the skin or deliver a shock correctly.
4. If required at your location, confirm pediatric pads are also available, sealed, and within expiry.

### Step 4. Check the Rescue Kit

Most AEDs are stored with a small kit of extra tools. Open the case or pouch and confirm the following items are present and in usable condition:

- A pair of gloves.
- Scissors (to cut clothing if needed).
- A razor (to remove chest hair if needed).
- A pocket mask or face shield (for rescue breaths).
- A small towel or wipe (to dry the chest if it is wet).

Oftentimes these kits may go missing over time, or it's possible to receive an AED without this kit. It is important that you replace any missing pieces so that you can use the AED when needed, if for example the razor is missing, you will not be able to apply the AED to someone with chest hair.

### Step 5. Confirm Signage and Accessibility

- The AED should be stored where it is visible and easy to access, this includes accessible for someone who is short or in a wheelchair.
- Ensure there are no boxes, furniture, or locked doors blocking the AED.
- Check that signage is present, such as a wall sticker or cabinet label that clearly says "AED."
- Instructions or diagrams near the device should be visible and easy to understand.

**Step 6. Record and Report**

1. Record the date of inspection, your name or initials, and the results in the AED log or inspection sheet.
2. If you find any issues such as expired pads, a missing rescue kit, or a red error light, report it immediately to the person responsible for maintenance. Do not leave an AED out of service without follow-up.

**Signs the AED May Not Be Ready**

- Status indicator shows red or error symbol.
- The battery is expired, missing, or loose.
- Pads are expired, missing, damaged, or not sealed.
- Rescue kit items are missing.
- AED is not in its proper location or is blocked.

If any of these are found, the AED should be considered not ready for use until corrected.

# Chapter 15
## Choking - Adult

When the topic of choking arises in conversation, most people cringe, suffer a mild to severe anxiety attack followed by a quick suggestion to alter the topic of conversation. Choking is real. It can happen to anyone, of any age and at anytime. A severe choking emergency can cause unconsciousness and death if not treated immediately and effectively; no one is immune.

**Choking** is a physical/mechanical obstruction of air (oxygen) from our environment into our lungs, causing a partial or complete cessation of breathing. If one cannot breath, asphyxiation is inevitable unless the obstruction is alleviated or corrected. If one cannot breathe, oxygen will no longer be delivered to the brain and minutes later, the heart will stop beating and one will be deemed clinically dead (no vital signs present).



Brain death begins approximately 4-6 minutes after your heart stops beating.

**Common Causes of Choking**

- Swallowing large pieces of poorly chewed or cut up food (e.g. hot dogs, grapes, peanuts, candy).
- Drinking alcohol prior to/or during meals.
- Eating while talking or laughing.
- Playing or running with objects or food in your mouth.
- Wearing dentures while you eat (prevents sensation of knowing if food is in small enough pieces to swallow).

### How to Prevent Choking

- Cut food into small pieces prior to eating.
- Chew food completely before swallowing.
- Decrease alcohol consumption prior to/and during meals.

- **DO NOT** walk or do physical activity while eating.
- Be overly cautious when eating foods containing bones.
- If you have allergies, be aware of your triggers.
- Avoid talking or laughing while eating.

**Considerations for Children**

- Children should only be fed when seated in a secure chair.
- Avoid feeding children while they are playing.
- **DO NOT** let children move with food or objects in their hand(s) or mouth.
- Feed appropriate food for the specific age of the child and cut into appropriate sizes.
- Make sure no small objects from toys or from the environment are present or available.
- Children should be kept away from balloons which can easily burst into many smaller pieces.

# *Recognizing Choking*

## Causes of Choking

**There are two causes of Airway Obstructions:**

1. **Mechanical Obstructions:** This occurs when the airway is blocked by a foreign object such as food, fluids (such as vomit or blood), toys, mucous etc…

2. **Anatomical Obstructions:** This occurs when the tongue physically falls back over the airway (such as, in an unconscious casualty) preventing breathing. Swollen tissues can also cause airway obstructions for example, in cases where a casualty has sustained upper airway burns or is suffering from a severe anaphylactic reaction.

## The Signs of Choking

### The Two Categories of Airway Obstructions, Partial and Complete

1. **Partial Airway Obstruction:** In this situation, air is still able to enter the lungs, albeit, often times in inadequate amounts to support brain and other vital body functions. A partial obstruction can easily lead to a complete obstruction.

**Good Air Exchange = Mild Obstruction**

### Signs and Symptoms of a Partial Airway Obstruction (With air exchange)

- Casualty may still be able to speak and therefore breathe.
- Wheezing sounds (Air passing through narrowed and inflamed respiratory passages).
- Clutching of the throat with one or both hand(s); "Universal Sign of Choking".
- Eyes bugging out.
- Coughing
- Face may appear red.
- Possibly gagging.




**Fig. 1 - Universal Sign of Choking**

When someone is choking, remember this: Breathe – Talk – Cough – Hands stay off unless they cannot effectively cough or breathe.

## Interventions by Age Group:

**Adults:** 5 back blows + 5 abdominal or chest thrusts (based on the situation)

**Children:** 5 back blows + 5 abdominal thrusts

**Infants:** 5 back blows + 5 chest thrusts

# *Providing First Aid for a Choking Adult*



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Ask the casualty if they are choking and if so…
- Have someone **call 9-1-1**.
- Inform the casualty you are trained in First Aid and are there to help him/her, if need be. If the casualty can still cough, breathe and speak to you then…
- **ENCOURAGE THE CASUALTY TO COUGH VIGOROUSLY!**
- **DO NOT TOUCH** the casualty!
- If the partial obstruction becomes a full obstruction→ **Begin 5 Back Blows followed by 5 Abdominal/Chest Thrusts and repeat**



- Stay with the casualty until the obstruction has been alleviated.
- Often times an adult casualty who is choking gets embarrassed and tends to go off on his/her own. Make sure you stay with the choking casualty and let him/her know you are there to help if required.



**A casualty who has a partial airway obstruction with a weak, ineffective cough and poor air exchange should be treated as if he/she has a full/complete airway obstruction and therefore should receive Abdominal Thrusts.**

**2. Complete Airway Obstruction:** A partial airway obstruction, can lead to a full/ complete airway obstruction resulting in a complete inability to breath, speak, or cough. This is an **EMERGENCY** and time is of the essence.



**Poor or No Air Exchange = Severe Obstruction**

**Signs and Symptoms of a Complete Airway Obstruction (No air exchange)**

- Casualty cannot speak.
- No air entry, therefore not breathing.
- Stridor (high pitched sound of air going through a very narrow opening).
- Clutching of the throat with one or both hand(s); **"Universal Sign of Choking"**
- Eyes bugging out and signs of panic.
- May have bluish/gray lips, skin and fingernail beds.



An adult casualty, on average, has 30- 60 seconds before going completely unconscious from a complete airway obstruction.

## First Aid Procedures for a Conscious Casualty Suffering from a Complete Airway Obstruction

- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Ask the casualty if they are choking and if so…
- Have someone **call 9-1-1**.
- Inform the casualty you are trained in First Aid and are there to help.
- Perform a combination of **Abdominal Thrusts** until the casualty goes unconscious or the obstruction is alleviated ("Pop until they Drop"). **(Refer to Fig. 2)**



- **Back Blows force vibration through the chest allowing the object to be dislodged and coughed up by the casualty**
- **Chest/Abdominal Thrusts produce an artificial cough for the casualty, to help alleviate the obstruction**

**How to Perform Back Blows (Adults and Children)**

Stand slightly behind the person.

Slide one arm under their arm, across the chest, aiming to reach their opposite shoulder.

If their size prevents this, secure the upper chest instead.

Support them as you bend them forward so the airway is angled downward.

Deliver 5 firm back blows between the shoulder blades.

Immediately bring them upright and transition into 5 abdominal or chest thrusts.

Rescuers must always be prepared for a sudden loss of consciousness and prevent the person from falling head-first.



**The Abdominal Thrust Technique (Refer to Fig. 2)**

**1.** Position yourself behind the casualty.

**2.** Place your dominant foot between the casualty's legs, with your opposite leg behind you for support.

**3.** Locate the casualty's hips and place your hands over top of them. From this landmark, move your hands to the center of the casualty's abdomen and locate the belly button.

**4.** Move two fingers above the belly button and make a side fist (your thumb should be flush with the casualty's abdomen).

**5.** Place your other hand over top of that side fist.

**6.** Place your head on one of the casualty's shoulders.

**7.** Use a forceful **"J"** motion (one fluid motion) with your side fist pressing in and up into the casualty's abdomen.

**8.** Continue this motion until the foreign body has been removed or the casualty goes unconscious.

- Always **call 9-1-1** even if the obstruction has been cleared by Abdominal Thrusts as this technique can cause internal injury.
- There is no specific force or depth requirement for Abdominal Thrusts. The rule of thumb is to use enough force to expel the object. If the first few thrusts were unsuccessful in clearing the airway, then use more force.




**Fig 2 - Abdominal Thrust Technique**

**First Aid Procedure for a Conscious→ Unconscious Choking Casualty or a Casualty Who is Found Unconscious**

- **Refer to CPR Algorithm Chart for techniques in CPR.**
- **Remember to look in the casualty's airway prior to ventilations for any foreign bodies and remove as required.**

## Special Considerations

How would one alleviate an obstruction in a casualty who is markedly obese or pregnant, in a wheelchair, too short or too tall? What do we do if we choke and no one is around??

**Chest Thrusts (Refer to Fig. 3, Fig. 4):** Instead of the typical Abdominal Thrusts whereby we push with a "J" motion in and up on the casualty's abdomen, here, we position our hands directly over the casualty's breastbone and apply only inward pressure. Chest Thrusts can be performed from behind the casualty, or from in front of the casualty. These are ideal for a casualty who is pregnant, obese, or if you have physical limitations. To landmark for Chest Thrusts, stand behind the casualty as you normally would if you were going to administer Abdominal Thrusts and straighten both of you arms out in front of you, positioning them underneath the casualty's armpits. Once your arms are extended and are beneath both armpits, bring both of your hands into the centre of the casualty's chest. Make a side fist with one hand and cover with your other hand. Apply inward pressure to the casualty's chest until the obstruction is alleviated or the casualty goes unconscious. There is no "J" motion, just inward thrusts.

- If you are close to a wall, you can place the casualty up against it and administer Chest Thrusts from the front. To perform Chest Thrusts from in front of a casualty place your heel of one hand in centre of sternum and interlock hands, keeping elbows locked and arms rigid.
- If you still cannot get into the correct position, you can place one hand over the casualty's shoulder and your other hand under his/her armpit, having both hands meeting in the centre of the sternum.







**Fig. 3, Fig. 4 - Chest Thrust Technique**

**Obese Casualties:** You may physically not be able to put yourself in the correct position of alignment to deliver Abdominal Thrusts effectively to an obese choking casualty, so align yourself for the administration of a combination of Chest Thrusts (From either in front of the casualty or behind the casualty, depending on the situation).**(Refer to Fig. 3, Fig. 4)**

**Pregnant Casualties:** A casualty in advanced stages of pregnancy will not benefit from Abdominal Thrusts due to her over-extended belly, and therefore, a combination of Chest Thrusts will be required for the alleviation of foreign body obstructions (From either in front of the casualty or behind the casualty, depending on the situation). **(Refer to Fig. 3, Fig. 4)**

If a pregnant woman goes unconscious or if you find an unconscious pregnant casualty, it is ideal to place a blanket or pillow under her right hip (approximately 2 inches in height). This will promote blood flow back to the heart, as the baby can physically restrict blood flow returning to the heart via the Inferior Vena Cava (major blood vessel).

**Wheelchair Casualties:** Chest Thrusts are also indicated for those in wheelchairs. If a First Aider is very close to a wall, put the chair up against it, apply the brakes and perform the procedure from in front of the casualty. If you are not close to a wall, quickly apply the brakes and begin Chest Thrusts. If you are able to position yourself behind the casualty, by having him/her lean forward in his/her wheelchair, you can perform Chest Thrusts from behind the casualty or you can place one hand over the casualty's shoulder and your other hand under his/her armpit, having both hands meeting in the centre of the sternum.

**Casualties too Tall or too Short:** If the casualty is too tall, have him/her kneel in front of you and administer Abdominal Thrusts. If you are dealing with a short casualty, such as a child, kneel behind the casualty and perform Abdominal Thrusts.

**IF YOU CHOKE: (Refer to Fig. 5)**

- **Call 9-1-1** immediately
- Try to cough forcefully if you can.
- Put yourself in public and try to make yourself visible whereby a bystander can come to your aid (leave your house, apartment etc...).
- Try to alleviate your obstruction using Abdominal Thrusts on yourself. If you are pregnant or obese, try attempting Chest Thrusts. Position yourself up against a wall for greater stability while performing these self-choking techniques.
- Use a solid object like a chair **(Refer to Fig. 5).** Position yourself with your hips just above the chair and press forcefully; so that the chair is being forced in and up into your abdomen producing an Abdominal Thrust.


Fig. 5

- Use objects such as hard plastic bottle, shaving cream cans, hard cover books, etc. and position these items 2 fingers above your navel and begin Abdominal Thrusts upon yourself.
- Make sure the chair is sturdy and not on wheels.

## *Providing Ongoing Casualty Care for a Casualty Whose Airway has been Cleared*

- **Unconscious casualty who is spontaneously breathing → Recovery Position and monitor A,B,C's every 30 seconds.**
- **Unconscious casualty who is not breathing, breathing irregularly, or gasping → CPR 30:2.**

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# Chapter 16
## Choking - Child

### Six Causes of Breathing Emergencies in Children and their Prevention

1. **Choking:** Children should only be fed when seated in a secure chair. **DO NOT** feed children while they are playing. **DO NOT** let children move with food or objects in their hand(s) or mouth.

2. **Asthma:** Make sure medications are available and not expired. At the first sign of an emergency dial 9-1-1.

3. **Allergic reactions:** Make sure medication is available, not expired and that a minimum of two EpiPens are available at all times.

4. **Injury:** Children should be properly supervised at all times. Parents and caregivers should be trained in First Aid and CPR.

5. **Illness:** Make sure your child's vaccinations are up to date and seek medical attention at the first sign of illness.

6. **Drowning:** Children should be properly supervised at all times in situations where water is involved and drowning a possibility.

# First Aid For A Choking Child

**Common Causes of Choking**

- Swallowing large pieces of poorly chewed or cut up food (hot dogs, grapes, peanuts, candy).
- Eating while talking or laughing.
- Playing, or running with objects or food in the mouth.

**How to Prevent Choking**

Cut food into small pieces prior to eating.

Chew food completely before swallowing.

- **DO NOT** walk or do physical activity while eating.
- Be overly cautious when eating foods containing bones.
- If you have allergies, be aware of your triggers.
- Avoid talking or laughing while eating.

**Considerations for Children**

- Children should only be fed when seated in a secure chair.
- **DO NOT** feed children while they are playing.
- **DO NOT** let children move with food or objects in their hand(s) or mouth.
- Feed appropriate food for the specific age of the child and cut into appropriate sizes.
- Make sure no small objects from toys or from the environment are present or available.
- Children should be kept away from balloons which can easily burst into many smaller pieces.

## Recognizing Choking in a Child

**1. Partial Airway Obstruction:** In this situation, air is still able to enter the lungs, albeit, often times in inadequate amounts to support brain and other vital body functions. A partial obstruction can easily lead to a complete obstruction.

**Signs and Symptoms of a PARTIAL Airway Obstruction (With air exchange)**

- Child may still be able to speak and therefore breathe.
- Wheezing sounds (Air passing through narrowed and inflamed respiratory passages).
- Clutching of the throat with one or both hand(s): "Universal Sign of Choking".
- Eyes bugging out.
- Coughing
- Face may appear red.
- Gagging

**2. Complete Airway Obstruction**: A partial airway obstruction can lead to a full/ complete airway obstruction resulting in a complete inability to breath, speak, or cough. **This is an EMERGENCY and time is of the essence.**

**Signs and Symptoms of a COMPLETE Airway Obstruction (No air exchange)**

- Child cannot speak.
- No air entry, therefore not breathing.
- Stridor (high pitched sound of air going through a very narrow opening).
- Clutching of the throat with one or both hand(s). "Universal Sign of Choking"
- Eyes bugging out and signs of panic.
- May have bluish/gray lips, skin and fingernail beds.

## First Aid for a Conscious Choking Child who has a Partial Airway Obstruction

**A First Aider must be able to both recognize and differentiate the signs and symptoms of a child who has an obstructed airway from:**

**a) Foreign Object:** For signs and symptoms of partial and complete airway obstructions.

**b) Infection (caused by injury or illness):** A child may have shortness of breath, wheezing, fever, or sore throat; all of which are symptoms of an Upper Respiratory Tract Infection. This should not be confused with choking. Seek medical attention if your child has any of the symptoms previously listed.

**c) Airway Swelling:** Anaphylaxis can cause swelling of the upper airway and respiratory tract which can appear as if a child is choking. Abdominal Thrust will be ineffective for this type of emergency. The correct treatment is epinephrine administration via an EpiPen.

**First Aid for a Conscious Choking Child who has a Partial Airway Obstruction**



- Scene Survey (Assess hazards, PPE, Obtain consent, support head/neck if suspected head and/or spinal injury).
- Ask child if he/she are choking and if so…
- Have someone **call 9-1-1**.
- Inform the child you are trained in First Aid and will be there to help, if need be. If the child can still cough, breathe and speak to you then…
- **ENCOURAGE THE CHILD TO COUGH VIGOROUSLY!**
- **DO NOT TOUCH** the child.
- If the partial obstruction becomes a full obstruction→**Begin 5 Back Blows followed by 5 Abdominal Thrusts.**
- Stay with the child until the obstruction has been alleviated.



**A child who has a partial airway obstruction with a weak, ineffective cough and poor air exchange should be treated as if he/she has a full/complete airway obstruction and therefore should receive Abdominal Thrusts.**

## First Aid for a Child with a Complete Airway Obstruction

**A child who has a complete airway obstruction has approximately 30 seconds before he/she will go completely unconscious.**

### a) A Conscious Child With a Complete Airway Obstruction



- Scene Survey (Assess hazards, PPE, Obtain consent, support head/neck if suspected head and/or spinal injury.
- Ask the child if he/she are choking and if so…
- Have someone **call 9-1-1**.
- Inform the child you are trained in First Aid and are there to help.
- Perform 5 Back Blows followed by 5 Abdominal Thrusts and repeat until the child goes unconscious or the obstruction is alleviated ("Pop until they Drop").
- Perform a Secondary Survey.
- Provide Ongoing Casualty Care.

### b) First Aid Procedure for a Conscious→Unconscious Choking Child or a Child who is Found Unconscious

**If you are alone with an infant or child casualty, who is unconscious/unresponsive and not breathing, prior to making the 9-1-1 call, administer 2 minutes of CPR.**

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# Chapter 17

## Choking - Infant

### Causes of Breathing Emergencies in Infants

1. **Airway Obstruction:** Infants commonly choke on small objects such as marbles, peanuts, small toys, grapes, etc…

2. **Illness:** Infants are susceptible to a variety of possible illnesses which can cause breathing emergencies.

3. **Poisoning:** Poisoning from certain chemicals and gases can cause breathing emergencies in infants.

4. **Suffocation Hazards and water emergencies** (e.g. blankets, toys, drowning).

### Six Measures to Prevent Breathing Emergencies in Infants

1. **Choking:** Infants should only be fed when seated in a secure chair. **DO NOT** feed infants while they are playing. **DO NOT** let infants move with food or objects in their hand(s) or mouth.

2. **Asthma:** Make sure medications are available and not expired. At the first sign of emergency, dial 9-1-1.

3. **Allergic reactions:** Make sure medication is available, not expired and that a minimum of two EpiPens are available at all times.

4. **Injury:** Infants should be properly supervised at all times. Parents and caregivers should be trained in First Aid and CPR.

5. **Illness:** Make sure your infant's vaccinations are up to date and seek medical attention at the first sign of illness.

6. **Drowning:** Infants should be properly supervised at all times in situations where water is involved and drowning a possibility.

# *First Aid For A Choking Infant*

**Common Causes of Choking**

- Swallowing large pieces of poorly chewed or cut up food (hot dogs, grapes, peanuts, candy).
- Eating while talking or laughing.
- Playing, or running with objects or food in the mouth.

**How to Prevent Choking**

- Cut food into small pieces prior to eating.
- Chew food completely before swallowing.
- **DO NOT** walk or do physical activity while eating.
- Be overly cautious when eating foods containing bones.
- If you have allergies, be aware of your triggers.
- Avoid talking or laughing while eating.



**Considerations for Infants**

- Infants should only be fed when seated in a secure chair.
- **DO NOT** feed infants while they are playing.
- **DO NOT** let infants move with food or objects in their hand(s) or mouth.
- Feed appropriate food for the specific age of the infant and cut into appropriate sizes.
- Make sure no small objects from toys or from the environment are present or available.
- Infants should be kept away from balloons which can easily burst into many smaller pieces.

## Recognizing Choking in an Infant

An infant cannot communicate that he/she is choking and in distress, so it is vitally important to become familiar with the signs and symptoms below to be able to quickly and accurately identify a true emergency when it is happening. Below are signs of breathing distress in an infant:

**Signs and Symptoms of a Choking Infant**

- Coughing
- Gagging
- Drooling
- Lethargy
- Stridor (high pitched whistling sound)
- No sound/no crying.
- Cyanosis (bluish around the lips)



- **An infant's airway is funnel-shaped, unlike the cylindrical shape of an adult's airway. For this reason, infants are more susceptible and at greater risk for choking/breathing emergencies.**
- **An infant who has a complete airway obstruction has approximately 30 seconds before he/she will go completely unconscious.**



## First Aid for an Infant who has a Partial Airway Obstruction when the Infant Is:

**a) Conscious:** Assess the infant's breathing and if he/she is still able to forcefully cough and breathe, do not interfere and monitor the situation. Be aware that a partial obstruction can very quickly turn into a complete obstruction.

If the conscious infant shows any of the previously listed signs and symptoms at anytime, you must act immediately by administering **5 chest thrusts.** Procedure to follow:



Fig. 6

**First Aid for a Conscious Choking Infant**
**(Back Blows Fig. 6)**

**1.** Hold the infant and support his/her head and neck.

**2.** Sandwich the infant between your forearms, and turn him/her face down.

**3.** Position the infant, so that his/her head is lower than his/her body, at approximately a 45 degree angle. Make sure to support the infant's head.

**4.** With your opposite hand, administer 5 back blows between the infant's shoulder blades.

**5.** Position the infant so he/she is now facing up.

**6.** Position the heel of your hand in between the armpits for chest thrusts.

**7.** Administer 5 chest thrusts; approximately 1 inch deep.

**8.** Repeat steps 3 through 7 until the airway is cleared or the infant goes unconscious.



**First Aid Procedure for a Conscious→Unconscious Choking Infant or an Infant who is Found Unconscious (Refer to CPR Algorithm)**

**If you are alone with an infant or child casualty, who is unconscious/unresponsive and not breathing, prior to making the 9-1-1 call, administer 2 minutes of CPR.**

**b) Infection (caused by injury or illness):** An infant may have shortness of breath, wheezing, fever, which are all symptoms of an Upper Respiratory Tract Infection. This should not be confused with choking. Seek medical attention if your infant has any of the symptoms previously listed.

c) **Airway swelling:** Anaphylaxis can cause swelling of the upper airway and respiratory tract which can appear as if an infant is choking. Chest Thrusts will be ineffective for this type of emergency. The correct treatment is epinephrine administration via an EpiPen.

## Follow-Up Care for an Airway Obstruction in an Infant

It is possible to sustain injuries from an episode of choking or by the First Aid procedures used to help alleviate an obstruction. It is for this reason that an infant previously choking should be seen by medical professionals, even if the infant is acting normal and appears to be suffering no ill effects.

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# Chapter 18
## Opioids

### Understanding Opioids

Opioids are powerful drugs that are commonly prescribed to manage moderate to severe pain, such as pain following surgery, injury, or certain medical conditions. They work by binding to specific receptors in the brain and nervous system, blocking pain signals and often creating feelings of calm or well-being.

When used exactly as prescribed, opioids can be effective for pain management. However, opioids also carry significant risks. Misuse can lead to dependence, addiction, and overdose, particularly when taken in higher doses, used more often than prescribed, or combined with other substances.

Over time, the body can develop a tolerance to opioids, meaning larger amounts are needed to achieve the same effect. When opioid use is reduced or stopped suddenly, a person may experience withdrawal symptoms, which can feel similar to a severe flu but are often more intense. These effects can make it difficult to stop using opioids and increase the risk of misuse.

Understanding how opioids work and recognizing their risks is essential for both personal safety and effective first aid response.

#### A Note on the Use and Misuse of Substances

Substance use refers to the consumption of alcohol, prescription medications, or other drugs for medical, recreational, or social purposes. Substance misuse occurs when these substances are used in a harmful way, such as:

- Taking more medication than prescribed
- Using substances to cope with stress or emotions
- Using illegal drugs or misusing prescription medications

Substance misuse disrupts normal brain function and can impair judgment, coordination, perception, breathing, and heart function. From a first aid perspective, this is critical because misuse can lead to life-threatening emergencies, including respiratory depression, cardiac arrest, seizures, and unconsciousness.

## What Are Opioids?

Opioids are classified as depressant drugs, meaning they slow down activity in the brain and nervous system, similar to alcohol. Medical professionals prescribe opioids to treat moderate to severe pain caused by conditions such as sports injuries, dental surgery, cancer, or major trauma.

Some opioids are also prescribed as part of opioid dependence treatment, such as methadone or buprenorphine, which help reduce cravings and withdrawal symptoms.

The term opiate refers specifically to drugs naturally derived from the opium poppy. The term opioid is broader and includes:

- Natural opiates
- Semi-synthetic opioids
- Fully synthetic opioids

All opioids work by binding to opioid receptors in the brain and blocking pain signals.

## How Opioids Work

Opioids affect nerve cells (neurons) throughout the brain and body. They attach to opioid receptors and send signals that:

- Reduce the perception of pain
- Create feelings of calm or euphoria
- Slow breathing and heart rate

When taken correctly under medical supervision, opioids can provide effective pain relief. However, slowing of breathing is also what makes opioids dangerous. If breathing becomes too slow or stops, oxygen levels drop and the person can die.

Repeated use can cause physical dependence, meaning the body relies on the drug to function normally. Withdrawal symptoms can be severe and may contribute to continued use and addiction.

## Types of Legal and Illegal Opioids

**Examples of legal prescription opioids include:**

- Codeine (found in Tylenol® 1, 2, and 3)
- Morphine
- Fentanyl
- OxyContin®
- Percocet®
- hydromorphone

This is not a comprehensive list, and many other prescription opioids are available.

Illegal opioids include heroin. In addition, substances such as fentanyl and carfentanil (a drug used by veterinarians for very large animals) are often mixed into illegal drugs without the user's knowledge, greatly increasing the risk of overdose.

## Risk, Bias, and First Aid

There is no single "type" of person who becomes addicted to opioids or experiences an overdose. Addiction and overdose affect people of all ages, professions, income levels, and backgrounds.

As a first aider, it is critical to:

- Avoid assumptions or judgment
- Focus on signs, symptoms, and patient care
- Set aside personal bias and stigma

Your role is to assess the situation and provide appropriate care, not to determine why or how the person uses substances.

Learners can explore more about opioids, addiction, and stigma through resources provided by the Government of Canada.

## What Is an Opioid Overdose?

An opioid overdose occurs when the body is overwhelmed by opioids from prescription medications or illegal drugs. Because opioids affect the part of the brain that controls breathing, high levels can cause breathing to slow to dangerously low levels or stop completely.

Without oxygen, the brain and heart are quickly damaged, leading to cardiac arrest and death if not treated promptly.

Approximately every 11 minutes, someone overdoses on opioids, and 94% of opioid overdose deaths are accidental. Early recognition and treatment can save lives.

### Signs of an Opioid Overdose

Signs and symptoms may include:

- Signs of sudden cardiac arrest
- Snoring, choking, or gasping sounds
- Slow breathing or no breathing
- Blue or purple lips and fingertips
- Tiny, pin-point pupils
- Pale or sweaty skin

You may also notice drug paraphernalia, empty pill bottles, or information from bystanders that helps explain what happened. Always use your first aid detective skills to assess the scene and patient.

### First Aid Procedure for Opioid Overdoses

Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).



- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- Administer naloxone if available and authorized
- Treat for Shock.
- Provide Ongoing Casualty Care

# *Naloxone/Narcan*

**Naloxone, also known as Narcan** is a medication used to reverse the effects of an opioid overdose. It works by quickly attaching to opioid receptors in the brain and blocking the opioids, which can restore normal breathing. Naloxone only works if opioids are present and will not harm someone if they are not experiencing an opioid overdose. Its effects are temporary, so emergency medical care is still required.

**There are two types of kits available, intranasal (IN) and intramuscular (IM)**

**How to administer naloxone:**

**Intranasal:**

1. Ensure scene safety.
2. Check responsiveness.
3. **Call 9-1-1** or direct someone nearby to call.
4. Open the airway and check breathing.
5. If the person is not breathing or breathing is slow/irregular, begin CPR and apply AED, consider naloxone if enough responders are present and it does not interfere with life-saving measures.
6. Remove the naloxone nasal spray from the package.
7. Tilt the head back slightly.
8. Insert the nozzle into one nostril until your fingers touch the nose.
9. Press the plunger firmly to deliver the full dose.
10. Continue monitoring and care as needed.
11. Wait 2–3 minutes.
12. If there is no improvement, give a second dose in the other nostril (if available).
13. Stay with the person until help arrives.

**Intramuscular:**

1. Ensure scene safety.
2. Check responsiveness.
3. **Call 9-1-1** or direct someone nearby to call.
4. Open the airway and check breathing.
5. If the person is not breathing or breathing is slow/irregular, begin CPR and apply AED, consider naloxone if enough responders are present and it does not interfere with life-saving measures.
6. Remove syringe from packaging.
7. If the kit contains ampules:
   a) Place the plastic breaker over the small part of the ampule
   b) Hold the plastic breaker with one hand, and the glass base with the other
   c) Push firmly with even pressure away from you, but not towards any other bystanders
8. Insert the needle into the medication and draw up as directed.
9. Select an injection site, thigh or upper arm (outer thigh preferred).
10. Insert the needle at a 90° angle into the muscle.
11. Push the plunger fully to deliver the medication, be aware most needles are self retracting and will retract fully once the medication is delivered.
12. Continue monitoring and care as needed.
13. Wait 2–3 minutes.
14. If there is no improvement, give a second dose if available, ideally on the opposite side from the first dose.
15. Stay with the person until help arrives.

**When Naloxone Might Not Work**

Naloxone (Narcan®) reverses the effects of opioids only. It will not reverse overdoses caused by:

- Alcohol
- Benzodiazepines
- Stimulants (e.g., amphetamines, ephedrine)
- Sleep medications



Naloxone will not harm the patient if opioids are not present, so it should still be given when an opioid overdose is suspected.

Many overdoses involve multiple substances, meaning naloxone may reverse the opioid effects while other drugs continue to affect the body. Ongoing monitoring and EMS care are still required.

**Note**

Naloxone kits are often available free of charge. You can search online in your area to find out how to obtain one. Carrying naloxone can save lives.

### Opioid Overdose and Cardiac Arrest

In almost all cardiac arrests, treatment remains the same:

- Start CPR immediately
- Use an AED as soon as it is available

**Exception:**

If cardiac arrest is suspected to be caused by an opioid overdose, naloxone may be used only if:

- There are enough responders present, and
- Giving naloxone does not delay or interrupt CPR or defibrillation

**CPR is always the priority. Never pause compressions to give naloxone.**

If you are alone:

- Start CPR and use the AED first
- Give naloxone only if it does not interfere with those life-saving steps

### Preventing Opioid Overdoses

Most opioid overdoses are preventable. Risk increases when opioids are misused, mixed with other substances, or used in unsafe situations.

**Ways to reduce risk include:**

- Use opioids only as prescribed. Never take extra doses or someone else's medication.
- Avoid mixing opioids with alcohol, benzodiazepines, or sleep medications. Ask a pharmacist or doctor if unsure.
- Be aware of tolerance. After a break, previous doses may become dangerous.
- Avoid street drugs. Many contain fentanyl even if they appear legitimate.
- Do not use alone. Having someone nearby increases survival if breathing stops.

# Chapter 19

## Severe Bleeding (Internal/External) and Wound Care

## *Dressings And Bandages Used In First Aid Procedures*

Dressings are used in First Aid procedures to cover injured parts, such as a wound. A dressing is a protective covering held in place by a bandage to help stop or at least control bleeding.

### Dressings in More Detail

**Characteristics**

**Dressings should be**

- Sterile, or as clean as possible to protect the wound from further contamination.
- Absorbent to keep the wound as dry as possible.
- Bulky to help manage severe bleeds.

**Used To:**

- Stop or control bleeding.
- Absorb blood from a wound.
- Prevent contamination.



Fig. 1

**Fig. 1 - Various dressings and bandages used in First Aid.**

**Improvised Dressings**

In situations where specific "First Aid" dressings are unavailable, one may improvise dressings. Examples of such dressings would be sheets, towels, pillow covers, maxi pads, diapers; all of which **should** have the following characteristics:

- Lint free (Avoid materials which will stick to wounds or leave material behind when the dressing is removed).
- Sterile
- Large enough to cover the injured area.



Materials to avoid are paper products, tapes or those which are rough and non-absorbent.

**Guidelines for Applying Dressings**

- Take **Universal Precautions** and wear gloves.
- Dressings should be clean or as sterile as possible to prevent any further contamination and risk of infection.
- Dressing should cover all of the wound area and a bit more, making sure the wound is completely covered.



- **Never** remove a dressing if there is "bleed through" (blood seeping through a dressing). Simply apply another dressing over top of the previous one.

- Dressings must be secured in place either by bandages such as "kling", tape or triangular bandages.

## Bandages in More Detail

The purpose of a **bandage** is to hold a dressing in place while providing some pressure to the injured area. Other roles of bandages are to secure an injured body part in place via immobilization and to help secure splints.

**Characteristics**

- Strong enough to secure a dressing and to keep applied pressure to an injury site.
- Long enough to secure a splint or immobilize an injured body part.

**Used To:**

- Secure dressings in place.
- Immobilize an injury site.
- Help secure splints.

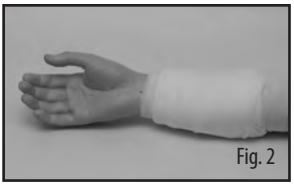

Fig. 2


Fig. 3

**Fig. 2 - Bandages secured overtop of a dressing.**
**Fig. 3 - Bandages securing a splint.**

**Improvised Bandages**

In situations where specific "First Aid" bandages are unavailable, improvised bandages can be used. Examples of such bandages would be scarves, ties, belts; all of which should have the following characteristics:

- Sterile
- Long enough to secure dressings and immobilize injury sites.

**Guidelines for Applying Bandages**

- Firmly apply to injury site for the control of bleeding.
- Firmly apply and secure appropriately to maintain immobilization.
- Circulation should be assessed before and after the application of a bandage (Assess pulse, motor and sensation of parts distal/below the injury site).

If circulation is compromised, the bandage must be loosened.

## Using a Triangular Bandage to Make a "Broad" and "Narrow" Bandage

**Broad Bandage:**

**Broad bandages** are commonly used to hold splints in place or for the application of pressure over a broad or large wound area.

**Narrow Bandage:**

**Narrow bandages** are commonly used to help immobilize a fracture or to help secure dressings.

## How to use a Roller Bandage




**Description:** Roller bandages are rolls of gauze or other sterile fabrics which aid in securing dressings in place and help protect injured parts of the body.

**Fig. 4 - Roller Bandages**

# *Recognizing Major Wounds*

## Definition of a Major Wound

A **wound** is any type of injury which results in damage to soft tissues of the body. A wound can be classified as either **internal** or **external**. An **external** wound refers to any injury where the skin has been broken by a tear or penetration. An **internal** wound occurs when a blunt force injury/trauma to the skin has resulted in a contusion/bruise. A **major wound** is any external or internal wound with the potential for causing life-threatening quantities of blood loss.

## Amputations

An **amputation** is the complete removal of a body part (e.g. finger).

### Partial Amputation

Some degree of soft tissue remains connected. Depending on the degree of injury, some partial amputations can be surgically repaired.

### Complete Amputation

A **complete amputation** is a full/complete severing of a part of the body. No bone, blood vessels, soft tissue etc… remain attached at the site of amputation.

- Bleeding is generally not as severe with complete amputations since blood vessels constrict and retract at the site of injury. Together with the application of direct pressure and the protective response by the body, this combination generally aids in controlling blood loss at the amputation site.

- Amputated body parts should be brought to the hospital for possible reattachment.
- Amputated body parts should be wrapped in moistened sterile dressings, placed in a bag and then placed on ice. **( Never put ice directly onto amputated body parts)**

# *Recognizing Severe External And Internal Bleeding*

## External and Internal Bleeding

Blood vessels have often times been compared to pipes in a house. In your house, the pipes carry water. In your body, the pipes carry or facilitate the transport of blood. Pipes are not meant to break and when they do, serious damage can occur; whether it is water damage in your house or a severe bleed in your body. **Bleeding** can be defined as blood which escapes from damages blood vessels and body tissues.

**a) External Bleeding:** Blood which escapes from a damaged blood vessel through an open tear in the skin. External bleeding is visible to the eye.

**b) Internal Bleeding:** Blood which escapes from damaged blood vessels and tissues from inside the body. There is no external wound, hence internal bleeding cannot be seen. Certain signs and symptoms can lead one to suspect a casualty is suffering from an internal bleed.

## Arterial vs. Venus Bleeding

**Arterial bleeding** is a result of damage to an artery. Arterial bleeding is bright red (oxygenated) blood which spurts each time the heart beats. This type of bleed can potentially lead to major blood loss, hypovolemia, Shock, and eventual death if not treated immediately.

**Venous Bleeding** is a result of damage to a vein. Dark red (deoxygenated) blood flows steadily from the injured area due to the fact that veins are under less pressure than arteries. This type of bleed is easier to stop than an arterial bleed but can be just as deadly if left untreated.

- An average adult has a total of 5 L of circulating blood volume.

- Infant and children have between 75-100ml/kg of circulating blood volume.



Children cannot tolerate large amounts of blood loss. Bleeds must be arrested immediately in children with the application of direct pressure.

## Signs and Symptoms (S/S) of Severe Bleeding

Signs and symptoms will vary depending on the type of bleed (arterial or venous); the mechanism of injury as well as the amount of blood loss sustained either internally or externally. Severe blood loss, as mentioned, will lead to Shock and eventual death.

| External | Internal (Signs and Symptoms of Shock) |
|---|---|
| Presence of blood (arterial or venous) | Pale, cool, clammy skin |
| Pain | Faintness, dizziness |
| Swelling and/or discolouration | Thirst and nausea |
| In addition to S/S of shock | Restlessness, and/or anxiety |
| | Weak, rapid pulse |
| | Bluish lips, nail beds, earlobes |
| | Shallow, rapid breathing |
| | Changes in level of awareness |
| | Swelling or bruising at injury site |
| | Swollen, tender, or rigid areas of the body |

## How to Recognize Bleeding

**a) External bleeding**, as described previously, can be either venous or arterial. Venous bleeds are more common, as veins are located closer to the skin, whereas arteries are situated deeper in the body for protection. Arterial blood is bright red and spurts with each beat of the heart whereby a venous bleed is dark red and oozes steadily under less pressure.

**b) Internal bleeding** is blood which escapes from damaged blood vessels and tissues from inside the body. It generally occurs from injuries involving a blunt force trauma, such as in the case when an unrestrained driver, in a motor vehicle collision, hits his/her chest on a steering wheel. Penetrating injuries such as stab wounds or gun shots can also cause significant internal bleeding and injury.

- Blunt force or penetrating injuries to the head, neck, chest, abdomen, or pelvis have the potential to cause significant internal injury and should be treated as medical emergencies.

**Internal bleeding is not as easily recognizable as external bleeding. Specific signs will lead you to suspect a casualty is suffering from internal bleeding.**

**1.** Casualty is coughing up blood.

**2.** Blood is visible from the ear, nose, or back of the eye.

**3.** Dark, coffee ground blood, or bright coloured blood found in a casualty's vomit.

**4.** Rigid, distended, swollen appearance in the abdomen.

**5.** Compound fractures (bones penetrating through the skin), can result in internal bleeding.

**6.** Dark, black, tarry-looking bowel movements are indicative of an upper gastrointestinal bleed whereas bright, red stools can either be caused by hemorrhoids or a lower gastrointestinal bleed.



Individuals who take supplemental Iron can have grayish, tarry looking stools. This is not an indication of internal bleeding.

# *First Aid For Wounds With Severe External Bleeding*

## First Aid Principles for Wounds with Severe External Bleeding

The principles for the treatment of a severe bleed whether arterial or venous in origin are the same; **APPLY DIRECT PRESSURE**!



**Remember your PPE, especially when dealing with blood and/or body fluids**

**First Aid Procedure for Severe Bleeds**

- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- Have the casualty **Rest** (Place in Shock Position if necessary and if tolerated by the casualty).
- If there is an associated fracture in conjunction with a bleed, **DO NOT** manipulate or aggravate the fracture. Leave in the position found and apply direct pressure
- Apply **Direct Pressure** using a pressure dressing and then bandage the wound **(Refer to Fig. 5)**.
- The casualty can apply direct pressure to themselves prior to the arrival of First Aid supplies.
- Treat for Shock.
- Provide Ongoing Casualty Care.

**Fig. 5 - Bandages secured overtop of a dressing**




- **Use of pressure points to control severe bleeding is no longer recommended. Research has shown that the use of pressure points is not effective in controlling bleeding.**

**Important Notes on the Application of Dressings**

- Apply one dressing at a time.
- Once applied, never take off a dressing unless it is causing harm. (e.g., impeding circulation, wrong placement)
- Always assess for "bleed-through" from the first dressing and if present, apply a second dressing over top of the first and so on…

# *Providing First Aid For Amputations And The Care Of Amputated Tissue*

There are two classifications of amputations; **partial** and **complete.** Some degree of soft tissue remains connected in a partial amputation, whereby a complete dissociation of a body part occurs with complete amputation.

The potential for successful reattachment of amputated tissue in a hospital setting does exist and is dependant on a number of factors. In order for this to even be a possibility for a casualty, it is important to locate and appropriately handle partially or completely amputated tissue.

## First Aid for Partial Amputations



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- Apply a thick, sterile moistened gauze dressing to the affected area.



- If possible, depending on the site of the partial amputation, a splint may secure the body part in place, in conjunction with a dressing and bandage.



- Bandage the partial amputation.
- Treat for Shock.
- Provide Ongoing Casualty Care.

**First Aid for a Complete Amputation**



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- Have the casualty **Rest** (Place in Shock Position if necessary and if tolerated by the casualty).
- Apply **Direct Pressure** using a pressure dressing and then bandage the wound.
- Wrap the amputated body part in a clean, sterile, moistened dressing and place into a watertight plastic bag. Place this bag, into another bag containing ice or an ice pack.
- Record the date, time and name of casualty directly onto the bag.
- Treat for Shock.
- Provide Ongoing Casualty Care.

# *Tourniquets*

**What Is a Tourniquet?**

A tourniquet is a device used to control severe, life-threatening bleeding from an arm or leg by applying tight circumferential pressure to stop blood flow past the injury.

Uncontrolled bleeding is one of the leading preventable causes of death in trauma. When direct pressure alone is not enough, a tourniquet can be life-saving.

## When a Tourniquet Is Indicated

A tourniquet should be used for life-threatening external bleeding from an arm or leg when:

- Bleeding is heavy, continuous, and not controlled with direct pressure
- Blood is spurting or pooling rapidly
- There is a partial or complete amputation
- The wound is large, deep, or visibly severe
- It is unsafe or impractical to maintain direct pressure (e.g., multiple casualties, scene hazards)

**Key principle:**

Life over limb: Saving the person's life always takes priority over the risk of limb injury.

## Where a Tourniquet Can Be Used:

- Arms and legs only
- Never on the neck, chest, abdomen, or pelvis
- Tourniquets will not work effectively on, right above, or below the joint (within 1 inch)

## Tourniquet Application: Step by Step

1. Ensure scene safety
2. Expose the limb if possible to locate the bleeding source
3. Position the tourniquet:

    **Place 5–7 cm (2–3 inches) above the wound**

    **Do not place directly over a joint (elbow or knee), if 2-3 inches above the wound is a joint, place 2-3 inches ABOVE that joint**

    **If the wound location is unclear, place the tourniquet as high as possible on the limb**

4. Tighten the tourniquet until: **Bleeding stops completely**
5. Secure the tourniquet so it cannot loosen.
6. Note the time the tourniquet was applied
7. Do not remove it

8. **Call 9-1-1** or ensure EMS is on the way
9. Monitor the casualty for shock until help arrives

**Important Safety Points**

- Tourniquets will be painful, pain is expected and does not mean it is applied incorrectly
- Once applied, a tourniquet must not be loosened or removed by a first aider
- Only trained medical professionals should remove a tourniquet in a controlled setting
- Reassess the casualty frequently while waiting for EMS
- You may notice the limb below the tourniquet becomes pale or cyanotic, this is expected with a tourniquet and is not a sign to remove it

**Contraindications & Limitations**

Do not use it for minor or controllable bleeding

Do not use it on non-limb injuries

Do not place over joints or bulky objects in pockets

Improvised tourniquets such as a belt or rope are not effective and should not be used as they cannot get and stay tight enough to restrict circulation

# *Recognizing Inadequate Circulation To Extremities And Providing Appropriate First Aid*

## Causes of Impaired Distal Circulation

## Signs and Effects of Impaired Distal Circulation

Certain injuries can impair and even completely cut off circulation to body parts. Even certain First Aid procedures, such as bandaging, can impair circulation. Whatever the cause, when circulation becomes impaired, tissues

are starved of vital oxygen, and nutrients. As well, waste products produced by the cells begin to accumulate, which in itself can have a detrimental effect. Eventually, without adequate circulation, tissues will begin to die and a loss of a limb may result.

As First Aiders we can control some of these situations. Bandaging too tightly can result in impairment of circulation distal/below an injury site. For this reason, it is important to remember not to bandage too tightly. As well, remember that swelling is common with most injuries and this too can result in an impairment of circulation. Take this into consideration when applying dressings and bandages.

It is important to assess circulation distal/below an injury site prior to the application of dressings and bandages and again after the application process. To assess circulation, follow these steps:



Remember to assess the uninjured side and compare it to the injured side.


Fig. 6

**Fig 6. - Assessing for a radial pulse after the application of dressings and bandages.**

**Assess PMS**

**a) Pulse:** Make sure there is a pulse present and note its volume (e.g. full, weak etc…). If there is a weak pulse, or no pulse present, this can be a medical emergency. [Health Care Providers Only]

**b) Motor:** Assess the limb for movement of fingers, toes etc…, to determine whether or not there is a compromise in neuromuscular status (nerves and muscles).

**c) Sensation:** Ask the casualty if he/she can feel his/her injured side. Circulation impairment may cause a decrease in sensation.

**d) Capillary Refill Test:** Press on a nailbed and release. The nail should turn white and return to red/dark pink in under two seconds. If there is a delay in the capillary refill, circulation may be impaired.

**e) Assess Skin Temperature and Colour:** If the limb is cold, and looks pale, especially when compared to the uninjured side, this could mean circulation is in fact impaired.

### Steps to Improve Distal Circulation when a Limb has been Bandaged



- Dressings and bandages may need to be loosened or repositioned if a casualty has a weak or absent pulse, impaired motor skills, a decrease in sensation or anything else indicative of impaired or compromised circulation after the application of a dressing and bandage.
- Moving a limb, without obvious major trauma or fractures, may increase or promote circulation which otherwise may have been compromised. Movement should be towards the body's natural anatomical position.

# *First Aid For Internal Bleeding*

Internal bleeding refers to blood which escapes from damaged blood vessels and tissues from inside the body and generally occurs from injuries involving a blunt force trauma.

The major Signs and Symptoms of Internal Bleeding (Shock) are:

- Pale, cool, clammy skin.
- Faintness, dizziness.
- Thirst and nausea.
- Restlessness, and/or anxiety.
- Weak, rapid pulse.
- Bluish lips, nail beds, earlobes.
- Shallow, rapid breathing.
- Changes in level of awareness.
- Swelling or bruising at injury site.
- Swollen, tender, or rigid areas of the body.

### First Aid for Suspected Internal Bleeding



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).



- **Call 9-1-1**.
- A,B,C's.
- Treat the cause of the Shock (e.g. If there is a severe bleed, apply Direct Pressure).
- Rest and reassure the casualty.
- Provide oxygen if available.
- Provide a blanket and keep the casualty warm.
- **DO NOT** provide the casualty with anything to eat or drink.
- Place the casualty in the Shock Position if indicated, tolerated and if there is no suspected Head and/ or Spinal injury.
- Provide Ongoing Casualty Care.

# *Measures Taken To Prevent Further Contamination And Infection Of Wounds*

### Two Types of Minor Soft Tissue Injuries

**Wound:** Any injury resulting in damage to soft tissues of the body.

Wounds can be further defined as either "open" or "closed". **Open** wounds are injuries that break the skin.



- A break in the skin can leave a host (casualty) susceptible to infection by microorganisms.
- Blood loss can occur when there is a break in the skin and can range from mild to severe.

**Categories of Open Wounds**

**a) Punctures:** Injuries resulting from penetration by a narrow object, such as glass, a knife, animal bites or insect stings. These injuries do not cause impalements.

**b) Lacerations:** A cut, which can leave the skin with torn, jagged, or smooth edges. Lacerations are commonly caused by objects which have sharp edges, such as a knife.



The deeper the laceration into the soft tissue, the greater the potential for damage to muscles, nerves and blood vessels.

**c) Abrasions:** An injury causing a scraping or rubbing away of the skin.



- Abrasions may be painful as damaged skin leaves nerve endings exposed.
- Abrasions should be disinfected; decreasing the likelihood of infection.

**d) Avulsions:** An injury resulting in either a partial or complete tearing of a piece of skin or other tissue.

**First Aid Treatment for Punctures, Lacerations, Abrasions and Avulsions**



Remember PPE, especially when dealing with blood and/or body fluids.



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- **Rest** the casualty.
- Apply **Direct Pressure** to the injury site to arrest the bleed.
- Clean the area using a soap and water solution or antiseptic solution.
- Apply a clean, sterile dressing to limit susceptibility to further injury and infection.
- Treat for Shock.
- Provide Ongoing Casualty Care.



If you are dealing with an avulsion injury, gently manipulate the skin back into its original anatomical position, if possible. Apply direct pressure and secure.

**Closed Wounds**

**Closed wounds** are injuries which occur beneath the skin. These injuries present with no physical damage to the skin, hence the skin's integrity remains intact. A bruise/contusion is an example of a closed wound.

**Bruise/Contusion:** Injuries which are a result of a blunt force trauma. Trauma to soft tissues and blood vessels causes bleeding beneath the skin→Internal bleeding.

## Five Measures to Prevent Further Contamination and Infection of Wounds

**1.** Wear non-latex medical exam gloves.

**2.** Prevent further contamination by not breathing or touching a wound.

**3.** Gently rinse off excess debris from the surface of a wound.

**4.** Dry the area around a wound. Always wipe away from a wound using sterile dressings.

**5.** Use clean, sterile dressings and secure in place, over a wound.

## How to Clean a Minor Wound

**1.** Clean with a soap and water solution.

**2.** Dry thoroughly.

**3.** Apply antibiotic cream.

**4.** Cover with clean, sterile dressings.

## First Aiders Role in the Prevention of Tetanus

Tetanus is a serious medical condition caused by toxins released from the bacteria *Clostridium tetani*. These bacteria are commonly found in soil, animal feces and dust. Bacterial spores may enter a wound and start to release their deadly toxin. This toxin causes severe muscle spasms, **"Lock Jaw"**, and can produce severe breathing difficulties. If left untreated, this disease can be fatal. Prevention is the key in combating this disease. Tetanus shots and boosters

along with proper wound care are vital steps in preventing this potentially deadly disease. As a First Aider, you must advise a casualty to seek medical attention if the wound is caused by an animal bite or if animal feces or soil have potentially contaminated the wound.

### The Signs of Infection (General/ Systemic and Local)

- Fever
- Headache
- Vomiting
- Redness
- Pain
- Body aches / Chills
- Nausea
- Weakness
- Swelling
- Warmth
- Yellow/green discharge from an injury site (pus)
- Red-streaking around a wound (very serious)

# *Using Dressings, Bandages And Slings In First Aid Procedures*

### Characteristics of Dressings, Bandages and Slings and Their Uses

**Dressings** are used in First Aid to cover injured parts, such as a wound. A dressing is a protective covering held in place by a bandage to help stop or at least control bleeding.

The purpose of **Bandages** is to hold a dressing in place while providing some pressure to the injured area. Other roles of bandages are to secure an injured body part in place via immobilization and to help secure splints.

**Fig. 7 - Various dressings and bandages used in First Aid.**

**Slings** are designed to support and protect a casualty's arm. They are generally used to help support injuries to the wrist, hand, forearm and elbow. Slings can also be used to stabilize and prevent further injury, for example, when a casualty has a suspected clavicle fracture.



Fig. 7

## Slings used in First Aid

**Arm Sling:** When injuries are sustained to the forearm, hand, wrist or elbow an arm sling can be used to provide support, limit movement and decrease pain.

**Tubular Sling:** When injuries are sustained to the collarbone or shoulder, or when a severe bleed from the hand is present, a tubular sling can be used to support the injured side; thus providing pain relief and decreasing the risk of further aggravation of the injury. A tubular sling displaces the weight from the injured side to the uninjured side.

## Ways to Improvise Dressings, Bandages and Slings

**Improvised Dressings or Bandages**

- Towels
- Shirts
- Clean linen.
- Sanitary napkins.
- Triangular bandages.
- Clean towel.
- Paper towel.
- Diapers
- Pillow covers.

**Improvised Slings**

- Shirts
- Belts
- Scarves
- Triangular bandages.
- Rope that is padded.

# *Controlling External Bleeding From A Wound With An Embedded Object*

**Impaled objects** are objects such as knives, glass, nails, pencils, etc…which are forcefully driven into a casualty without their removal and are therefore embedded.

**Impaled Objects are generally always left in place because:**

- Additional trauma may occur if the object is removed (nerve and blood vessel damage).
- The impaled object will often times prevent external bleeding, acting as a cork, preventing further blood loss. However, internal bleeding is almost certain with these types of injuries.

**There are however, several exceptions:**

Trained medical professionals such as paramedics will remove an impaled object if:

**a)** It is preventing the medical professional from gaining access to a casualty's airway. For example, if the casualty requires assisted or full ventilatory support, or if there is an obstructed airway.

**b)** It is preventing a medical professional from administering proper CPR. The object is subsequently removed and a dressing is placed overtop of the wound to prevent further blood loss while CPR is administered.

**c)** It is impeding/preventing transport of the casualty to a medical facility.

## First Aid for a Wound with an Embedded Object



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- **DO NOT REMOVE THE OBJECT!**
- Use bulky dressings to stabilize the object, from its base, in the position found **(Refer to Fig. 8)** and secure with bandages **(Refer to Fig. 9)**.



- Make sure not to move the object when securing it in place as further damage may result.
- Bleeding can be controlled with the application of bandages overtop of the dressings.



- Treat for Shock.
- Provide Ongoing Casualty Care.

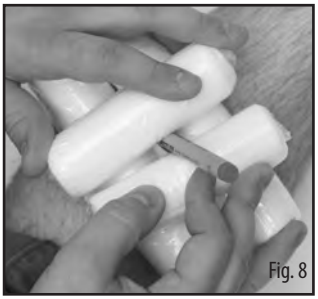

Fig. 8


Fig. 9

**Fig. 8 - "Log Cabin" technique**
**Fig. 9 - Log cabin secured with bandages**

**A "Log Cabin" (Refer to Fig. 8) can be constructed around the base of the embedded object using bulky dressings or gauze which has been rolled up. Ring bandages may also be used if available. All dressings should be secured in place with bandages (Refer to Fig. 9)**

# *Controlling Bleeding From The Nose, Gums, Tongue And Cheek*

## How to Control Bleeding from the Nose

a) **Nose bleeds** often occur as a result of a blunt object such as an elbow or basketball hitting the nose. Nose bleeds which occur spontaneously and with no blunt injury may be a result of high blood pressure/hypertension and are generally harder to stop. Regardless of the cause of the nose bleed, the treatment is geared towards minimizing blood loss and arresting the bleed.

**1.** Position the casualty in a comfortable **upright sitting position** (decreases pressure in the veins going to the nose) with his/her **head tilted downward** (Do not tilt the head back as this can cause the casualty to swallow blood and potentially vomit).

**2.** Have the casualty pinch the "fleshy-part" of both nostrils with equal pressure using his/her thumb and index finger for approximately 10 minutes.

**Once bleeding has stopped, to prevent a reoccurrence of the bleed, discourage the casualty from:**

**1.** Blowing his/her nose for at least two hours after the event.

**2.** Picking his/her nose.

**3.** Bending down.

**If bleeding lasts longer than 20 minutes, or if the Mechanism of Injury suggests a possible Head and/or Spinal injury, maintain the casualty in the position found, secure his/her head and neck and seek medical attention immediately.**

b) Bleeds to the **gums, cheek and tongue** are mainly injuries to soft tissues and can be controlled using the same principles as when treating soft tissue injuries. If bleeding occurs **inside the mouth**, apply clean, sterile dressing and have the casualty apply direct pressure to the wound. If the bleed is on the **inside of the cheek**, apply direct pressure in the direction of the injury. If there is a **puncture**, (for example a tooth has created a hole through the cheek) then apply clean, sterile gauze on either side of the injury while applying direct pressure.

- Be aware of any loose teeth as they can become choking hazards.
- If the Mechanism of Injury suggests a possible Head and/or Spinal injury, maintain the casualty in the position found, secure his/her head and neck and seek medical attention immediately.

# *Tooth Injuries*

**Causes:** Blunt force trauma and falls involving the mouth

**Signs and Symptoms of Tooth Injuries**



- Bleeding
- Swelling
- Broken, loose or dislodged tooth/teeth

**First Aid for Tooth Injuries**



- Apply direct pressure in the empty socket with a clean, sterile dressing
- Tilt head downward to allow for drainage of blood
- Place tooth (holding the crown-end) in container of milk (name, date, time), water, or clean cloth
- Go directly to dentist or if injury severe **call 9-1-1**



- **DO NOT** clean or disinfect the tooth
- **DO NOT** wash out the mouth once bleeding has stopped
- **DO NOT** handle the tooth by the broken, cracked or root-end



- **If the Mechanism of Injury suggests a potential Head and/or Spinal injury, leave the casualty in the position found and secure the head and neck.**

# *First Aid for a Wound in the Palm of the Hand*



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- **Rest** the casualty.
- **Direct** pressure. Have the casualty apply direct pressure to the wound while waiting for First Aid supplies.
- Apply thick bulky sterile dressings or rolls of gauze inside the palm of the casualty.
- Have the casualty bend his/her fingers overtop of the dressings, making a fist, and secure with a triangular bandage.



- If the casualty is unable to make a fist due to a fracture or other injury, place dressings or rolled gauze in the centre of the casualty's palm and secure in place, without moving the casualty's fingers.



- Treat for Shock.
- Provide Ongoing Casualty Care.

# *Recognizing Abdominal Wounds*

The abdomen houses major organs of the Digestive, Endocrine (hormones) and Urinary systems along with many major blood vessels. Abdominal injuries are often the result of either blunt or penetrating traumas with injuries often hard to detect. Injuries to the abdomen can cause significant internal organ damage and rupture, along with severe internal or external bleeding and Shock. As a First Aider, it is vitally important to look at the Mechanism of Injury in helping you determine what potential injuries the casualty may have sustained as these types of injuries often present with absent or minimal signs and symptoms.

## Definition of an Abdominal Wound

Abdominal wounds can either be **"open"**, or **"closed"**.

**Open:** With this category of wound, the skin has been broken. Abdominal organs may or may not be visible protruding from the injury site.

**Closed:** The skin remains intact in "closed" wounds, however internal organs, blood vessels and tissue may be significantly damaged with the potential for significant internal bleeding.

### Signs and Symptoms of Abdominal Wounds

- Abdominal pain/tenderness.
- Nausea/vomiting.
- Distension or rigidity of the abdomen.
- Abdominal bruising.
- Organs protruding from abdomen.

- Guarding of the injured area (abdominal muscles tense to protect injured organs).
- Pale, cool, moist skin.
- Weakness
- Thirst
- Shock

# *First Aid For An Abdominal Wound*

## First Aid for an Abdominal Wound

**If the Mechanism of Injury suggests a potential Head and/or Spinal injury, leave the casualty in the position found and secure the head and neck.**

**a) Organs not protruding**



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout) and secure the head if you suspect a Head and/or Spinal injury.
- **Call 9-1-1**.
- A,B,C's.
- **DO NOT** apply direct pressure.
- Position the casualty on his/her back with his/her head and shoulders raised slightly.
- Bend the casualty's knees up and place rolled up blankets or pillows underneath for support (This will allow the muscles of the abdomen to relax).
- Treat for Shock.
- Provide Ongoing Casualty Care.

**b) Organs protruding**



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout) and secure the head if you suspect a Head and/or Spinal injury.



- **Call 9-1-1**.



- A,B,C's.
- Position the casualty on his/her back.
- **DO NOT** apply direct pressure.
- **DO NOT** attempt to push the organs back into the abdomen.
- Apply moist sterile bulky dressings loosely over the wound to prevent further contamination and drying out of abdominal contents.
- Place plastic wrap, if available, overtop of the dressings and secure with tape. If plastic wrap is not available, secure dressings with tape or triangular bandages.
- Place a towel or folded cloth overtop of the dressing to preserve heat.
- Position the casualty on his/her back with his/her head and shoulders slightly raised.
- Bend the casualty's knees up and place rolled up blankets or pillows underneath for support (This will allow the muscles of the abdomen to relax and prevent the wound from becoming larger).
- Treat for Shock.
- Provide Ongoing Casualty Care.

## Two Major Complications Which May Result From Abdominal Wounds

**1. Severe internal** or **external bleeding** causing Shock.

**2.** Severe contamination and infection may result. Ruptured abdominal organs can leak their contents into the abdominal and chest cavities. Open abdominal wounds put the casualty at risk for invasion by microorganisms.

# Chapter 20
## Chest Injuries

## *Recognizing Chest Injuries*



The chest is comprised of our ribcage, overlying muscles and cartilage. It is the protective cage under which extremely vital and highly sensitive organs and structures operate to sustain life. Below our ribcage you will find such familiar structures as the heart, lungs, aorta and major blood vessels, along with the esophagus (eating tube), trachea (breathing tube) and special muscles involved in breathing. When the chest sustains extensive injuries, multiple organ systems can be negatively affected, triggering a cascade of potentially catastrophic events, often life-threatening and potentially lethal.

Significant chest injuries are often a result of **blunt traumas** (motor vehicle collisions, high falls, violent acts etc…), **penetrating trauma**s (gun shot wounds, stab wounds, impaled objects etc…) or both. Chest injuries can be categorized as either being **"open"** or **"closed"**. An **"open"** injury is often the result of torn skin, due to an object which has penetrated the chest cavity, or from broken ribs, which can potentially create a penetration in the chest wall. A **"closed"** injury of the chest occurs when the skin has not been broken and integrity of the skin remains intact. Chest injuries account for 20% off all deaths related to trauma and result in 160,000 deaths per year in the United States.

### Three Types of Chest Injuries

**a) Penetrating Chest Wound:** Objects, such as a bullet, penetrate the chest wall and enter the chest cavity, potentially damaging vital organs and tissue. Unwanted atmospheric air rushes into the wound cavity and has the potential to cause serious adverse effects.

**b) Fractures of the Rib Cage:** Blunt force traumas are the most common cause of fractured ribs. These injuries are generally very painful and most often not life-threatening. Ribs have the potential to fracture in more than one area, resulting in loose sections of rib cage which tend to move in opposite direction from the rest of the chest each time a casualty breathes. When two or more adjacent ribs are broken in two or more places, it is termed a **Flail Chest**. When a fractured chest segment moves in the opposite direction of normal chest movement, it is termed **paradoxical movement**.

**c) Blast injury:** These injuries occur when a casualty is exposed to certain pressures which are produced from explosions. Energy in the form of heat and pressure are released when a volatile substance explodes (e.g. a bomb). This can cause fractures, burns, penetrating injuries and the potential for internal organs to rupture.

### Three Serious Effects of Chest Injuries

**1.** Severe breathing/respiratory distress.

**2.** Internal organ, blood vessel, or tissue rupture/damage.

**3.** Severe internal bleeding.



## *Recognizing A Penetrating Chest Wound*

Injuries to the chest, which leave an open wound, allow for air to enter the chest cavity which otherwise, should not be there. This unwanted air can be of detriment to the normal operation of the lung(s), causing collapse, which can lead to significant breathing difficulties and eventual death of the casualty if not promptly treated. Air entering the chest cavity is called a **Pneumothorax**. A pneumothorax will not always have an open wound associated with it. Certain individuals (tall thin males under the age of 40, asthmatics) are at greater risk for a spontaneous pneumothorax (non traumatic). **Rib fractures** can also cause a pneumothorax. Penetrating chest wounds may also be referred to as **Sucking Chest Wounds** because as the casualty breathes in, air is sucked into the wound cavity and when he/she breathes out, air and blood escape.

### Signs and Symptoms of a Penetrating Chest Wound

- Shortness of breath.
- Sudden chest pain on the injured side.
- Chest tightness.
- Painful and/or difficult breathing.
- Air can be heard/seen bubbling from the wound. Blood may or may not be visible.
- Changes in level of awareness (depending on the degree of lung collapse).



# *First Aid For A Penetrating Chest Wound*

### The Aim of First Aid for a Penetrating Chest Wound

The primary goal/objective when treating P**enetrating Chest Wounds** is to try to limit and preferably stop atmospheric air from entering the chest cavity, while allowing for excess air and blood to escape/drain through the wound. If too much air enters the chest cavity, the affected lung will begin to collapse and the casualty will begin a downward spiral towards an extreme medical emergency called a **Tension Pneumothorax**

**First Aid for a Penetrating Chest Wound**



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout) and secure the head if you suspect a potential Head and/or Spinal injury.
- **Call 9-1-1**.
- A,B,C's.
- Cover the open chest wound immediately with the casualty's hand or a bystander's hand to prevent further movement of air into the wound.

- Position the casualty in a position which makes breathing easier and less painful. This is generally accomplished by placing the casualty in a semi-sitting position, leaning slightly towards the injured side.
- Seal the wound with a **three-sided air tight dressing (Refer to Fig. 1)**. Tape the object on **three** sides, with the fourth side open, with no tape. This design allows for air to escape and blood to drain when the casualty exhales and will prevent air from entering the wound when the casualty inhales.

- Materials such as plastic bags, cellophane, non latex medical gloves can all be used to construct the three-sided dressing.

- Treat for Shock.
- Provide Ongoing Casualty Care.

- Remember Universal Precautions.
- If you suspect a Head and/or Spinal injury, leave the casualty in the position found and support his/her head.




**Fig. 1-Three-sided air tight dressing**

**If a penetrating chest wound is accompanied by an impaled object, leave the object in place and apply a three-sided air tight dressing around the object and secure with tape or bandages.**

## Types of Materials used to seal a Penetrating Chest Wound

Plastic bags, cellophane, non latex medical gloves are a few examples of materials that can be used to construct the three-sided dressing for penetrating chest wounds.

## Signs and Symptoms of a Developing Tension Pneumothorax and its Respective First Aid

A **Tension Pneumothorax** is a potential lethal side effect, originally caused by a pneumothrax, in which air has built up in the chest cavity to a dangerous level, and has not been able to escape, causing a complete collapse of a lung. This lung collapse causes a physical shift inside the chest cavity of vital structures and organs, mainly that of the heart and major blood vessels. This shift in structures physically blocks blood from returning to the heart from the rest of the body and causes a disruption in the heart's ability to properly beat. This is a true medical emergency and if left untreated will most certainly lead to death of the casualty.

### Signs and Symptoms of a Developing Tension Pneumothorax

- Shortness of breath.
- Restlessness.
- Anxiety/agitation.
- Cyanosis (bluish skin colour).
- Changes in level of awareness.
- Distended neck veins.
- Painful and/or difficult breathing.
- Rapid heart beat.
- Easy to fatigue.
- Sudden chest pain/tightness.



### First Aid for a Developing Tension Pneumothorax



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout) and secure the head if you suspect a potential Head and/or Spinal injury.
- **Call 9-1-1**.
- A,B,C's.
- Position the casualty in a position of comfort in which breathing is made easier.



- If a three-sided air tight dressing was applied, remove it for several seconds to let air escape and then reseal. Make sure air does not enter the wound when the casualty inhales and that air can escape when the casualty exhales.
- Treat for Shock.
- Provide Ongoing Casualty Care.

### Immediate Medical Attention for a Tension Pneumothorax

As noted earlier, a **Tension Pneumothorax** is a true medical emergency and if left untreated, will result in death. A casualty cannot sustain this emergency for very long before they go into Cardiac Arrest. There are medical treatments available both by EMS and in a hospital setting which can reverse this deadly condition. Immediate 9-1-1 with the appropriate First Aid treatments can provide a casualty with a greater chance of survival while awaiting EMS arrival.

## *Recognizing A Flail Chest*



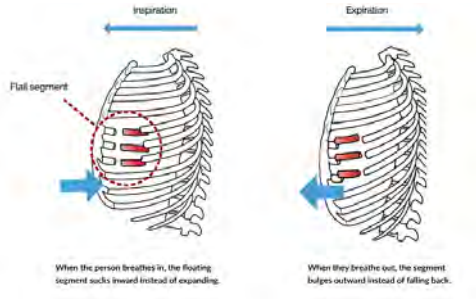
### Definition of a Flail Chest

**Flail Chest:** A Flail Chest occurs when two or more adjacent ribs are broken in two or more places. It is generally caused by a significant blunt force trauma (motor vehicle accident, serious fall etc…). The fractured segments are no longer a part of the chest wall and are therefore free floating pieces of bone. Certain anatomical changes occur when a casualty suffers from a flail segment. When the casualty inhales, the flail segment does not expand as does the rest of the chest wall and gets pulled back into the chest. When the casualty exhales, the flail segment pushes outward, where the rest of the chest wall is brought inward. This type of movement, noted earlier, is termed **paradoxical movement**. Breathing is often made difficult for a casualty suffering from flail segments because of the discrepancy in chest movement. Often times the force required to cause a flail segment is enough to cause a bruising of the underlying lung, causing further respiratory distress.

- Always suspect a Head and/or Spinal injury in a casualty who has sustained blunt force trauma significant enough to cause a flail segment.
- Remember, the rib cage encompasses 360°and flail segments can occur anywhere along the rib cage, including the back and armpits.
- Flail segments as well as sharp boney ribs can potentially puncture or lacerate the lungs causing bleeding and a potential pneumothorax.

### Signs and Symptoms of a Flail Chest

- Paradoxical chest movement.
- Painful and difficult breathing.
- Bruising and/or discoloration around the injury site.
- Sound of bone rubbing on bone at the fracture site.
- Pain on and around the fracture site.
- Casualty may be in a particular position to support or splint his/her injury.
- Anxiety
- Shock






# *First Aid For A Flail Chest*

### The Aim of First Aid for a Flail Chest

**The aim of treatment for a casualty suffering from a flail chest is to:**

**1.** Minimize pain associated with the injury.

**2.** Promote functional and effective breathing.

**3.** Decrease the amount of tissue damage.

**4.** Prevent potential lung laceration and bleeding.

**5.** Minimize the potential for a pneumothorax.

## First Aid for a Flail Chest



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout) and secure the head if you suspect a potential Head and/or Spinal injury.
- **Call 9-1-1**.
- A,B,C's.
- Stabilize the flail segment immediately with your hand, the casualty's hand or with aid from a bystander.



- Gentle pressure applied to the flail will aid the casualty in breathing by minimizing the amount of paradoxical movement experienced.



- Bulky dressings or a pillow, secured by long strips of tape or triangular bandages, can also be used to stabilize the flail segment.
- Position the casualty in a position of comfort, generally in a Semi-Sitting position or in the Recovery Position with the injured side supported by the ground.

**The main goal is to promote ease and effectiveness of breathing.**

- Treat for Shock.
- Provide Ongoing Casualty Care.



**Do not wrap bandages around the entire circumference of a casualty's chest as this may impede the ability to breathe.**

# *Recognizing A Rib Fracture And Providing First Aid*

## Signs and Symptoms of Closed Fractures of the Rib Cage

Fractures of the ribs are usually a result of a blunt force trauma striking the casualty's chest. These types of injuries are generally very painful and can cause significant bruising and tenderness at the injury site. Breathing is also affected with rib fracture injuries as breathing tends to be very painful with normal or deep breathing. As a result, the casualty is often observed taking shallow breaths.



**Signs and Symptoms of Closed Fractures of the Ribs**

- Bruising and tenderness at and around the injury site.
- Painful and shallow breathing.
- Chest pain.
- Pain on movement.
- Chest wall deformity.
- Casualty is observed splinting his/her injury to relieve pain.

## First Aid for a Rib Fracture



- Position the casualty in a position of comfort; one which makes breathing easier.
- Minimize movement.
- Use an object, such as a rolled up blanket or small pillow to help immobilize the injured area.
- Treat for Shock.
- Provide Ongoing Casualty Care.



**Rib fractures can be categorized as either open or closed and have the potential to cause major internal damage due to sharp bone ends piercing internal organs and other structures.**

# *Recognizing A Blast Injury To The Chest And Providing First Aid*

## How to Recognize Blast Injuries to the Chest and Internal Organs

A large number of Canadians work in industries such as mines, refineries, factories, the military, chemical plants, ship yards and so on, where explosions are a particular occupational hazard. Explosions have three phases or three Mechanisms of Injury which can result in varying injuries a casualty can sustain, with varying degrees of severity. Blast injuries can result in significant trauma to a casualty's chest and internal organs which can be life-threatening. When treating a casualty of a blast injury, always be aware of the different Mechanisms of Injury as well as the source of the explosion to help determine potential injuries.





**Be on the lookout for multiple casualties in situations involving an explosion.**

### The Three Phases of Explosions

**Phase 1:** The pressure wave created from the blast can travel up to speeds of 10,000 feet per second. The majority of injuries sustained from this phase are to gas containing organs such as the lungs, bowel and eardrum.



Be aware of life-threatening breathing emergencies.

**Phase 2:** Injuries are sustained when fragments of material become projectiles, such as glass or explosive device fragments, causing penetrating injuries and wounds to the casualty.

**Phase 3:** A casualty may be thrown against other objects from the sheer force of the blast or have debris collapse onto him/her.

When dealing with a casualty of a blast injury, be aware that no obvious signs and symptoms of trauma may be evident, however, the initial pressure wave of the explosion could have caused significant damage to a casualty's lungs and chest cavity. Chest pain and coughing up of blood, along with shortness of breath are common signs of a blast injury. Other injuries sustained from blasts are fractures, open wounds, burns to the face as well as the body and impaled objects from projectiles or shrapnel.

## First Aid for Blast Injuries to the Chest and its Contents



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout) and secure the head if you suspect a potential Head and/or Spinal injury.
- **Call 9-1-1**.
- A,B,C's.
- Place the casualty in a position of comfort. Semi-sitting is generally well tolerated if no suspected Head and/or Spinal injury.
- Treat any injuries sustained in the blast.
- Treat for Shock.
- Provide Ongoing Casualty Care.



## Recognizing a Pneumothorax and Providing First Aid

A **pneumothorax** occurs when there is a hole in the lung, a hole in the chest, or a hole in both.

Before getting into different types of pneumothorax, it's important to understand some definitions.

| Term | What it Means | What's happening inside the chest | Examples |
|---|---|---|---|
| **Closed** | Air leaks from the lung into the chest cavity, but there's no open wound | The air comes from inside the body | Spontaneous pneumothorax, Traumatic pneumothorax from blunt force trauma |
| **Open** | There's an open wound in the chest wall letting air move in and out | Air enters from outside the body | Traumatic pneumothorax (stab, puncture, etc.) Penetrating chest injury |
| **Tension** | Air gets trapped and can't escape, causing pressure to build | Pressure pushes on the heart and other lung — life-threatening | Can develop from either open or closed pneumothorax |
| **Hemothorax** | Means blood. A hemothorax is when blood (not air) fills the space around the lung | The lung gets compressed and oxygen levels drop | Usually from trauma (vehicle crash, broken ribs, etc.) |

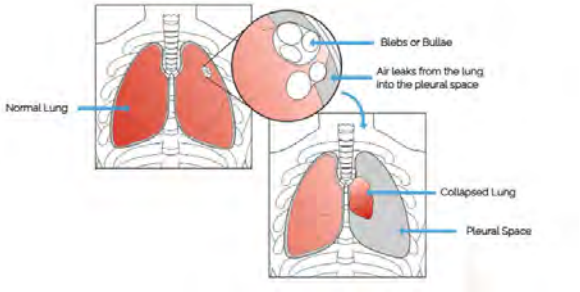


### 1. Spontaneous Pneumothorax (closed)

**What is happening:**

Air leaks from a small weak spot on the surface of the lung into the space between the lung and chest wall.

This trapped air makes the lung collapse partly or fully.




**Why it happens:**

- A weak area on the lung (called a "bleb") bursts
- Can occur after coughing, stretching, or even at rest
- Sometimes linked to asthma, COPD, or smoking, but can also happen in healthy, tall, thin people

**Signs and symptoms:**

- Sudden, sharp chest pain (usually one side)
- Shortness of breath
- May feel tightness or pressure in the chest
- Rapid breathing or increased effort to breathe
- Sometimes mild cough

**Treatment for first aiders:**

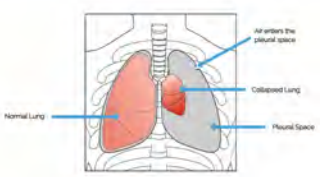
- **Call 911**
- Sit the person upright to make breathing easier
- Stay calm and reassure them
- Monitor breathing and level of responsiveness



**2. Traumatic Pneumothorax (can be open or closed)**

**What is happening:**

Air enters the chest cavity due to an external injury, such as a broken rib or penetrating wound. This air pushes against the lung, causing it to collapse.




**Why it happens:**

- Penetrating chest wound (e.g., knife, debris, bullet)
- Blunt trauma (car crash, sports impact)
- Rib fracture puncturing the lung

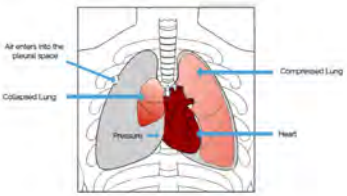
**Signs and symptoms:**

- Obvious chest injury or bruising
- Shortness of breath
- Pain at the site of injury
- Rapid heartbeat and pale or bluish skin
- Bubbling or sucking sound from the wound

**Treatment for first aiders:**

- **Call 911**
- If there's an open wound: Cover it with a dressing taped on 3 sides only to let air escape but not enter (refer to sucking chest wound)
- Leave any object stuck in the chest in place - stabilize it with bulky dressings
- Sit the person upright if possible and monitor breathing

### 3. Tension Pneumothorax (open or closed)




**What is happening:**

Air enters the chest cavity and becomes trapped, building pressure inside. This pressure squeezes the lung, pushes the heart and other lung to the side, and blocks normal blood flow.

**Why it happens:**

- Untreated or worsening pneumothorax
- Air enters through a one-way valve effect (goes in but can't escape)
- Can occur from major chest trauma or even mechanical ventilation

**Signs and symptoms:**

- Severe shortness of breath and distress
- One side of the chest may look larger or rise less when breathing
- Neck veins may bulge
- Skin may be pale, blue, or clammy
- Rapid pulse, anxiety, confusion, or collapse

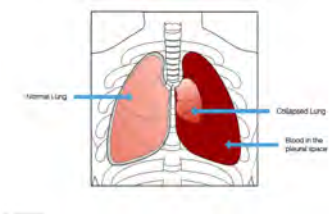
**Treatment for first aiders:**

- Call 911
- Sit the person upright if they can tolerate it
- If there's an open wound: Cover it with a dressing taped on 3 sides only to let air escape but not enter (refer to sucking chest wound)
- Loosen tight clothing
- Be ready to start CPR if they become unresponsive

**4. Hemothorax (open or closed)**

**What is happening:**

Blood collects between the lung and chest wall. The buildup of blood prevents the lung from expanding and can cause shock from internal bleeding.




**Why it happens:**

- Direct trauma to the chest (vehicle accident, fall, stabbing, gunshot, rib fractures)
- Sometimes occurs with a pneumothorax (hemopneumothorax)

**Signs and symptoms:**

- Shortness of breath
- Chest pain that worsens with breathing
- Signs of shock: pale, cool, clammy skin, rapid weak pulse, dizziness
- Coughing up blood (in some cases)
- Bruising or visible injury over ribs

**Treatment for first aiders:**

- **Call 911**
- Keep person sitting upright if breathing is easier
- Control any visible external bleeding
- Monitor breathing and be ready to begin CPR if needed

# Chapter 21
## Burns

Burns have the potential to cause devastating injuries and can result in extensive physiological damage as well as emotional and physical scarring. Burns can be extremely painful and debilitating, resulting in high mortality rates or long, arduous periods of rehabilitation. According to the American Burn Association, 1 million burn injuries occur each year with 4500 resulting in death. Approximately 70% of burn injuries to children are a result of scalds while 20% are a result of child abuse. Individuals between the ages of 18-35 are at highest risk for burn injuries and casualties over the age of 65 have a much higher risk of death than those of the general population. The risk of mortality associated with a burn injury depends on several factors; the size of the burn, increasing age of the casualty, the presence of inhalation injury, gender, and socioeconomic status.

The skin is not the only organ which can be detrimentally affected by burn injuries. If the burn surface is large enough, multiple organs systems can be severely affected, including the heart, lungs, kidneys and so on.

There are four different sources of energy that are responsible for causing burn injuries: **Thermal** (hot or cold), **Chemical, Electrical** and **Radiation**. Now is a perfect time to slide in a quick anatomy lesson on the skin in order to gain an understanding of how burns affect us.

**The skin is the largest organ in the body and comprises 15% of our total body weight.**

**Functions of the Skin**

a) To provide protection for underlying tissue.

b) Enables Vitamin D synthesis.

c) Protection from microorganisms.

d) Temperature regulation.

e) Immune System protection.

f) Maintenance of fluid balance.

**Three Major Layers of Skin (Fig. 1)**

**Epidermis:** Thinner, outermost layer of skin.

**Dermis:** Thicker, middle layer, containing blood vessels, connective tissue, nerve endings and hair follicles.

**Hypodermis:** This layer contains fat (adipose tissue) and is the layer between the skin and underlying tissues.

**Fig. 1 - Three major layers of skin.**

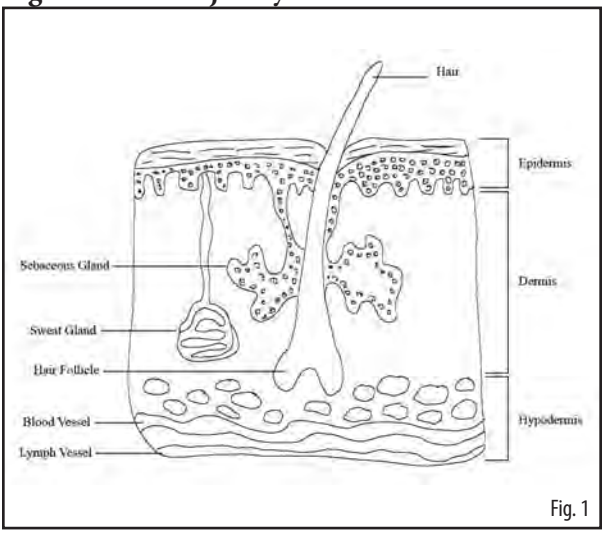


Fig. 1

Burns, depending on the source and time of exposure can cause injury to one, two or all three layers of skin. If the burn depth is significant enough, deep underlying structures such as muscles, tendons, nerves and bones can be damaged or even disintegrated.

As previously mentioned, skin plays a key role in the regulation of body temperature. When significant burn injuries occur, the skin's ability to maintain appropriate body temperature becomes compromised. A casualty who has received extensive burns is at risk for hypothermia and every attempt should be made to keep the casualty warm and to maintain adequate body temperature.

# *Measures To Prevent Burns*

### Four Safety Measures to Prevent Burns

**1.** Maintain functional smoke detectors in your home and workplace.

**2.** Be familiar with different types of fire extinguishers, how to operate them safely and effectively and which are most beneficial to your needs.

**3.** Wear proper equipment and take other precautionary measures when dealing with potential burn hazards.

**4.** Take time to educate yourself and your family on burn prevention using information provided by reputable resources.

# *Recognizing Burns*

### Four Classifications of Burns by Mechanism of Injury/Causes

1. **Thermal Burns:** Responsible for the majority of burns. These commonly result from flames, scalds (steam, hot liquid) or from contact with hot substances (cooking pot). Frostbite is classified as a thermal burn.

2. **Electrical Burns:** A result of direct contact with an electrical current. These injuries typically have an entry and exit wound and can result in fractures and Cardiac Arrest. Lightning injuries are included in this category.

3. **Chemical Burns:** Any substance that has the ability to create chemical changes to the skin without producing heat. Caustic chemicals such as toilet bowl cleaners and bleach will destroy tissue and cause severe skin burns. Acids and alkalis are included in this category.

4. **Radiation Burns:** Caused by exposure to radiation from sources such as the sun, medical diagnostic tests/treatments and welding.

## Classification of Burns by Severity their Associated Signs and Symptoms

**a) Superficial Burns:** Affect only the outermost layer of the skin, the epidermis, and are generally red in appearance, dry and painful, with the potential for swelling. Healing time is generally one week, producing no physical scarring. Sun burns are often the cause.



Superficial burns can be a medical emergency if a large portion of the body is burned.

**b) Partial Thickness Burns:** Affect both the epidermis and dermis. These burns are generally red or mottled (splotchy red patches) and moist in appearance. They are extremely painful, with accompanied swelling and the presence of blisters. Hair follicles are still present on burnt tissue. Healing time is generally 2-3 weeks.

**c) Full Thickness Burns:** Affect both the epidermis and dermis in addition to delicate blood vessels, nerves, hair follicles and sweat glands. All are destroyed. If the burn is deep enough, muscles, tendons, deep nerves and bone may be damaged. Pain may or may not be felt as nerve endings have been destroyed, however, tissues around the Full Thickness burns (Partial and Superficial burn tissue) may have nerve endings intact which can result in pain. Full thickness burns may appear thick, leathery, white, pearly white, dry, or even charred. Full Thickness burns can be life-threatening and therefore require prompt medical attention. Surgery and extensive rehabilitation programs are not uncommon for a casualty who has suffered Full Thickness burns.

## Four Factors that Determine the Seriousness of a Burn

**1.** Burn depth (e.g. Superficial, Partial Thickness, Full Thickness…).

**2.** Total body surface area which has been burned.

**3.** The specific area of the body which has been burned.

**4.** Age, gender and physical condition of the casualty.

**The Mechanism of Injury is an important factor to consider when treating a casualty who has sustained injuries from burns. Factors to consider:**

**1.** What was the cause of the burn (e.g. fire, chemical, explosion)?

**2.** Is the potential for smoke inhalation a possibility (e.g. house fire)?

**3.** Was the casualty in a closed space (carbon monoxide poisoning, smoke inhalation)?

4. Were dangerous fumes/chemicals involved (e.g. cyanide or chlorine gas)?
5. Did the casualty sustain additional injuries (e.g. fractures from a blast injury or lightning strike)?
6. Was the casualty initially found conscious or unconscious?

### Four Complications which may Result from a Burn

1. **Infection:** Microorganisms can enter the body where damage to the skin has occurred.
2. **Respiratory/Breathing problems:** Smoke inhalation, upper airway burns and facial burns can cause severe breathing difficulties.
3. **Shock:** Significant loss and undesired redistribution of body fluids and electrolytes which occurs with major burns can cause both Hypovolemic and Burn Shock.
4. **Swelling:** Swelling of the mouth, tongue and upper airway can cause extreme breathing difficulties. Swelling of body tissues can cut off circulation.

## *First Aid For Burns*



### First Aid Procedures for Burns Caused by:



**The primary goal in treating any burn is to first stop the burning process with the application of copious amounts of room temperature water.**

**a) Heat Burns (First and Second-Degree Burns)**



- Scene Survey: Be aware of fire, smoke, chemicals, electrical wires (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- If the heat source is still present, remove the heat source, **if it is safe to do so!**



- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- Cool the burn immediately by immersing the affected area in large amounts of room temperature water for at least 15 minutes, or until the pain and/or burning sensation have ceased.
- Remove jewelry and cut away loose clothing which is not stuck to the casualty, as soon as possible. These items retain heat and can continue to burn the casualty.
- Cover the burn with a dry, sterile, lint free dressing and bandage loosely.
- Initiate a Secondary Survey.
- Keep the casualty warm.
- Treat for Shock.
- Provide Ongoing Casualty Care.



- **DO NOT** pop blisters if present.
- Clean sheets or towels can be soaked and applied to affected area if immersion is not possible.
- Never use ice to cool a burn as this will cause blood vessels to constrict and will limit the amount of blood and oxygen reaching healthy tissue. Ice can cause a thermal burn which will do more harm than good.
- Never use ointments, butter or other remedies to cool a burn, as these substances will trap in heat which is trying to escape and will cause further injury.
- Jewelry and constricting clothing can cut off circulation when swelling occurs.
- **DO NOT** remove clothing which is stuck to the casualty. Instead, smoldering pieces of clothing stuck to the skin should be cut away.
- Dressings and bandages protect skin from infection, decrease pain by covering exposed nerve endings and protect blisters from rupturing.
- If the burn surface area is too big for dressings, apply clean sheets and secure with tape.

**A casualty who has extensive body burns loses the ability to regulate body temperature and is therefore susceptible to hypothermia. Keep this point in mind when cooling large areas of the body.**

### Third-Degree Burns

- Scene Survey: Be aware of fire, smoke, chemicals, electrical wires (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- If the heat source is still present, remove the heat source, **if it is safe to do so!**
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- Cool the burn immediately by treating the affected area with room temperature water for at least 15 minutes or until pain and/or burning sensation have ceased.

- It is imperative to stop the burning process; however, a casualty who has suffered an extensive Third-degree burn is at extreme risk of hypothermia and Shock. Use caution when applying water to large areas which contain Third-degree burns.
- Areas of Second and First-degree burns will be present around Third-degree burnt tissue and must also be cooled.

- Cover the burn with a dry, sterile, lint free dressing and bandage loosely.
- Initiate a Secondary Survey.
- Keep the casualty warm.
- Treat for Shock.
- Provide Ongoing Casualty Care.

**b) Chemical burns:** Individuals who work in industrial settings are prone to chemical burns; however, common household products which we use daily can also place individuals at risk for chemical injury from their caustic ingredients. Always read product labels which contain chemical agents and become familiar with each product's specific First Aid treatment in case of accidental exposure. The primary goal when treating chemical burns is to remove the chemical agent from the skin as soon as possible (dry or liquid) to prevent further tissue damage and destruction.

**i) Dry Chemicals:** Carefully brush off any excess chemical that remains **prior** to flushing with water. Immerse the injured tissue in room temperature water for 15-20 minutes or until pain and/or burning sensation has ceased. Cover the area with dry, sterile, lint free dressings. Use clean sheets secured by tape to cover larger burn surface areas. If burning re-occurs, provide additional flushing for 10-15 minutes, or until pain and/or burning sensation has ceased. Seek medical attention immediately.



- Carefully remove and discard contaminated clothing.
- When flushing with water, try and limit chemical exposure to healthy tissue.

**ii) Liquid Chemicals:** Immerse the injured tissue in room temperature water for 15-20 minutes or until pain and/or burning sensation has ceased. Cover the area with dry, sterile, lint free dressings. Use clean sheets secured by tape to cover larger burn surface areas. If burning reoccurs, provide additional flushing for 10-15 minutes, or until pain and/or burning sensation has ceased. Seek medical attention immediately.

**c) Electric Current Burns:** Two potential injuries can occur when a casualty is exposed to an electric current. The factors listed below provide an indication as to the severity/degree of electrical injury sustained.

a) The type of current.

b) Amount of current.

c) Path of current.

d) Duration of contact with the source.

**Two electric current injuries are:**

**1. Contact Burns:** These injuries occur when there is direct exposure and penetration of an electric current through the skin causing damage to underlying tissues. There is commonly an entrance point, typically the wrist and an exit point, at the feet. Major tissue damage and burns are often seen

at both the entrance and exit points. In addition, severe internal injuries sustained to tissues which lay between the two points is most definitely of major concern.

2. **Arc injury/Flash Burns:** A casualty who is close to an electric source which produces high-voltage can be injured when an electric current overcomes the resistance of air and jumps or arcs towards the casualty. Temperatures produced can reach 4000 °C resulting in severe Third-degree burns and extensive tissue destruction. All injuries are external as electricity does not pass directly through a casualty's body.



- A casualty who has sustained an electric current injury is susceptible to breathing emergencies and may stop breathing.
- An electric current entering the body can trigger heart arrhythmias which may result in Cardiac Arrest.
- Certain electrical current injuries may cause a casualty to be thrown, leaving him/her susceptible to fractures, dislocations as well as Head and/or Spinal injuries.

**First Aid for Electric Current Injuries**



- Scene Survey: Be aware of your safety and the environment. Turn off electrical source **if it is safe to do so!** (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness, tap and shout (Be aware of potential Head and/or Spinal injuries if the casualty was thrown a distance).
- **Call 9-1-1**.
- A,B,C's.
- Initiate a Secondary Survey to locate burns, fractures, dislocations etc…
- Apply clean, sterile, dry dressings, secured by tape or bandages to entrance and exit wounds and manage other burns you find from your Secondary Survey.
- Splint and stabilize fractures and/or dislocations.
- Keep casualty warm.
- Treat for Shock.
- Provide Ongoing Casualty Care.

**d) Radiation Burns:** Caused by exposure to radiation from sources such as the sun, medical diagnostic tests/treatments and welding. The most common cause of a radiation burn is a result of prolonged exposure to the sun's ultraviolet rays.

**First Aid for Sun Burns**



- Remove the casualty from the source of the burn.
- Stop the burning process by immersing the casualty in a cool bath or shower for 10-15 minutes or apply wet cloths.



- **DO NOT** pop blisters.
- Signs and symptoms of sunburn may not be evident for hours after initial overexposure.



- Medicated ointments may be applied to burn surface areas once the tissue has been cooled and the burning process has ceased.



- Aloe may be applied as this helps decrease pain and inflammation.
- Do not apply jelly, butter other lotions or remedies which are not specific to the treatment of sun burns as this delays healing and may increase pain.

**First Aid for Radioactivity Burns**

Follow the steps outlined for the treatment of **heat burns** when treating a casualty who has sustained burns as a result of radioactive exposure. Specific emergency personnel who are trained for these types of emergencies should be involved in the primary treatment and care of a casualty in such situations. Do not enter an environment in which decontamination has not yet taken place and wear appropriate protective equipment in such circumstances.

## Five Instances when Medical Help is Required for a Casualty who has Been Burned

**1.** Any burns which cause breathing emergencies such as those caused by inhalation, and burns to the face or upper airway.

**2.** Significant fracture(s) and/or soft tissue injury.

**3.** Any chemical burn.

**4.** Any electrical burn.

**5.** Burns sustained in the very young or very old.

### Burns to the Face and Upper Airway

Burns to the face and/or upper airway, whether from smoke inhalation, superheated vapors, or flammable gases which ignite, can cause severe breathing difficulties and significant swelling of a casualty's airway. Immediate care and treatment by EMS and hospital staff are required for this casualty.

### Signs and Symptoms of Facial and Upper Airway Burns

- Visible burns to the face.
- Singed eyebrows.
- Swollen lips.
- Casualty is coughing up black mucous.
- Mechanism of Injury suggests a casualty was in a confined space when the incident occurred.
- Abnormal breathing sounds such as wheezing, gurgling, or a hoarse voice.

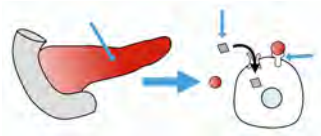
# Chapter 22
## Diabetes

## *Recognizing Diabetic Emergencies*

### Definition of a Diabetic Emergency

In order to effectively recognize and treat a casualty who is suffering from a diabetic emergency, we must first understand how this disease works on a physiological level.

**Diabetes**, otherwise known as Diabetes Mellitus is a disease of the **Endocrine System** (Responsible for the production and distribution of hormones). The word Diabetes in Greek translates to "pass" or "siphon" and mellitus translates to "sweet" or "honey". The **pancreas** is the key organ which is affected by Diabetes. Normally, when we eat a meal which contains sugars or carbohydrates in the form of glucose, our pancreas secretes the hormone **insulin**. Insulin helps transfer the sugars out of the bloodstream and into our cells. Individuals who are not affected by Diabetes have a harmonious balance between insulin levels, proper glucose/sugar levels in the blood and glucose levels in the cells. With Diabetes, there is either an absence or diminished amount of insulin secretion by the pancreas, or defects in the body's cells themselves, which result in an insensitivity to insulin. As a result, the cells of the body cannot uptake (transfer into the cell) glucose effectively or even at all. This leads to dangerously high levels of glucose/sugar in the blood, and low levels of glucose/sugar in the cells; both of which have detrimental affects. There are two divisions of Diabetes, Type I and Type II.

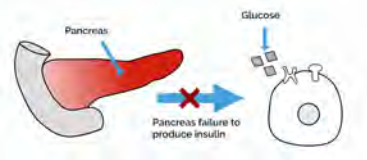


**Type I Diabetes:**

Type 1 diabetes is an autoimmune disease. The body's immune system attacks the insulin-producing cells in the pancreas, this causes little to no insulin being made by the body. Insulin is the hormone that helps move glucose (sugar) from the bloodstream into the body's cells for energy.

Because the body cannot make insulin on its own (or an insignificant amount), people with type 1 diabetes must take daily insulin for life.

Type 1 diabetes can develop at any age, but most diagnoses happen in children, teens, and young adults. The exact cause is not fully understood. Genetics may play a small role, however most people with type 1 diabetes do not have a family history. It is not caused by diet or lifestyle.




With proper insulin use and monitoring, most people with Type 1 diabetes can successfully manage their condition with little to no long term complications.

**Type II Diabetes:**

Type 2 diabetes happens when the body does not respond to insulin, this is called insulin resistance. Over time, the pancreas may also begin to produce less insulin, which makes it harder to control blood sugar.

Type 2 diabetes can occur at any age. It is more common in adults, but is now becoming increasingly more common in teens and young adults, Risk can be influenced by genetics, family history, age, lifestyle factors, and other medical conditions.

**There are a variety of treatment options for type 2 diabetes:**

- Some people can manage their blood sugar with healthy eating and physical activity alone
- Some need oral medications
- Some may require insulin, especially as the body produces less insulin over time.




Type 2 diabetes is a chronic disease, but with proper treatment and monitoring, it can effectively be managed.

**Why the Types Are Different**

The type of diabetes is based on the cause of diabetes:

- **Type 1 diabetes is an autoimmune disease**
  The immune system destroys the insulin-producing cells in the pancreas, so the body cannot make insulin.
- **Type 2 diabetes is caused by insulin resistance**
  This happens when the body's cells do not use insulin properly, over time the pancreas may also make less insulin.

Both types affect the body's ability to control blood sugar, but the underlying cause is different, which is why treatment can vary.

**Diabetic Emergencies**

There are two types of diabetic emergencies both of which can result in life-threatening emergencies.

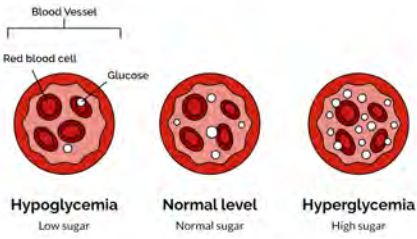
1. **Hyperglycemia:** Hyperglycemia means that the blood sugar (glucose) is higher than normal. This can happen when the body does not have enough insulin, or the insulin isn't working well, this causes sugar to build up in the bloodstream.

**Possible Causes**

- Not taking insulin or diabetes medication
- Not enough insulin or medication for food eaten
- Increased or high-carbohydrate food intake
- Illness, infection, or increased stress
- Decreased physical activity

2. **Hypoglycemia:** Hypoglycemia means the blood sugar is lower than normal. It can happen when there is too much insulin or not enough food in the body.

**Possible Causes**




- Taking too much insulin or other Diabetes medications.
- Not enough dietary intake, or skipping a meal.
- Unusual or vigorous physical exercise.
- Alcohol consumption.

## The History of an Incident Can Help Identify a Diabetic Emergency

Knowledge of the incidents which lead up to an emergency situation can provide clues to what might be ailing a casualty. Individuals with Diabetes usually have medical alerts which identify his/her condition. As mentioned in previous chapters, in order to gain a concise incident history, one must be a detective. Be familiar with the specific signs and symptoms of both hypoglycemia and hyperglycemia as well as what might cause these conditions; all of which will enable a First Aider to paint an accurate picture of the situation. If you encounter an individual who you suspect is suffering from a diabetic emergency and he/she is **conscious**, provide him/her with sugar. Sugar is likely to help someone suffering from hypoglycemia, while being unlikely to do more harm if someone's blood sugar is too high. If you encounter an unconscious casualty who you suspect is suffering from a diabetic emergency, **NO** sugar is to be provided as the casualty is **unconscious** and cannot protect his/her airway. Begin a Scene Survey, **call 9-1-1** and initiate a Primary Survey.

## Signs and Symptoms of Specific Diabetic Emergencies

It is important to note that signs and symptoms of **hypoglycemia** generally appear quickly, within minutes. In the early stages of hypoglycemia, the casualty may complain of extreme hunger. Individuals with hypoglycemia require sugar immediately to prevent brain damage and possible death.



- A casualty who is unconscious and is suspected of suffering from a diabetic emergency will **NOT** be provided anything by mouth (liquid or solids) as he/she cannot protect his/her airway. Instead, begin a Scene Survey, dial **9-1-1** and initiate a Primary Survey.
- Signs and Symptoms of **hyperglycemia** are slower in onset and generally take 12-48 hours to manifest.

| Hypoglycemia | Hyperglycemia |
|---|---|

| | |
|---|---|
| Nervousness, trembling | Increased urination |
| Irritability | Increased hunger |
| Aggressive behavior | Increased thirst |
| Confusion | Increased respiration |
| Appearance of intoxication | Warm, flushed, dry skin |
| Drowsiness | Abdominal pain |
| Seizure | Acetone-smelling (fruity) breath |
| Fainting/Unconsciousness | Nausea, vomiting |
| Stroke-like symptoms | |



- Hypoglycemia should be suspected in any diabetic casualty who presents with changes in behavior, confusion, or unconsciousness. This is a medical emergency and Emergency Medical Services must be notified.
- Do not confuse a diabetic casualty with one who is intoxicated. Observe the signs and symptoms, gather an accurate history and/or mechanism of injury and try to put the pieces of the puzzle together for that specific casualty/emergency situation.
- Do not allow biases to get in the way of your assessments and decision making processes, as every emergency situation and casualty is unique.

# *First Aid for a Diabetic Emergency*



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- If the casualty is **unconscious**, place him/her into the Recovery Position, if there is no suspected head and/or spinal injury, and monitor A,B,C's. **Nothing** is to be provided by mouth (liquids or solids) as the casualty is unable to protect his/her airway.
- If the casualty is **conscious**, ask him/her if they take medications



for his/her Diabetes and if he/she has taken them today. Ask the casualty when was the last time they ate.



- Provide sugar via fruit juices, sugar solutions, non-diet cola's, glucose tablets, etc...
- Treat for Shock.



- Provide Ongoing Casualty Care.
- If the casualty is confused, provide him/her with sugar. You can make a sugar solution by mixing two tablespoons of sugar added to a drink, such as fruit juice.
- Diet cola drinks are not advised as they do not contain the valuable sugar a diabetic casualty requires.
- Always **call 9-1-1** for a suspected diabetic casualty. A recurrent episode of low blood sugar/hypoglycemia can occur, even after sugar has been administered. This is especially true for Type II diabetic casualties who take oral (by mouth) diabetic medications.
- As a First Aider, you are **not permitted** to administer any medications a casualty has been prescribed (e.g. insulin, glucagon etc.).



**It is not advised to provide a diabetic casualty who is suffering from a diabetic emergency any hard candies or lozenges, as this can pose a choking hazard.**

# Chapter 23
## Seizure

## *Recognizing A Seizure*



### Definition of a Seizure

**Definitions**

**Seizure:** A temporary change in behavior or consciousness caused by abnormal electrical activity from brain cells (neurons) in the brain. Seizures can produce confusion, loss of consciousness, uncontrolled muscle jerking and movements, along with staring spells.

**Causes**

- High fever
- Infections in the brain
- Diabetic emergencies
- Hypothermia
- Decreased oxygen to the brain
- Trauma
- Drug use/abuse
- Stroke
- Brain tumor
- Idiopathic (no known cause)

**Epilepsy:** A disorder which causes a disrupted transmission of electrical signals in the brain causing an individual to have recurrent seizures.

**Seizures:** Uncontrollable rapid shaking of one's body.

**Postictal Phase:** This is the time immediately following a seizure. When the casualty regains consciousness, they may be confused, disoriented, tired, and irritable and have difficulty speaking. They may also complain of dizziness, headache, fatigue, and muscle soreness. It is not uncommon for the casualty to fall into a deep sleep after a seizure.

**Aura:** A sensation of light or warmth that may precede a migraine or seizure.



# *Types of Seizures*

## 1. Generalized Seizures

These affect both sides of the brain at the same time.

### Tonic-Clonic (Grand Mal)

The most recognized type of seizure.

The person may suddenly fall, become stiff, then start jerking or shaking.

Breathing may pause for a few seconds, and they may lose bladder or bowel control.

Afterward, they often feel tired, confused, or emotional.

### Absence (Petit Mal)

A brief "blank stare" lasting only a few seconds.

Often mistaken for daydreaming, especially in children.

The person may blink rapidly or stop talking mid-sentence, then quickly return to normal.

**Myoclonic Seizures**

Quick, sudden jerks of a muscle or a group of muscles, like a brief electric shock.

The person stays awake but may drop objects or lose balance.

**Atonic Seizures (Drop Attacks)**

Sudden loss of muscle tone causes the person to collapse without warning.

There's a high risk of head injury due to sudden falls.

## 2. Focal Seizures

These start in one area of the brain and may stay in that spot or spread.

**Focal Aware (Simple Partial)**

The person stays awake and aware.

They may feel tingling, smell or taste something odd, or have twitching in one body part.

**Focal Impaired Awareness (Complex Partial)**

The person seems awake but confused and not fully aware of what's happening. They might perform repeated actions, like smacking their lips or fiddling with clothing. Afterward, they may not remember what happened.

## 3. Other Types

**Febrile Seizures**

Common in children during a sudden spike in fever.

Usually brief and not dangerous long-term.

Most children recover quickly once the fever lowers.

**Pseudoseizures (Psychogenic Nonepileptic Seizures)**

These look very similar to epileptic seizures, but they are not caused by electrical activity in the brain.

Instead, they are a physical response to extreme stress, trauma, or emotional distress.

The person is not faking, their body reacts unconsciously.

Movements may be dramatic or prolonged, but breathing and skin color usually stay normal.

These seizures do not respond to epilepsy medication and are diagnosed by doctors after medical testing (such as EEG).

**Status Epilepticus**

A seizure lasting more than 5 minutes, or repeated seizures without recovery in between.

**Signs and Symptoms of Seizures**

- Sudden loss of awareness or blank stare
- Jerking or stiffening movements
- Sudden collapse
- Changes in breathing or skin color
- Unusual behavior or repeated movements
- Confusion or fatigue afterward

**Why Seizures Look Different**

Where the seizure starts in the brain changes what it looks like.

**In summary:**

Seizures happen when the brain's normal electrical rhythm is interrupted.

Some cause small, quick changes like a blank stare or muscle twitch, while others affect the whole body.

Not all seizures are epileptic, some, like pseudoseizures, come from emotional stress rather than electrical misfires.

Recognizing the difference helps ensure the person gets the right care and support.

## Signs and Symptoms of a Seizure

- Unresponsiveness
- Eyes rolled back in the head.
- Difficulty breathing.
- Rigidity (Tonic Phase).
- Frothing at the mouth.
- Violent muscle jerking and spasm (Clonic Phase).
- Bowel and bladder incontinence.
- Postictal stage following the seizure.

## First Aid for a Seizure



**Regardless of the cause of the seizure, the general First Aid treatments are the same.**



**Remember to do a Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury). Determine Responsiveness (tap and shout), Call 9-1-1, initiate a Primary Survey and follow these principles:**

**Convulsion Stage**

**1.** Move all objects away from the seizing casualty to prevent further injury.

**2. DO NOT** hold the casualty by the head. **DO NOT** restrict the casualty's movements.

**3. DO NOT** place anything inside the casualty's mouth; **NO** towels, fingers, etc… A person cannot swallow his/her tongue.

**4.** Place something soft underneath the casualty's head to prevent a head injury.

**5.** If possible, position the casualty into the Recovery Position, to allow for drainage of secretions and to decrease the likelihood of choking and aspiration (Inhalation of foreign material into the lungs).

**Postictal Phase (After the seizures)**

**1.** Re-assess Responsiveness (tap and shout).

**2. Call 9-1-1** if you have not already done so.

**3.** Initiate a Primary Survey and pay special attention to the airway.



It is not uncommon for a casualty to bite his/her tongue, and cause a bleed, while having a seizure.

4. Begin a Secondary Survey to assess for potential hidden injuries the casualty may have sustained during the seizure.



It is possible for the casualty to have sustained a fracture caused by the violent jerking movements while he/she was in seizure.

5. Keep the casualty warm by providing a blanket.

6. **DO NOT** provide the casualty with anything to eat or drink while waiting for EMS arrival.

7. If there is no suspected Head and/ or Spinal injury and the casualty remains unconscious, place him/her into the Recovery Position and monitor A,B,C's every 30 seconds.



**9-1-1 must always be called for a casualty who is or was in seizure.**

**In certain situations, a casualty will remain seizing and not stop, or will have stopped seizing, remain unconscious and begin to seize again. This is termed Status Epilepticus and is a true medical emergency.**



# *Recognizing Fever And Fever Seizures In Infants And Children*

**Definitions**

**Normal body temperature:** Generally rated at 36.8 °C or 98.6 °F.

**Fever:** Children with bacterial or viral infections can run very high fevers in response to these invaders. Fevers greater than 40 °C or 104 °F can result from minor colds to major illnesses such as pneumonia or meningitis. Fever is a sign of infection and not the problem itself. Fever on its own does not cause brain damage.

## Common causes of Seizures in Infants and Children

**Febrile seizures:** Most seizures that occur in infants and children are due to fever, hence the name febrile seizure. This type of seizure is a **Generalized tonic-clonic seizure** which generally affects feverish children between the ages of 6 months and 5 years. Febrile seizures occur most commonly from infections causing a spike in temperature generally greater than 38.9 °C or 102 °F.



- Febrile seizures appear more frightening and dangerous than they actually are.
- Febrile seizures are generally benign with no short or long term effects.
- Most febrile seizures are short-lived and last less than 15 minutes.

## Signs and Symptoms of Fever and Fever Seizures in Infants and Children

- Fever generally higher than 38.9 °C or 102 °F.
- Loss of consciousness.
- Violent muscle jerking of the arms and legs.
- Eyes rolled back in the head.
- Difficulty breathing.
- Bowel and bladder incontinence.
- Vomiting
- Moaning and crying.

# First Aid For Fever And Fever Seizures In Infants And Children

## First Aid for Fevers in Infants and Children



- Seek medical advice.
- Encourage the infant or child to drink small amounts of fluid, preferably water.
- Undress the feverish child without causing hypothermia.
- A lukewarm bath may provide cooling for the infant or child. Never submerge them into a cold bath.
- Be prepared for seizures.



- **DO NOT** administer Aspirin to an infant or child with fever. Seek medical advice for other recommendations. Aspirin can cause Reyes Syndrome which can be lethal.
- **DO NOT** use cold water, fans, ice, or alcohol baths to lower your child's body temperature.

## First Aid for Fever Seizures in Infants and Children

**1. Call 9-1-1**.

**2.** Place your child on a carpet or bed as this proves to be safer and more comfortable for the child.

**3.** Remove objects that are close to the seizing child which may cause injury.

**4. DO NOT** restrict your child's movements during the seizure.

**5.** After the seizure, assess and monitor A,B,C's.



Most febrile seizures stop on their own within a couple of minutes.

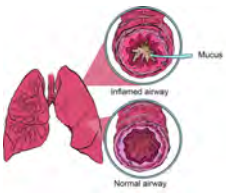
# Chapter 24
## Asthma & COPD

## *Recognizing A Severe Asthma Attack And Providing First Aid*

### Asthma and its Causes

Asthma kills approximately 500 Adults and 20 children each year in Canada. Another 8.4% of the population aged 12 and over have been diagnosed with the disease. Half of all asthma cases develop during childhood and another 1/3 develop before age 40.

Asthma is a life-threatening condition in which the airways in the lungs become inflamed and constricted. Asthma can be defined as a chronic inflammatory airway disorder. It is characterized by excessive **spasm** of the respiratory muscles in the breathing tubes of our lungs, excessive mucous **production/secretion** and **accumulation** as well as **excessive swelling** of the airways. Asthma occurs in individuals who have a predisposed (genetic) sensitivity or who respond aggressively to various airway irritants (e.g. dust, mold etc…). Asthma is not curable but it can be effectively controlled with medications in addition to the avoidance of potential triggers.




**Three Classifications of Asthma**

**Mild**

- Wheezing, coughing, chest tightness or difficulty breathing occur less than twice per week.
- Nighttime symptoms occur less than twice per month.
- Episodes are brief and may last anywhere from a few hours to a few days.
- Intensity may vary and symptoms may affect activity.

**Moderate**

- Wheezing, coughing, chest tightness or difficulty breathing occur daily.
- Daily use of short-acting medications are required to diminish symptoms.
- Nighttime symptoms experienced more than once a week.
- Episodes occur more than twice a week and may last for several days.
- Asthma episodes affect activity.

**Severe**

- Wheezing, coughing, chest tightness or difficulty breathing are continual.
- Physical activity is limited.
- Episodes are frequent during the day or night.
- Can lead to severe life-threatening conditions such as Respiratory and Cardiac Arrest if not treated immediately.

**Common Causes/Triggers of Asthma**

- Pollen
- Animal dander
- House dust
- Mold
- Emotional stress
- Exercise
- Temperature variations
- Infection
- Allergies

**Pediatric Consideration**

Cigarette smoke is considered a risk factor for the development of asthma when exposed to babies in utero and early in childhood.

- Children may outgrow asthma, although the tendency towards allergies still remains.



**Always call 9-1-1 if you encounter a casualty who is suffering from an asthma attack as this is a life-threatening medical condition.**

## Signs and Symptoms of a Severe Asthma Attack

- Sudden onset of shortness of breath.
- Anxiety

- Cool, pale, moist skin.
- Wheezing
- Coughing
- Coughing that produces thick, clear or yellowish sputum.
- Chest tightness or pain.
- Rapid breathing.
- Gasping
- Fatigue (getting tired of breathing).
- Quiet shallow breathing.
- Pale or bluish-coloured skin (lips, ears, fingernail beds).
- Accessory muscle use (e.g. muscles which are not ordinarily involved in breathing such as those in the neck, between the rib cage and stomach muscles when breathing becomes difficult).
- Decreased level of awareness.
- Confusion
- Unconsciousness

## First Aid for a Severe Asthma Attack



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1.**
- A,B,C's.
- Rest and reassure the casualty.
- Try and coach the casualty's breathing.



- If possible, remove the casualty from the environmental trigger(s).
- Assist with any medications (ventolin)
- If there is no trauma, sit the casualty upright (will aid in breathing).
- Treat for Shock.
- Provide Ongoing Casualty Care.

**Ventolin: (Refer to Fig. 1)**This specific medication is used to treat individuals suffering from acute asthma attacks. The medication is typically housed in a blue-coloured inhaler (Metered- Dose Inhaler or MDI) but can also be administered in a nebulized (fine spray/mist) form. The latter is typically administered by paramedics and in hospital settings. This medication is inhaled into the lungs and is referred to as a bronchodilator. This medication relaxes the smooth muscles of the airway allowing for ease of breathing. This medication acts within minutes and can last between 4-6 hours. Side effects of ventolin may include headache, dizziness, nervousness, dry mouth and throat, muscle pain, diarrhea, chest pain and heart palpitations.

**Aiding a Casualty with the Administration of Ventolin (Refer to Fig. 1)**

**1.** Ventolin inhaler must be shaken for 30 seconds prior to administration/inhalation.

**2.** Casualty can hold the inhaler 2-4 finger widths away from his/her mouth, or encircle the lips over the mouthpiece of the inhaler


Fig. 1

**3.** Casualty must inhale deeply, then exhale deeply, then inhale once again while the medication is now delivered (one spray).

**4.** Instruct the casualty to hold his/her breath to a maximum of 10 seconds to help distribute the medication into his/her lungs.

**5.** An additional dose (one spray) can be administered, for a total of two sprays, right after the first dose.

**Fig. 1 - Picture of a Ventolin Metered-Dose Inhaler**

**A Casualty's Asthma is Serious or has the Potential to Become Serious When A…**

- Casualty has been hospitalized for his/her asthma.
- Casualty has an EpiPen Auto-Injector for his/her asthma.
- Casualty has been injected with epinephrine by paramedics or other healthcare professionals for his/her previous asthma attack(s).
- Casualty has had breathing tubes inserted while in hospital for severe asthma attacks.
- Casualty is or has been on steroid medication for his/her asthma.
- Casualty has called 9-1-1 before for asthma attacks.
- Casualty has had an increase in severity and frequency of asthma attacks.

# *COPD*

## Overview

**Chronic Obstructive Pulmonary Disease (COPD)** is a long-term lung condition that slowly gets worse over time. It makes it hard for people to breathe because their airways (the tubes that carry air in and out of the lungs) become narrowed, swollen, or blocked with mucus.

COPD isn't just one disease. It is a term that includes two main conditions that often happen together:

**Chronic bronchitis:** The airways are swollen and filled with mucus, causing a constant cough.

**Emphysema:** The tiny air sacs in the lungs (called alveoli) are damaged and lose their stretch, making it harder to push air out.

## What is COPD?

COPD happens when the airways (also called bronchi) become irritated, narrow, and sometimes clogged with mucus.

**Analogy:**

Think of your airways like straws, when they're clean and open, air moves in and out easily. But if the straws are squeezed, swollen, or filled with gunk, it's much harder to suck air through them. That's what happens inside the lungs of someone with COPD.

Over time, the tiny air sacs in the lungs (alveoli) also get damaged. Normally, these sacs are stretchy like small balloons. When you breathe in, they fill with air; when you breathe out, they shrink and push the air out. In COPD, these "balloons" lose their stretchiness. Imagine blowing up a balloon over and over, eventually, it stops snapping back into shape. That's what happens to the alveoli.

Because of this, air gets trapped in the lungs and can't escape fully when you exhale. It's like your lungs are half-full all the time, leaving little room for fresh air to come in.

**When air is trapped:**

- Less oxygen gets into the bloodstream.
- Carbon dioxide (a waste gas) builds up.
- This causes shortness of breath, tiredness, and a constant cough as the body tries to clear the airways.

So, when someone has COPD, it's like trying to breathe through a partly blocked straw, air goes in, but struggles to come back out.

## How COPD Affects the Body

Think of your lungs like a tree:

- The trunk (windpipe) divides into branches (airways) that end in tiny leaves (air sacs).
- In COPD, the leaves are damaged, the branches are clogged, and the air can't move freely.

Normally, when you breathe in, oxygen moves through these passages into the tiny air sacs, where oxygen goes into the blood and carbon dioxide comes out. In COPD, swelling and mucus block these passages, and the air sacs lose their shape and stretch. Stale air gets trapped, making it harder to bring in fresh air. This causes shortness of breath, fatigue, and low oxygen levels.

**Stages of COPD**

**Mild:** Occasional shortness of breath, constant cough, or mucus production.

**Moderate:** Breathlessness during activity, frequent flare-ups, and tiredness.

**Severe:** Noticeable shortness of breath even at rest; frequent hospital visits.

**Very Severe:** Extreme shortness of breath, need for oxygen, and major impact on daily life.

**Risk Factors**

- Smoking (most common cause)
- Long-term exposure to air pollution or workplace dust or fumes
- Repeated lung infections
- Aging (lungs naturally lose some strength and stretch)

Each of these irritates or damages the airways, speeding up lung damage.

**Signs and Symptoms**

- Chronic cough (often called "smoker's cough")
- Shortness of breath (feeling like you can't catch your breath)
- Wheezing (a whistling sound when breathing)
- Chest tightness
- Fatigue or blue-tinged lips or fingertips (from low oxygen)
- Frequent lung infections

These symptoms show that not enough oxygen is getting into the blood and that carbon dioxide is building up.

**First Aid for a COPD Flare-Up (Exacerbation)**



**1. Stay Calm and Sit the Person Upright**
Sitting upright allows the diaphragm to move freely and helps the lungs expand.

**2. Encourage Pursed-Lip Breathing**
Ask them to breathe in slowly through their nose for 2 seconds, then blow out gently through lips that are slightly puckered (like whistling) for about 4 seconds.

This helps release trapped air and makes breathing easier, like letting air out of a balloon slowly instead of all at once.

**3. Use Prescribed Inhalers**
Encourage them to use their rescue inhaler, or other medications

as prescribed. These medicines can help relax the airway muscles and open the air passages quickly.

**4. Loosen Tight Clothing and Create Airflow**
Open a window or use a fan to move air. Cool air can help reduce the feeling of breathlessness.

**5. Avoid Panic and Overexertion**
Encourage calm breathing and slow movements. Anxiety increases oxygen use and can worsen symptoms.

**6. Seek Medical Help**
**Call 911** if symptoms don't improve or the person becomes confused, turns bluish around the lips or fingers, or becomes unresponsive. These are signs of dangerously low oxygen levels or too much carbon dioxide in the body.

# Chapter 25
## Anaphylaxis

## *Recognizing A Severe Allergic Reaction And Providing First Aid*

### Four Routes of Entry by which Allergens are Introduced into the Body

**1.** Inhalation.
**2.** Ingestion
**3.** Injection
**4.** Absorption

### Definition of an Allergic Reaction with Associated Specific Signs and Symptoms

**Allergy:** An overstimulation of inflammatory reactions which occurs in response to a specific environmental **stimulus/allergen,** which is referred to as an **antigen**.

**Antigen:** A substance which triggers the body's antibodies, resulting in an immune response (e.g. shellfish, nuts, venom from a bee sting, latex…).

**Allergen:** An antigen, capable of triggering an **allergic reaction.**

**Allergic Reaction/Anaphylaxis:** Severe and often life-threatening allergic reaction to a stimulus/allergen, occurring anywhere, at any age, with sudden onset of multiple signs and symptoms generally involving the Cardiovascular, Gastrointestinal, Integument (skin), and Respiratory systems.

**Signs and symptoms of anaphylaxis** are generally quick in onset but are also dependant upon the casualty's sensitivity to the specific allergen(s), as well as the dose and route of administration of the allergen. Most reactions begin within an hour after initial exposure to the allergen. Some individuals experience symptoms within seconds to minutes, while others demonstrate symptoms hours after exposure (Biphasic reactions).



Fatalities from allergic reactions generally occur within the first hour. The quicker and more intense the initial reaction, the greater the risk of mortality.

**Common Causes of Anaphylaxis**

1. Foods: Peanuts, tree nuts, shellfish, milk, eggs, fish, soy, sesame seeds, wheat, sulfites.
2. Medications: Penicillins.
3. Latex
4. Bee or wasp stings.

**Statistics**

- 600,000, or 1- 2 %, of Canadians are at risk for anaphylaxis from food and insect stings.
- Asthmatics are at particular risk for experiencing life-threatening anaphylaxis.
- It takes only 1-2 minutes for a mild allergic reaction to escalate to full blown anaphylaxis.
- The quicker the onset of signs and symptoms in a casualty suffering from an anaphylactic reaction, the greater the likelihood that a life-threatening reaction will occur.

**Signs and Symptoms of an Allergic Reaction**

- Constriction of the upper and lower airways.
- Wheezing
- Swollen tongue or throat.
- Difficulty breathing.

- Tingling feeling in lips and/or mouth.
- Difficulty swallowing.
- Shock, associated with a decrease in blood pressure.
- Weak and rapid pulse.
- Dizziness and fainting.
- Hives and itching.
- Flushed or pale skin.
- Nausea, vomiting, diarrhea.
- Anxiety

**Using the "FAST" Acronym to Remember the Signs and Symptoms of an Allergic Reaction**

**Face:** Itchiness, redness, flushing, swelling of face and tongue, watery eyes, runny nose, sneezing.

**Airway:** Coughing, wheezing, difficulty breathing, or speaking, stridor (high-pitched, whistling sound).

**Stomach:** Stomach pain, vomiting, diarrhea.

**Total body:** Hives, rash, itchiness, swelling, weakness, paleness, sense of doom, anxiety, low BP progressing to Shock and loss of consciousness.

## First Aid for an Allergic Reaction

## ("Blue to the Sky, Orange to the Thigh")

Epinephrine is a life-saving medication used to treat severe allergic/anaphylactic reactions. This medication comes in a one time use Auto-Injector. There are no contraindications for the use of epinephrine for life-threatening anaphylactic reactions.



- Scene Survey (Assess hazards, Universal Precautions, Obtain consent, Support head/neck if suspected head and/or spinal injury).



- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.



- A,B,C's.

- If possible, remove the casualty from the source of the allergen(s).
- Assist with medications; Epipen Auto-injectors **(EpiPen, EpiPen Jr.- "Blue to the sky, Orange to the Thigh") Refer to Fig. 2; as well as Ventolin-Refer to Fig. 1 (Casualties with Asthma).**
- **Bee Stings:** Scrape the stinger away from the skin using a credit card edge or other straight edged surface (back of a knife), wash with soap and water and apply a cold compress.
- Treat for Shock.
- Provide Ongoing Casualty Care.
- **As a First Aider, it is important to become familiar with the signs and symptoms of a severe allergic reaction and how to assist with specific auto-injectors; however, it is highly recommended to seek medical advice before a second injection is administered.**
- **Approximately 18-35% of casualties who exhibit the signs and symptoms of anaphylaxis may require a second dose of life-saving epinephrine. The diagnosis and recognition of anaphylaxis can be a challenge, even for professionals. Excessive epinephrine may cause complications if administered to casualties who do not have anaphylaxis. Therefore, the First Aider is encouraged to active the EMS system before aiding in the administration of a second injection.**

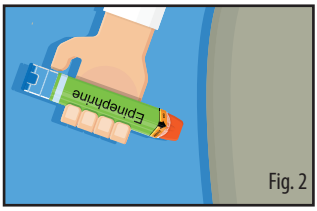



**Fig. 2 - EpiPen Auto-Injectors**

**Frequently Asked Questions**

**When should I use my Auto-Injector?**

**A:** Use the Auto-Injector at the first sign of a severe reaction. Do not wait and see if the reaction will escalate. Inject!

**What are the possible side effects of epinephrine, if any?**

**A:** Palpitations (pounding heartbeat), pallor (paleness), dizziness, weakness, tremor (trembling), headache, restlessness, anxiety and fear.

**Where is the most appropriate anatomical location for the Auto-Injector to be injected?**

**A:** In the outer thigh as there is little chance of hitting a major blood vessel or nerve.

**At what point do I switch from an EpiPen Jr. Auto-Injector (0.15mg) to an adult EpiPen Auto-Injector (0.3mg) for my child?**

**A:** Ask your Physician, however, it is suggested that once your child starts to approach 25kg or 55 lbs, it's time to switch.

**How many injectors should I carry with me at any given time?**

**A:** At least **two** doses of epinephrine should be available at any one time.

A second dose can be administered anywhere from 5-10 minutes after the initial dose if symptoms persist.

**What precautions should I take with my Auto-Injector?**

**A:** Auto-Injectors are light sensitive and should be stored in temperatures from 18-30 °C. Do not refrigerate and do not leave in a car during a hot or cold stretch. The medication should be clear with no brown colour or precipitate. The shelf-life is anywhere from 18-24 months.

**Why is there solution left in the device after use?**

**A:** Each EpiPen and EpiPen Jr. Auto-Injector are filled with 2 ml of solution. There will be 1.7 ml left over after injection. Do not worry, this is normal. Once an epi-pen has been used, you are unable to access any of the leftover medication.

**How to Administer an EpiPen Auto-Injector**
**(Blue to the Sky, Orange to the Thigh)**

**1.** Remove the Auto-Injector from its case. Check the expiry date and colour (There should be no floating objects in the solution).

**2.** Place the Auto-Injector in one hand and make a fist around it. The orange end should be facing downward.

**3.** Tuck your thumb, specifically the knuckle, into the side of the Auto-Injector.

**4.** Remove the blue cap with your other hand.

**5. DO NOT TOUCH ORANGE SIDE!**

**6.** Place the orange end tip near the fleshy outer portion of the thigh. **DO NOT** place your thumb over top of it. (It is not necessary to remove clothing as the Injector is meant to go through material).

**7.** Empty the casualty's pocket of coins, wallet, etc…prior to injection.

**8.** With a quick motion, swing your hand out and jab firmly into the outer thigh, so that the Injector enters at a 90 degree angle.

**9.** Hold firmly in the thigh for 10 seconds.

**10.** Massage the area for 10 seconds after injection.(wear gloves.)

**After Injection**

**11.** Check and see if the needle is exposed.

- If no needle is exposed, repeat the order of procedures again. If the needle is exposed; a dose of epinephrine has been delivered.
- If 90% of liquid remains, that is normal; a dose has been administered.

**12.** Bend the needle on a hard surface and place back in carrying container. Save for EMS or emergency room physician.

**13.** Mark the time of the first injection, as second injection can be delivered 5-10 minutes later, ideally in the opposite leg.

**The most common type of epinephrine auto injector in Canada is the epi-pen, but other types do exist.**

# Chapter 26
## Bone and Joint Injuries



## *Recognizing Bone And Joint Injuries*

### Two Classifications of Fractures

A fracture occurs when there is a break to cartilage or bone, resulting in their discontinuity. Fractures can result from a direct trauma, often times a blunt force trauma, and other times from medical conditions such as arthritis or osteoporosis.

**Fractures** are classified into two groups:

**Open/Compound fracture:** In an open fracture, severely damaged and angulated bone, which have sharp ends, pierce the skin creating an open wound. With these types of fractures it is not uncommon to have bleeding present, along with the potential for infection. As a First Aider, closely monitor this type of casualty for signs and symptoms of Shock.

**Closed fracture:** Closed fractures do not have bone protruding through the skin, although a tenting (fractured bone pushes the skin outward resembling a tent) of the skin may be present depending on the type of fracture sustained. **Closed** fractures are more common than those of **open** fractures.



- Long bone fractures may result in moderate to severe bleeding as major blood vessels may be punctured from jagged bone ends.
- Up to 550 ml of blood may be lost in a fracture of the lower leg (tibia/fibula).

- Up to 1000 ml of blood may be lost in an upper thigh/femur fracture.
- Up to 2000 ml of blood may be lost in a pelvic fracture.

**Fractures are generally not life-threatening, however, certain fractures, such as a pelvic fracture, can result in severe blood loss, whether internal or external, causing Shock**

## Definition of a Joint

A joint can be defined as a connection made between bones (where two bones come together). There are three classifications of joints: Cartilaginous, Fibrous and Synovial.



### Cartilaginous Joints

- Joints are slightly moveable.
- Cartilage is what joins the bones together.
- Typically found in joints connecting vertebrae and pubic bones.

### Fibrous Joints

- Immovable joints.
- Fibrous tissue connects the bones.
- Prevalent in bones of the skull.

### Synovial Joints

- Freely moveable joints.
- Covered by cartilage, attached by ligaments and lined with synovial membrane to lubricate the joint.
- Examples of **ball and socket** joints are hips and shoulders.

## Types of Joint Injuries

**a) Sprains:** Injuries to ligaments, resulting in a partial tear of the affected tissue. These injuries are typically caused by an overstretching or twisting of a joint beyond its normal range of motion. Knees and ankles are common areas for sprains.

**First Degree Sprain (Mild):** The joint is still stable. Only a few fibers are torn in first degree sprains. Swelling and bleeding is minimal.

**Second Degree Sprain (Moderate):** Joint remains intact; however, there is increased swelling and bruising to the affected area.

**Third Degree Sprain (Severe):** Affected tissue is completely torn. If there is a dislocation, in conjunction with a sprain, nerves and blood vessels to the affected area may become compromised.



- Some Second Degree Sprains and most Third Degree Sprains will have the same signs and symptoms of a fracture.
- Immediate application of ice during the first 24 hours can often times reduce pain and swelling.

**b) Strains:** Injuries to muscles or tendons, resulting in a stretching or tearing and caused by overexertion or overextension. These injuries can cause a disruption of function in the affected area. Arms and back are common sites of strain injuries.

**c) Dislocations:** An injury to a joint in which the ends of two bones are displaced, forcing them into an abnormal position. Sudden dislocations can cause immediate pain and discomfort. Dislocations are generally caused by trauma, such as from a fall. Common sites of dislocations are ankles, knees, hips, elbows, fingers and shoulders.



## Signs and Symptoms of Fractures, Sprains and Dislocations

**Fractures (Open/Closed)**

- Severe pain, increasing over time and with movement.
- Swelling
- Bruising
- Open wound with bone ends protruding.

- Blood loss from a compound fracture.
- Decrease or loss of function.
- Deformity
- Crepitus (Sound of bone ends grating overtop of each other).
- Numbness/tingling.
- Discolouration-Paleness.
- Casualty heard a “snap” or “popping” sound when injury occurred.
- Shock

**Sprains**

- Bruising
- Stiffness
- Swelling
- Pain

Signs and symptoms will vary depending on the **degree** (mild, moderate, and severe) of the sprain the casualty has endured. Some second degree and most third degree sprains will have the same signs and symptoms as those found in fractures.

**Dislocations**

- Deformity or irregular appearance of the joint.
- Intense pain.
- Swelling/discolouration.
- Numbness/tingling.
- Loss of function; may be immoveable.

### Specific Signs and Symptoms of a Femur/Thigh Fracture

- Intense pain.
- Swelling
- Tenderness
- Bruising
- Shortening of the affected leg when compared to the unaffected leg.
- Outward rotation of the affected leg.
- Possible bone ends protruding through the skin.
- Shock

### Two Factors Which Increase the Seriousness of a Femur Fracture

**1.** Internal bleeding may result when sharp bone ends pierce major blood vessels (e.g. femoral arteries).

**2.** Immense blood loss can result in life-threatening Shock.



# *First Aid For Bone And Joint Injuries*

### General Rules of First Aid for Bone and Joint Injuries

The general rule for treatment of bone and joint injuries is to prevent further tissue damage and injury, to control pain, to prevent further aggravation of the injury and to minimize swelling.



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.



- If a fracture or other soft tissue injury is suspected, provide manual support both above and below, stabilizing the injury in the position found (minimize movement as much as possible).
- Treat with RICE.
- **Rest:** Rest the casualty in a position of comfort.
- **Immobilize:** Support and stabilize affected area if you have not already done so. This helps to…



- Prevent further damage.
- Decrease pain.
- Decrease risk of bleeding.
- Decrease risk of loss of circulation.



- **Cool:** Apply cold to the injury once it has been stabilized.



- Helps reduce pain, swelling and bruising.
- Ice should never be placed directly over the skin.
- Apply ice or cold pack for 15 minutes “on”, 15 minutes “off”, 15 minutes “on” etc... for the first 48 hours after an initial injury.
- Cold triggers a constriction of blood vessels and numbs nerve endings, which helps alleviate pain and reduces swelling.
- Decreases pain and swelling.



- **Elevate:** Raise the injured area, as long as this does not cause further pain and/or injury to the casualty.
- Treat for Shock.
- Provide Ongoing Casualty Care.

## Characteristics of a Good Splint

A splint is a First Aid device used to stabilize an injured area and to keep it in place. Splints can be purchased commercially or they can be improvised with certain common materials such as pillows, blankets, towels, thick magazines, cardboard, wood etc… The purpose of a splint is to minimize movement of an injured area, decrease pain, decrease the potential for tissue injury, decrease bleeding and contamination from an open wound and to make transport more tolerable for a casualty.



Fig. 1

**Fig.1-Malleable "Quick Splint"**

Splints should be;

- Rigid enough to support the injury.
- Padded for casualty comfort and support.
- Long enough to extend both above and below the joints of the fracture site.

- Splint the injury in position found.
- Splint only if you will not cause further damage or discomfort.


Fig. 2

- Check pulse, motor and sensation (PMS) before and after splint application.
- Loosen a splint if circulation or sensation becomes impaired.

**Fig. 2 - Application of a splint and bandages to secure a fractured forearm.**



# *Recognizing Muscle Strains And Providing First Aid*

## Definition of a Muscle Strain

## Causes of Muscle Strains

A **muscle strain**, as mentioned earlier in this chapter, occurs when a muscle is stretched or torn from either overexertion or overextension, therefore going beyond the muscle's normal range of motion.

Strains typically occur when there is a high force; sudden contraction of a muscle. Strains commonly occur when one attempts to lift a heavy object from an unstable and awkward position, or when one suddenly slips on a slippery surface. These types of injuries can be very painful and uncomfortable and often times lead to a disruption in the normal functioning of the injured area. Arms and backs are common sites for these types of injuries.

**Signs and Symptoms of a Muscle Strain**

- A sharp pain felt in the muscle directly after the event.
- Swelling
- Bruising
- Muscle stiffness.
- Loss or disruption of functioning.

## First Aid for a Muscle Strain



- Place the casualty in a position of comfort.
- Do a Secondary Survey on the injury site once the Primary Survey has been cleared
- Immobilization of the injured area may be required for comfort when transporting the casualty **or** if the injury is severe.
- Minimize pain and swelling with the application of ice.

# *Recognizing Repetitive Strain Injury And Providing First Aid*



## Definition of Repetitive Strain Injury

## Causes of Repetitive Strain Injury

**Repetitive Strain Injuries** occur from repetitive, prolonged, specific movements of muscles which develop over time from their chronic use. With these repetitive movements, damage to soft tissue, tendons and nerves often result. Common sites which are susceptible to repetitive strain injury are the hands, wrists, elbows, knees, ankles, back and shoulders.

### Signs and Symptoms of Repetitive Strain Injuries

- Pain
- Numbness/tingling.
- Swelling/inflammation.
- Stiffness
- Decreased mobility/movement of the affected joint.

## First Aid for Repetitive Strain Injuries



- Minimize or completely stop the tasks which cause the discomfort.
- See your doctor for advice and suggestions on medications and rehabilitation treatments if necessary.
- Investigate other methods in which your environment can be modified to decrease the likelihood of continued physical strain.

# Chapter 27

## Head, Spinal and Pelvic Injuries

## *Recognizing Head and Spinal Injuries*

### How to Recognize Head and Spinal and Pelvic Injuries

### Injuries Most Commonly Associated with Head/Spinal and Pelvic Injuries

**Head injuries** are seen in 25% of all trauma victims and are the cause of death in 50% of motor vehicle collisions. Falls, fights, and sports injuries are also culprits in the genesis of head injuries. Head injuries can either be **"open"** where there is an open wound in the skull (e.g. gun shot), or **"closed"** generally from a blunt trauma (e.g. motor vehicle collision) where no open wound is present. "Open" head injuries pose an additional risk, as pathogens such as bacteria can enter the brain directly and cause infection (e.g. meningitis). When the head is directly injured, as with severe head injuries, fractures of the skull and face may result. Direct injury to the brain and blood vessels can often occur, leading to brain compression and brain swelling. Because the human brain is encased in a hard, rigid skull, it does not have much tolerance for swelling as the skull cannot expand and therefore accommodate for this increase in size. When the brain receives direct damage, the body goes into "alarm" mode by increasing the amount of vital blood and oxygen the brain receives. This reaction, meant to aid the ailing brain, can actually cause more detriment than good by creating further swelling. Increased swelling cuts off the blood supply to brain cells which leads to a decrease in blood flow, nutrients and oxygen.

This action results in death of brain cells and eventual death of the casualty. To complicate matters further, head injury casualties are often times unconscious and unable to protect their airway, in addition to being susceptible to vomiting and subsequent aspiration (Inhalation of foreign material into the lungs). A First Aider should always suspect a neck injury if there is an original suspicion of a head injury.

**Spinal injuries** can be devastating and can leave a casualty partially or permanently impaired with one of the most devastating effects being paralysis. Spinal cord injuries typically occur in individuals 16-35 years of age due to their involvement in high risk activities. Most trauma casualties are between the ages of 16-20 years of age. When violent forces are applied to the body, the spine may move beyond its normal ranges of motion causing injury and disability.

**Pelvic injuries:** The pelvis is located in the lower half of the trunk of the body at the base of the spine. The pelvic cavity contains the bladder, urethra, female reproductive organs, major blood vessels, large intestine and rectum. Injuries to the pelvis and organs encased in the pelvic cavity are usually as a result of blunt or penetrating traumas. Motor vehicle crashes are the most common cause of pelvic injuries generally resulting in pelvic fractures. One of the major concerns with pelvic injuries, often times from fractures, is the risk of severe internal bleeding/hemorrhaging. A casualty can have significant internal bleeding, leading to Shock and eventual death if not treated promptly. Other common injuries are damage to the urethra and the urinary bladder, with the urinary bladder being the most frequently injured.



If a casualty is suspected of having a fractured pelvis, one should also suspect a spinal injury.

**Common Causes of Head/Spinal Injuries**

**1.** Motor vehicle crashes 48%
**2.** Falls 21%
**3.** Penetrating injuries 15%
**4.** Sports injuries 14%
**5.** Other injuries 2%

**When to Suspect a Casualty has a Potential Head/Spinal Injury**

- Accidents which cause a sudden acceleration, deceleration or sideways bend with force applied to the neck or chest.
- Situations which produce a violent impact on the head, neck, torso, or pelvis.
- Any situation where a casualty has fallen from a height.
- Situations in which a casualty has been ejected from a vehicle (e.g. car, motor boat etc…).
- A casualty who has been involved in an accident involving shallow water.



- **Head and Spinal injuries often lead to long term disability and possible death. In order to provide these casualties with the greatest chance of survival, it is essential to promptly recognize and treat their injuries and to call 9-1-1 as soon as possible.**
- **Always stabilize a casualty's head in the position found when suspecting a Head and/or spinal injury. (With gloved hands secure on either side of the head and prevent further movement.)**

Certain additional clues can provide a First Aider with an indication of whether or not a casualty has suffered a Head and/or Spinal injury. It is vitally important to look carefully at the Mechanism of Injury for these types of injuries to determine the likelihood of the casualty suffering from a Head and/or Spinal injury. An example is that of a child who dives into a swimming pool and hits his/her head on the bottom MOI suggests both a Head and Spinal injury. Other key points are to look carefully at the position in which the casualty was found and observe whether or not there is significant deformity or awkward positioning of the body.

Another way to suspect/confirm whether a casualty has suffered a Head and/or Spinal injury is by looking at his/her specific signs and symptoms.

## Common Signs and Symptoms of Head and Spinal Injuries

- Changes in level of awareness/consciousness.
- Bruising of the head, especially behind the ear (Battle's sign), or around the eyes (Raccoon eyes/black eyes).

- Unequal and/or Unreactive pupil/or pupils.
- Pain and/or swelling around the head.
- Deformity of the face or skull (depressions, bumps).
- Nausea/vomiting.
- Persistent/ongoing headache.
- Impaired vision.
- Fluid draining from the ear(s) or nose (blood or cerebrospinal fluid)
- Numbness or tingling in the extremities.
- Partial or complete loss of movement.
- Back pain.
- Loss of coordination/balance.
- Loss of bowel and /or bladder control.
- Priapism (erection - can be observed in initial phase of spinal cord injury)

### Signs and Symptoms of Pelvic Injuries

- Tender, rigid abdominal region.
- Severe pain in the groin and lower back.
- Rectal bleeding.
- Vaginal bleeding.
- The urge to urinate (may or may not contain blood).
- Outward rotation of both legs.
- Inability to stand or walk.
- Increased pain on movement.
- Shock

## First Aid For Suspected Head And Spinal Injuries

### Principles of First Aid for Head and Spinal Injuries



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).



- Always approach casualty from the feet.
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- Maintain head and neck in the position found.
- If the casualty is conscious, inform him/her not to move.
- A,B,C's
- Control any bleeding.
- Perform a Secondary Survey (Do not move the casualty while assessing).
- Monitor vital signs.
- Treat for Shock.
- Keep the casualty warm.
- Provide oxygen if available.
- Provide Ongoing Casualty Care.
- Nothing to eat or drink
- If blood or straw-coloured fluid is draining from the ears, cover lightly with a sterile dressing.



- If there is a suspected underlying skull fracture, protect areas of deformity, open wounds, bumps etc…by applying thick dressings and bandages.
- If the casualty has a bloody nose, discourage him/her from sneezing or blowing his/her nose and allow it to drain while preventing it from entering the mouth.
- Sneezing and blowing one's nose can cause a dangerous increase in pressure within the brain in someone who has sustained a potential head injury.
- Blood is an irritant to the stomach and can cause vomiting, which can subsequently result in and additional increase in pressure within the brain.



**Casualties who have suffered a head injury should be monitored for 24 hours. If any of the below signs and symptoms are observed, call 9-1-1 immediately and seek medical help. (Changes in Level of Consciousness, bleeding from the nose or ears, vomiting, change in pupil size, a "bulging" soft spot for an infant, sudden weakness, seizures, sudden headaches with increasing pain, blurred, or double visions or a stiff neck.**

**A Severe head injury casualty is prone to severe vomiting. If the casualty's airway becomes compromised, you may have to roll the casualty in a controlled fashion (with the aid of bystanders) protecting his/her head and neck. This will help prevent an airway obstruction.** *(Recall the HAINES Position)*

## First Aid for a Suspected Pelvic Injury

First Aid for a suspected pelvic injury will incorporate the same First Aid Principles as employed for a suspected Head and/or Spinal injury.

- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout) and secure the head if you suspect a potential Head and/or Spinal injury.
- **Call 9-1-1**.
- A,B,C's.
- Support the casualty in the position found while waiting for EMS arrival
- If you have to transport the casualty, support him/her on a spinal board with support around the pelvic region.
- **DO NOT** squeeze the casualty's hips together and **DO NOT** apply any unnecessary pressure to the pelvic area.
- Treat for Shock.
- Provide Ongoing Casualty Care.

## Dangers of Improperly Handling a Casualty with a Head and Spinal Injury

## The Importance of Receiving Immediate Medical Help for A Casualty with Suspected Head and Spinal Injuries

Head and Spinal injuries are potentially life-threatening and can lead to paralysis, permanent disability and death. A casualty with such an injury requires prompt medical attention, generally at a trauma centre, with time being one of the crucial factors in determining the degree to which the casualty is partially or permanently disabled from the injury and more importantly, whether they live or die. Improper handling of the casualty can be catastrophic with the potential to aggravate and cause further irreversible damage. It is imperative to **call 9-1-1** immediately for a casualty suspected of having Head

and/or Spinal injuries while having the awareness to secure the head and body in the position found.

## Recognizing Concussions, Contusions, Compression and Skull Fracture Traumas

### Concussion

**Definition:** A transient period of altered level of consciousness, generally followed by a complete return of neurological function. No permanent brain damage is sustained.

**Causes:** Car accidents, falls, sports-related accidents and violence

**Signs and Symptoms of a Concussion**

- Confusion and inability to focus
- Amnesia (memory loss)
- Slurred or incoherent speech
- Lack of coordination
- Memory deficits

### Contusion

**Definition:** Physical damage/trauma to the brain itself which may include injury to blood vessels resulting in bleeding within the brain (bruising to the brain)

**Causes:** Care accidents, falls, sports-related accidents and violence

**Signs and Symptoms of a Contusion**

- Memory loss
- Attention problems
- Emotional disturbances
- Difficulty with motor coordination
- Numbness
- Loss of ability to understand or express speech



**Outcome depends upon the severity of the injury**

## Brain Compression

**Definition:** When pressure inside the brain increases from either an accumulation of blood within the skull or from brain tissue swelling and inflammation.

**Signs and Symptoms of a Compression Injury:**

- MOI suggests recent head injury
- Sudden onset headache
- Breathing may be slow or noisy
- Unequal pupil size
- Tiredness/lethargy
- Body paralysis or weakness along one side of the body
- Increase in body temperature
- Change in normal behavior

## Skull Fractures:

**Definition:** Significant mechanisms of injury from blunt or penetrating traumas can result in catastrophic skull fractures. Most fractures are called linear fractures which account for 80% of all skull fractures. If the force is great enough, bone fragments can get driven into actual brain tissue. Common sites of skull fractures are at the base or crown of the skull.

**Signs and Symptoms of Skull Fractures:**

- Significant MOI to face/skull
- Loss of consciousness or altered level of awareness
- Intermittent spells of unconsciousness and consciousness
- Obvious deformity/depressions of the skull/face
- Scalp trauma
- Fluid draining from the ears or nose (blood or cerebrospinal fluid)
- Bruising around the eyes
- Bruising or swelling behind the ear(s)
- Bloodshot eyes



**Severe, nausea, vomiting, headache and dizziness are frequently experienced post concussion. May last hours, to days and some may experience for weeks and months (Post Concussive Syndrome).**

# *First Aid for Suspected Head/Spinal Injuries*

## First Aid for a Bump on the Head

Bumps on the head are common injuries and most often not life-threatening. This form of injury is often seen in infants and young children as their heads are disproportionately larger and therefore heavier than the rest of their body. A bump on the head can however lead to serious problems if the Mechanism of Injury is significant. Concussions (a temporary interruption in brain functioning), contusions (bruising of brain tissue), skull fractures, etc… are serious complications of severe bumps to the head.

**First Aid for a Bump on the Head**



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Instruct Casualty not to move
- Determine Responsiveness (tap and shout) and secure the head if you suspect a potential Head and/or Spinal injury.
- **Call 9-1-1**.
- A,B,C's.
- Apply ice or a cold compress to the injury site for 15 minutes with a rotation of 15 minutes "on" and 15 minutes "off".
- Treat for Shock.
- Instruct Casualty not to eat or drink.
- Provide Ongoing Casualty Care.



**If you assess a casualty as having Changes in Level of Consciousness, bleeding from the nose or ears, vomiting, change in pupil size, a "bulging" soft spot for an infant, sudden weakness, seizures, sudden headaches with increasing pain, blurred, or double visions or a stiff neck, seek medical attention immediately.**

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# Chapter 28
## Multiple Injury Management

## *Priorities Of First Aid And Transportation In Multiple Casualty Situations*

### The importance of Triage and Levels of Priorities

Imagine for a moment, you're driving up to your friend's cottage. It's a beautiful sunny day and not a cloud in the sky. You listen to your favorite classical music in the background, when all of a sudden you hear horns blaring, tires squealing and the sound of metal smashing on metal. Once all the chaos is over, you look ahead, see a massive pileup of cars and metal debris strewn across the highway. You have now just become involved in a **Multi Casualty Incident.**

Multi Casualty Incidents (MCI) are situations involving multiple casualties who are ill and/or injured. If you thought providing First Aid for one casualty may be stressful, here is a situation in which many casualties are involved, some of which may be seriously injured or even dead. Here the concept of Triage comes into effect. **Triage** enables a First Aider to handle MCI's in a manner which allows one to operate in a fashion that promotes good decision making and which facilitates one to help as many casualties as possible without wasting unnecessary time.

Triage, is a process of quickly assessing casualties of an MCI based on the severity of his/her injury and/or condition. The goal is to help as many casualties as possible and to help expedite stabilization of their injuries, treatment, and transport to emergency facilities.

The triage process and subsequent assessment of injured or ill casualties is not the same as if you were dealing with just one casualty. In triage, the most ill and

injured casualties will take priority and will be the first to be transported to hospital upon EMS arrival. Casualties will be categorized as either **Highest Priority**-Casualty requires immediate First Aid, stabilization and transport; **Second Priority**-Casualty can generally wait up to one hour for medical help and transportation while not putting his/her life at risk; or **Third Priority**-These casualties are obviously dead or can wait for treatment, with no risk to life or limb. They receive First Aid and transportation last.

**Highest Priority**

These injuries are life-threatening and generally involve issues surrounding A,B,C's and are therefore rated as **High Priority.**

**1. Airway issues**

- Obstructed airway from foreign bodies.
- Swelling or fluid blocking the airway.

**2. Breathing issues**

- Sucking chest wounds (pneumothorax, tension pneumothorax).
- Broken ribs.
- Head injuries causing breathing difficulties.
- Skull fractures causing breathing difficulties.

**3. Circulation**

- Shock caused by major external bleeding.
- Shock caused by major internal bleeding.

**4. Other**

- Abdominal organs protruding.
- Severe burns.
- Major fractures.
- Major medical problems which can be easily corrected (e.g. diabetes).

**Second Priority**

These injuries have the potential to affect A,B,C's and are rated as

**Medium Priority**

- Severe burns.
- Fractures which could affect breathing.
- Spinal cord injuries.
- Head injuries.
- Injuries of the eye.
- Chest wounds without breathing difficulty.

**Third Priority**

These are minor injuries and are rated as **Low Priority**

- Minor fractures.
- Minor bleeds.
- Minor medical problems.
- Burns which are not critical.
- Behavioral issues such as anxiety and stress which are related to the incident.
- Casualties who present with no vital signs.
- Obviously dead casualties (transected, decapitated, charred).



Casualties who are unconscious, not breathing, and have no signs of life are treated as Third Priority (except in situations involving casualties struck by lightening).



- **Be aware that a casualty's condition can be rated as a Medium Priority but can quickly shift to a life-threatening High Priority. It is crucial to re-assess a casualty to determine whether his/her condition is remaining the same, improving, or getting worse.**
- **A quick assessment tool to gauge a casualty's condition is to use the Modified Glasgow Coma Scale to assess his/her Level of Consciousness.**

### How Triage Priorities Change in the First Aid for Lightening Injuries

If when triaging an emergency situation, you encounter a casualty who has been **struck by lightening** and who is found to be unconscious, not breathing, and without signs of life, this casualty becomes **HIGHEST PRIORITY.**



- Lightening strikes are dangerous to the heart and can cause Ventricular Fibrillation→Cardiac Arrest.
- All casualties who have been struck by lightening should seek medical attention immediately.
- 80% of the casualties struck by lightening will survive.
- 70% of lightening strike casualties are prone to hearing and vision disturbances.

# *Providing Ongoing Casualty Care For Multiple Casualties*

### Providing Emergency Care for Multiple Casualties according to changing First Aid Priorities

Multi Casualty Incident scenes are ever-changing and evolving with many uncontrollable variables. The suggestions relayed in this chapter on how to tackle these incidents will help you organize and become more confident when having to make decisions and when assessing priorities. A casualty's condition often times does not remain static throughout such events and therefore it becomes imperative to remain determined and diligent in re-assessing a casualty's condition and making the appropriate priority changes, if necessary.

## How to Provide Maximum Benefit to Casualties and Maintain them in the Best Possible Condition Until Medical Help Assumes Responsibility

**The Triage Algorithm**

**1.** Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).

**2. Call 9-1-1**.

**3.** Determine the number of ill and/or injured casualties and recruit bystanders to help manage the situation and to help provide First Aid .

**4.** Begin assessing the **first** casualty you come across. Determine Responsiveness (tap and shout), A,B,C's and treat any life-threatening injury and/or illness without partaking in unnecessary tasks. **Only do what is necessary to save the casualty's life.**



Casualties who are unconscious, not breathing and with no signs of life, or ones who are obviously dead are **Third Priority.**

**5.** Continue triaging casualties as outlined in **step 4.**

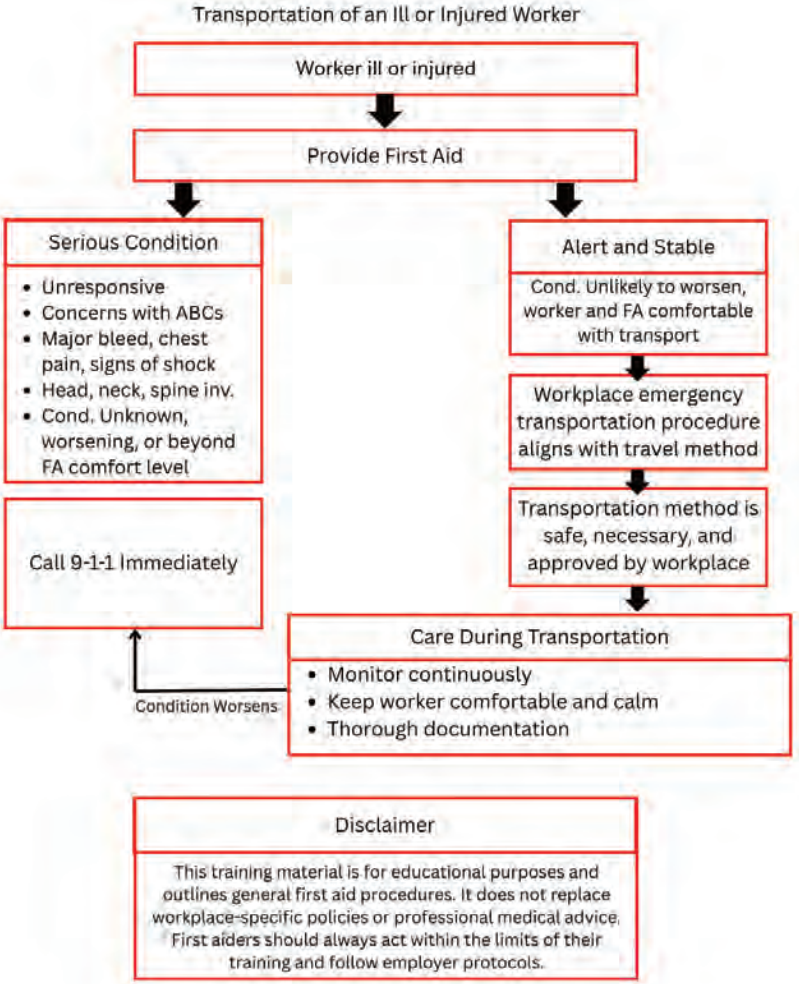
**6.** Once all the casualties have been triaged and you have an idea of injuries and/or illnesses from which the different casualties are suffering, **Begin Prioritization (Highest, Second, Third).**

**7. Transport casualties of Highest Priority first.**

**8.** Re-assess all remaining casualties A,B,C's and begin a Secondary Survey, starting with the casualties who were in the **Highest Priority** category, working your way down to the **Lowest Priority.**



**Casualties involved in the MCI who sustained minor injuries may be able to assist you in providing First Aid to other more serious casualties.**


Transportation of an Ill or Injured Worker
Worker ill or injured
Provide First Aid
Serious Condition
• Unresponsive
• Concerns with ABCs
• Major bleed, chest pain, signs of shock
• Head, neck, spine inv.
• Cond. Unknown, worsening, or beyond FA comfort level
Alert and Stable
Cond. Unlikely to worsen, worker and FA comfortable with transport
Workplace emergency transportation procedure aligns with travel method
Transportation method is safe, necessary, and approved by workplace
Call 9-1-1 Immediately
Care During Transportation
• Monitor continuously
• Keep worker comfortable and calm
• Thorough documentation
Condition Worsens
Disclaimer
This training material is for educational purposes and outlines general first aid procedures. It does not replace workplace-specific policies or professional medical advice. First aiders should always act within the limits of their training and follow employer protocols.

# Chapter 29
## Rescue Carries



## *Safety Principles When Moving A Casualty*

### Principles of Safety for Moving a Conscious and Unconscious Casualty

In most First Aid situations, you will not be faced with the task of moving the casualty. The responsibility of moving a casualty is generally left in the hands of EMS personnel when they are providing transport. If a casualty is moved prematurely and if injuries are not stabilized, further injury can ensue. For example, unnecessary movement of a casualty who has a suspected Head and/or Spinal injury can lead to paralysis and in the worst case scenario, death. That being said, there are specific situations in which it is imperative to move a casualty from his/her original position.

1. Situations in which the environment becomes hazardous and potentially life-threatening to the rescuer and the casualty, such as in cases of gas leaks, fires and explosions.
2. A casualty with minor injuries may need to be moved to gain access to more seriously injured casualties.
3. A casualty may need to be moved from his/her environment if First Aid treatments cannot be rendered in the position found. For example, a casualty who has suffered a Cardiac Arrest and is in a position or environment which does not allow for proper resuscitation efforts.
4. A casualty must be moved if they are going to be transported to a medical facility.

**When making the decision to move a casualty, a rescuer should first consider the following:**

- The size and weight of the casualty.
- What injuries require stabilization prior to movement?
- Your physical limitations (Will you be able to move him/her safely, without putting yourself at risk for injury).
- Will the casualty's condition worsen if he/she is moved?

If you weigh the risk/benefit ratio for the casualty and decide to move him/her, as it would be in his/her best interest, attempt to stabilize any injuries if time permits and try to prevent further injuries during mobilization.

There are several different rescue carry techniques which can be utilized if the decision has been made to move a casualty from his/her original position. Select the method which will benefit both the rescuer and the casualty in providing safety and protection from injury.

In order for a rescuer to minimize the chance of injury while moving a casualty, it is essential to implement proper body mechanics by following these suggestions:

**1.** Do not go above your limitations. If you cannot safely and effectively move a casualty, then don't.

**2.** Line yourself up as close to the casualty as you can.

**3.** Bend your knees and not your waist.

**4.** Lift with your legs, never your back.

**5.** Try to keep your back straight and let your legs do all the work.

**6.** Take little steps and be aware of your immediate environment.

**7.** Try to move forward as opposed to backwards if possible.

**8.** Never twist your body if you are going to turn. Use your feet to pivot.

# *Moving A Casualty From A Life-Threatening Situation*

## When and How to use the Drag Carry Method

A **Drag Carry** is the desired method of transport for a casualty who is lying on his/her back or in a sitting position, providing optimal support for both the head and neck. The drag carry should **only** be used in situations which pose a life-threat to the casualty.



## The Drag Carry Method for a Casualty who is Lying on His/Her Back

**a) Technique:**

**1.** Position yourself at the top of the casualty's head so that you are looking down at his/her body.

**2.** Bend at your knees and reach under the casualty's shoulders.

**3.** Grab clothing on either shoulder with your hands.

**4.** Support the casualty's head atop of your forearms.

**5.** Drag the casualty backwards until the desired distance is achieved.

**b) When to use the Drag Carry**

As previously mentioned, this method of casualty transport should only be utilized in situations which pose a life-threat to the casualty as the drag carry has the potential to provoke further injuries. The drag carry is ideal for moving a casualty with suspected Head and/or Spinal injuries.

## Extricating a Sitting Casualty with a Suspected Neck Injury from a Life-Threatening Situation

The **Drag Carry** is the optimal choice when moving a sitting casualty who has a suspected neck injury.

**1.** Position yourself behind the casualty, clutching clothes on either shoulder.

**2.** Stabilize the head on your forearms prior to moving the casualty.

**3.** Slowly and in a fluid motion, move the casualty while continuing to maintain support for the head and neck.

This casualty should not be moved great distances. The shorter the distance, the better. For long transport, spine boards are to be utilized.

# *Moving A Casualty Without A Stretcher*



## Seven Rescue Carries and the Appropriate Time to use Them



**Always communicate with your casualty before and during a rescue carry to make him/her comfortable, to decrease anxiety and to ensure safety along the way**

**a) Pick-a-Back:** This rescue carry is to be used on a casualty who is conscious with suspected lower limb injuries.

**1.** Bend at your knees and crouch down so that your back is flush, centered between the casualty's knees.

**2.** Have the casualty hop onto your back with his/her arms secured around your shoulders for support.

**3.** Provide support under the casualty's legs and stand up, making sure not to use your back. Instead, use force generated from your legs.

**b) Cradle Carry:** This rescue carry is to be used to lift children and light-weight adults.

**1.** Place one knee on the ground, kneeling beside the casualty.

**2.** Have the casualty place one arm around your shoulders while providing support for his/her shoulders and back with your arm.

**3.** Provide support with your other arm under the casualty's knees.

**4.** Lift the casualty using your legs.

**c) Human Crutch:** This rescue carry is used to aid a casualty who has injured a leg or foot and requires support while walking.

**1.** Have the casualty place one arm around your shoulders (his/her injured side) and take a firm grip of his/her wrist.

**2.** With your other hand, grab around the casualty's waist, either on a belt, or piece of material to provide extra support.

**3.** Walk step by step, in unison with the casualty.

**d) Two-Hand Seat:** This rescue carry requires two rescuers to implement and is to be utilized on a casualty who is unable to support his/her body weight.

**1.** Rescuers will be positioned on either side of the casualty.

**2.** Both rescuers will reach around the casualty's back gripping either a belt or clothing for support.

**3.** Both rescuers will place their opposite hands under the thighs of the casualty and will grasp and interlock fingers.

**4.** In unison, they will lift the casualty using his/her legs, walking step by step.

**e) Four-Hand Seat:** This rescue carry requires two rescuers and is to be used on a casualty who is conscious and who has full use of his/her hands and arms.

**1.** Rescuers will interlock hands and wrists creating a square.

**2.** The casualty will place his/her arms around the shoulders of the rescuers and lift themselves up so the hands of the rescuers are positioned under the casualty's backside.

**3.** Rescuers walk in unison, step by step.

**f) Chair Carry:** This rescue carry is often used by EMS and other emergency personnel to help transport a casualty up and down stairs and through passages which are too narrow for stretchers and other transport equipment to reach. This can be used on a casualty who is either conscious or unconscious and is not to be used on a casualty with suspected Head and/or Spinal injuries.

1. If possible, secure the casualty at the chest, waist and legs to a stable chair.
2. One rescuer will be facing towards the casualty (bottom of the chair) and will secure his/her hands on the front chair legs while the other rescuer, stationed at the top of the chair, will grasp the chair from the back. Both rescuers should be facing each other and should always maintain good communication while moving the casualty.
3. Have a third bystander position themselves behind the rescuer who is at the bottom of the chair for additional support and stability, especially when going backwards down stairs.

**g) Blanket Lift:** This rescue carry can be used to transport an injured casualty who does not have suspected Head and/or Spinal injuries. Blankets act as improvised stretchers when other methods of casualty transportation are unavailable. Blanket lifts require the participation of four bearers in order to safely and effectively transport the casualty.

It is imperative to test the strength of the blanket prior to placing the injured casualty on it. Select a bystander of equal or greater weight and test the blanket's strength on him/her first. If you do not have an available bystander to test the blankets strength, tie one end of the blanket to a tree, have another bystander grab the unattached end, while a final bystander climbs into the blanket to assess its strength.

1. Position the blanket lengthwise and roll it up halfway.
2. Have one bearer positioned at the casualty's head with another at his/her feet.
3. A third bearer will be stationed at the casualty's waist and **log roll** the casualty (uninjured side) onto the blanket.
4. The casualty is now positioned face up on the blanket.
5. Roll the rest of the blanket ends out, so that the ends are equal in length on both sides of the casualty.
6. Bearers will now be positioned. Two will be at the casualty's head and one on either side, grabbing the blanket at the shoulders. The final two bearers will be stationed at the casualty's feet grabbing the blanket at the hips and feet.
7. Lift the casualty in unison, making sure the blanket is kept tight and rigid.



**It is essential to have excellent communication between all rescuers, bystanders and the casualty, when performing rescue carries.**

# Chapter 30
## Eye, Ear & Nose Injuries

## *Measures To Prevent Eye Injuries*

Eye related injuries can happen to anyone, and at any age, however, over half of all eye injuries occur in casualties under the age of 25. The good news is that 90% of all eye injuries can be prevented with the use of proper safety equipment. Injuries to the eye can affect the bones surrounding the eyeball, their supportive soft tissues as well as the eyeball itself. They are commonly caused by blunt and penetrating traumas from motor vehicle collisions, sports and recreational activities, chemical exposures, foreign bodies entering the eye, animal bites and scratches. Injuries to the eye can cause a wide range of effects anywhere from minimal to profound, depending on the Mechanism of Injury. They can result in traumas ranging from mild irritation of the eye, fractures of the bones surrounding the eye, bleeding in, around or behind the eye and temporary or permanent blindness.



**Signs and Symptoms of Eye Injuries May Include**

- Pain
- Sensitivity to light.
- Blurred vision.
- Loss of vision.
- Extreme dilation or constriction of the pupil.
- Tenderness
- Swelling
- Bleeding
- Bruising around the eye.
- Extruded eyeball (eyeball displaced out of its socket).
- Double vision.
- Redness of the eye.
- Stinging or burning.
- Cuts or other wounds in or around the eye.
- Headache

## Two Serious Effects of Eye Injuries

**1.** Partial blindness.

**2.** Complete vision loss in one or both eyes.

## Safety Measures to Prevent Eye Injuries

**1.** Protect your eyes with properly fitted protective goggles/glasses when exposing yourself to situations which may cause eye injuries (work related, recreational sports).

**2.** Individuals with good vision in only one eye should always wear protective glasses or goggles.

**3.** Parents are encouraged to provide education and awareness on this topic, as well, to act as role models, following/implementing eye prevention principles.

**4.** Protect your eyes from ultraviolet light by wearing sunglasses which protect from UV rays.



**Before any First Aider attempts to treat a casualty who has suffered an eye injury, he/she must first wash his/her hands with soap and water and ideally apply non-latex medical exam gloves.**

# *First Aid For Foreign Objects In Eyes*

It is not uncommon for small particles such as dirt, sand, eyelashes, wood or metal to enter the eye. This commonly results in immediate irritation, inflammation, pain and discomfort. Foreign objects can scratch the surface of the eye (cornea), become stuck to the eyeball itself, or lodge in the upper or lower eyelids. Tears immediately generate as a defense response to try to remove the foreign object. It is not uncommon to see a reddish appearance in the affected eye.

## General Rules of the Eye Examination Technique

**1.** Wash hands with soap and water.

**2.** Wear non-latex medical exam gloves.

**3. DO NOT** apply pressure to the eye.

**4.** Assess the casualty's vision (Except in cases of chemical burns to the eyes as eye flushing and irrigation should come first).

**5.** Be aware of the Mechanism of Injury.

## First Aid for Foreign Objects in the Eye

**On the eyeball (surface of the eye, or coloured part of eyeball)**



- Instruct the casualty **not** to rub his/her eye as this can cause further damage and irritation and may embed the object.



- Flush the eye with water, available eyewash solution, saline solution, water from a drinking fountain, or eye dropper. A small cup or drinking glass may be used and should be placed at the base of the bone right below the injured eye. To prevent any possible contamination to the good eye, tilt the casualty's head, if tolerated, so as to have the eye with the foreign body lower than that of the other eye.



- **DO NOT** attempt to remove contact lenses as this may cause more damage and irritation to the injury.
- **DO NOT** attempt to remove foreign objects which remain attached to the eyeball after flushing.



- If the foreign object still remains after flushing with water, cover with a clean, sterile dressing and secure with a bandage. Seek medical attention.

**Under the upper eyelid**



- Have the casualty move his/her upper eyelid (holding the eyelashes) and pull down toward the lower eyelid and repeat several times. The lashes of the lower eyelid should make contact with the upper eyelid and may sweep away the foreign object.
- If the aforementioned technique has proven unsuccessful, expose the eyelid. With the tip of a moistened cotton swab, or moistened rolled up tissue, gently attempt to touch the end of the foreign object and remove it.

**Under the lower eyelid**



- Gently pull the lower eyelid away from the eyeball.
- Instruct the casualty to look upwards.
- Use the tip of a moistened cotton swab, or moistened rolled up tissue, and gently attempt to touch the end of the foreign object and remove it.

## Three Situations in which NO Attempt Should be Made to Remove a Foreign Object from the Eye

**1.** Objects/materials which are embedded in the eye.

**2.** Objects/materials which appear to be stuck to the eye.

**3.** Objects/materials which are stuck to the eye as a result of a burn.

**One Should Never:**

- Attempt to remove an embedded object.
- Use tweezers, cotton swabs or other instruments directly on the surface of the eye.
- Apply direct pressure for a bleed to the eye.
- Rub an injured eye.
- Attempt to remove a foreign body that appears to be embedded in the eye.

## First Aid When a Foreign Object is Adhered or Embedded in the Eye



- **DO NOT** attempt to remove the object.
- **DO NOT** apply direct pressure if a bleed is present.
- Leave the foreign object in place.
- Calm and reassure the casualty.
- Attempt to lay the casualty on his/her back, if tolerated.
- If the foreign object is large enough and protruding (e.g. a pencil), secure and stabilize the object using the "log cabin" technique which incorporates dressings, padding or rolled up gauze stacked around the base of the object.
- Place a cup, if available, atop of the "log cabin" to prevent any further movement of the object and secure with tape or bandages (around the casualty's head).
- Cover the uninjured eye with gauze or a clean cloth to prevent blinking of the injured eye.

- Eye blinking occurs in both eyes in unison. Because of this, if the uninjured eye blinks, so will the injured eye, possibly making the injury worse with each blink.
- Seek medical attention immediately.

**If the object is small enough, place gauze, a clean cloth, or other form of dressing overtop of the injured eye. Secure in place with tape or bandages (around the casualty's head). The uninjured eye should have gauze or a clean cloth placed overtop to prevent blinking of the injured eye.**

# *First Aid For Wounds In And Around The Eye*

## First Aid for Wounds to the Eye

Wounds in and around the eye can be very serious if the injury extends to the eyeball. The Mechanism of Injury is a good indicator of possible injuries the casualty may have sustained to the eye. If the eyeball was unaffected by the trauma, vision should not be affected.

**a) Wounds to the soft tissue around the eye:** A Mechanism of Injury from a **blunt trauma** in and around the eye can cause severe bruising and fracturing of the skin and bones surrounding the eyes and result in both internal and external bleeding. A **penetrating trauma** to the eye can cause bleeding, both internal and external along with major damage to sensitive structures in and around the eye itself. Both of the aforementioned trauma scenarios can lead to vision loss if the eyeball and its delicate internal structures are affected.

**i) Internal Bleeding (Contusion)**

Bleeding inside the eye can occur when sensitive blood vessels rupture as a result of trauma. This can be very dangerous as blood tends to pool and accumulate inside the eye. This causes an increase in pressure within the eye putting a strain on sensitive nerves and blood vessels. If the bleed continues and pressure rises, loss of vision may result. Medical attention should be sought immediately for a casualty suspected of having this type of injury.

**ii) External Bleeding**

If bleeding occurs in tissues around the eye, stop the bleeding with the application of clean, sterile dressings and secure with tape or bandages. **DO NOT** apply direct pressure to the eyeball itself.

**b) Wounds of the eyeball:** Wounds of the eyeball can be very serious and may be caused by a **blunt** or **penetrating** trauma causing lacerations, scratches, puncture wounds and so on. They may result in bleeding, eyeball rupture, vision impairment or complete vision loss. A casualty who has suffered a wound to one or both eyeball(s) should seek medical attention immediately. To treat a wound of the eyeball, if no embedded object is present, cover the injured eye with clean, sterile dressings and secure with tape or bandages. Never apply direct pressure to the eyeball itself, even if bleeding is present as this can cause further trauma. Never attempt to remove a foreign object on or embedded in the eyeball

**c) Penetrating wound with an embedded object in the eyeball:** Never remove a foreign object which has been embedded in the eyeball and never apply pressure. These objects must be secured in place and stabilized. For the First Aid treatment of embedded objects in the eye,

## First Aid for an Extruded Eyeball



- **DO NOT** attempt to place the eyeball back into the eye socket.
- **DO NOT** apply any pressure to the eyeball itself at anytime.
- Place the casualty lying on his/her back.
- Place a clean, sterile and moist dressing lightly overtop of the extruded eyeball.
- Secure dressing in place with tape.



- A cup, secured by a ring pad is also an acceptable method to protect the extruded eyeball.



- The casualty's other eye should be covered with gauze or a clean cloth.
- The casualty should be instructed to remain still, with his/her head secured during transport.
- Seek medical attention immediately.

### First Aid for a Wound with an Embedded Object in the Soft Tissue Near an Eye



- **DO NOT** attempt to remove the object.
- **DO NOT** apply direct pressure if a bleed is present on the eyeball itself.



- Light pressure may be applied to soft tissue to control bleeding, **if away** from the eyeball.



- Attempt to lay the casualty on his/her back if tolerated.
- If the foreign object is large enough and protruding (e.g. a pencil), secure and stabilize the object using the "log cabin" technique which incorporates dressings, padding or rolled up gauze stacked around the base of the object.
- Place a cup, if available, atop of the "log cabin" to prevent any further movement of the object and secure with tape or bandages (around the casualty's head).
- Seek medical attention immediately.

# *First Aid For Burns To The Eye*

### First Aid for Burns to the Eye

**a) Chemicals:** Chemical burns to the eye(s) can be very serious and account for 7-10% of all eye injuries. Chemical burns occur when solids, liquids, or fumes produced from chemicals enter the eye. The extent of injury caused by a burn depends on several factors; the specific chemical involved, how long the chemical was in contact with the eye and the specific treatment rendered. It may take up to 24 hours, post burn, to determine the extent of injury/damage incurred to the eye. Always advise the casualty to seek medical attention when chemical burns to the eye(s) have occurred.



**When treating all chemical burns to the eye, the general rule is to immediately flush the injured eye with large/copious amounts of room temperature water, or specific eye wash solution, for at least 15-30 minutes.**

If a casualty has suffered a **liquid** chemical burn to the eye, immediately flush the eye with large/copious amounts of room temperature water for a minimum of 15 minutes (contact lenses do not need to be removed). It is imperative to dilute and flush the chemical from the eye to prevent further damage. A proper eyewash solution is ideal but if none is available, have the casualty jump into the shower with his/her clothes on and have him/her open his/her eyes as wide as possible while flushing. Garden hoses or water from a tap will also suffice. Once the burning has stopped and you have flushed for the appropriate amount of time, apply a clean, sterile dressing to the injured eye and secure. Seek medical attention immediately.

For a casualty who has sustained a **dry** chemical burn which contains powdered residue; First Aiders must first **brush away the powder**, making sure not to get any chemical in the good eye, prior to the flushing with large/copious amounts of room temperature water. Once the burning has stopped and you have flushed for an appropriate amount of time, apply a clean, sterile dressing to the injured eye and secure. Seek medical attention immediately.



Clothes which have been contaminated with powdered chemicals should be discarded.



**If burning sensation continues or re-occurs after the initial flushing with large/copious amounts of room temperature water, seek medical attention immediately and repeat flushing for an additional 15-30 minutes.**

**b) Intense Light Sources:** Exposure to intense light sources from sunlight, especially when reflecting off snow, those produced from welding equipment and from tanning beds can cause severe burns to the eyes. A casualty may be unaware that a burn to the eye(s) has taken place but may complain of pain, increased sensitivity to light and the sensation of having dust or small particles in his/her eye(s). First Aiders should cover the casualty's eyes with clean, sterile and moist dressings (preferably cool) and secure with bandages. Injury to the eye(s), as a result of exposure to intense light sources may not be evident for 24 hours after initial insult/exposure. Seek medical attention immediately.

# Understanding the Ear

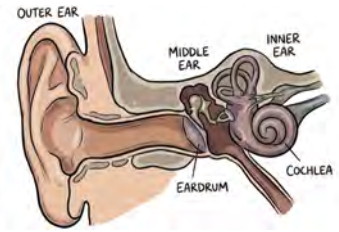
The ears allow us to hear and maintain balance.
They are made up of **three main parts:**

**Outer ear:** The visible ear and ear canal that collect sound

**Middle ear:** Contains the eardrum and three tiny bones that transmit sound

**Inner ear:** Controls hearing and balance through fluid-filled canals

Because the ear contains thin skin, soft cartilage, and delicate structures, it can be easily injured by trauma, foreign objects, pressure changes, or loud noise.




**Why this matters:**

The eardrum is extremely thin and delicate. A rupture can cause pain, dizziness, hearing loss, and drainage. Never place objects into the ear.

**Common Causes of Ear Injuries**

Objects inserted into the ear

Blows or trauma to the side of the head

Pressure changes (flying, diving, explosions)

Loud noises

Infections or inflammation

**First Aid for Ear Injuries**



Do not put anything into the ear, including cotton swabs or tissues

If bleeding is present, cover the ear lightly with sterile gauze but do not plug it, allowing drainage

Apply a cold compress to the outside of the ear if swelling or bruising is present

If a foreign object is visible and near the opening, tilt the head to allow it to fall out naturally

If a ruptured eardrum is suspected (pain, hearing loss, fluid or blood drainage), keep the ear dry and do not clean, flush, or use drops

**Call 9-1-1** or Seek Medical Care for Ear Injuries If:

There is severe pain, dizziness, or sudden hearing loss

Blood or clear fluid is draining from the ear

A foreign object is stuck deep inside the ear

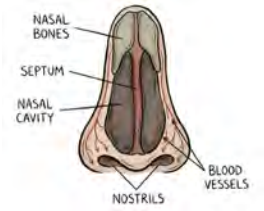
Symptoms worsen or do not improve

# *Nose Injuries*

## Understanding the Nose

The nose helps with breathing, smelling, and filtering the air we breathe. The front part of the nose contains a dense network of small blood vessels that can break easily, causing nosebleeds (epistaxis).

Nose injuries commonly occur due to falls, sports, trauma, or foreign objects placed inside the nose.




**Why this matters:**

Because the nose is rich in blood vessels, even minor injuries can cause heavy bleeding. More serious injuries, such as fractures, can interfere with breathing and may require medical care.

**First Aid for Nosebleeds**



Sit the person upright and lean them forward to prevent blood from flowing into the throat

Pinch the soft part of the nose, just below the bone, for 10–15 minutes without stopping

Encourage breathing through the mouth

Apply a cold compress over the bridge of the nose (avoid pressure on the eyes)

Do not tilt the head back or blow the nose after bleeding stops, as this can restart bleeding or cause nausea if blood is swallowed.

**Call 9-1-1 or Seek Medical Care for Nose Injuries If:**

- Bleeding continues heavily for more than 5 minutes despite direct pressure
- Blood or clear fluid drains from the nose after a head injury
- The nose appears broken or deformed
- The person is taking blood-thinning medications
- Breathing becomes difficult
- Foreign Objects in the Nose

Children — and sometimes adults — may insert small objects into the nose.

**First Aid Principles for objects in the nose**

Do not poke, dig, or use tools to remove objects

If the object is visible and not deep, position the head to allow gravity to

help it come out

Stop immediately if pain, bleeding, or swelling begins

Encourage calm breathing through the mouth

**Seek medical care if:**

- The object is not visible
- Pain, bleeding, or swelling occurs
- The object is organic (food or insects)
- The object does not come out with gentle gravity positioning

**Prevention of Ear and Nose Injuries**

- Use hearing protection in loud environments such as concerts or when using power tools
- Avoid inserting objects into the ears or nose, including cotton swabs and fingers
- Keep sprays and chemicals pointed away from the face
- Teach children not to place objects or food into their ears or noses
- Equalize pressure gently during flying or diving by swallowing or yawning; never force it if pain occurs

**Infection and Delayed Complications**

Even small injuries can become serious if infection develops.

**Watch for:**

- Increasing pain, redness, or swelling
- Yellow or green drainage from the ear or nose
- Fever or feeling unwell
- Seek medical care if any of these symptoms appear.

**Children's Note**

Children's ear canals and nasal passages are smaller and more sensitive.

Do not insert swabs, drops, or thermometers unless directed by a healthcare provider

Never attempt to remove stuck objects yourself

Keep the child calm and wait for trained medical help

**Serious Facial or Sinus Injuries**

Heavy impact to the nose or surrounding facial structures can cause fractures or sinus injuries.

**Signs and symptoms can include:**

- Severe swelling or bruising
- Bleeding that will not stop
- Trouble breathing

Treat these as possible head or spinal injuries. Keep the person still, support the head and neck, and **call 9-1-1** immediately.

**What Not to Do**

- Do not tilt the head back for nosebleeds
- Do not stuff tissue or products into the nose
- Do not pour liquids or oils into the ears
- Do not remove deep or stuck objects
- Do not ignore hearing changes, dizziness, or breathing difficulty

## When to Call 9-1-1 for Ear or Nose Injuries

Heavy bleeding that does not stop

Clear fluid or blood from the nose or ears after head injury

Hearing loss, dizziness, or balance problems

Major deformity after trauma

Difficulty breathing or swallowing

**Key Takeaways**

The ears and nose are small but vital structures and must be treated gently.

Do not poke, pull, or flush unless you are certain it is safe

Control bleeding and protect the area

**Call 9-1-1** early for heavy bleeding, breathing difficulty, or trauma

Stay calm and reassure the person



**Remember: You do not have to fix the injury. Your job is to protect, comfort, and get help.**

By staying calm, keeping the area safe, and seeking professional care when needed, you are already doing the most important part of first aid.

# Chapter 31
## Poisons, Bites and Stings

## *Measures To Prevent Poisoning*

### Substances That Cause Poisoning



A **poison** can be defined as any substance which enters the body and has the potential to exert serious physiological effects. The effects of poison exposure to the human body can result in mild to moderate injury or illness, or worst case scenario, death to the casualty.

Whether known or unknown, on a daily basis, we come into contact with poisons, which have the potential to cause serious injury. Consumer products sold for home use contain chemicals which may be poisonous upon exposure. These products contain special labels, warning of their potential hazards. Familiarize yourself with consumer product labels and read the fine print. Consumer products labels contain invaluable life-saving information providing warnings, how to safely handle and use the product as well as outlined First Aid procedures if accidental exposure or poisoning occurs.

Often times poisonous substances are not labeled or are improperly labeled putting individuals at risk. If you are unsure of a product or chemical you may have used or exposed yourself to, remain diligent and seek trustworthy information in order to make an informed decision to keep yourself and others safe. Be sure to keep products which contain poisons locked in a secure area away from infants, children and pets. Products should always be accounted for and sealed appropriately. If labels become unreadable, manufacture your own.

**Common Poisons**

- Medications; both prescription and non-prescription.
- Household cleaners (e.g. bleach, toilet bowl cleaners).
- Alcohol (e.g. rubbing alcohol, beer/wine).
- Vehicle products (e.g. windshield washer fluid, antifreeze).
- Certain plants (e.g. Poison Ivy).

**General Signs and Symptoms of Poisoning**

Poisoning can result in a wide range of signs and symptoms and are specific to the toxicity of the poison ingested, the route of entry and the size (weight) of the casualty. Poisoning can often mimic other disorders such as alcohol intoxication, stroke and diabetic emergencies. Signs and symptoms may include:

- Chemical odors emanating from the mouth.
- Burns or redness to the mouth, lips or tongue.
- Empty pill bottles or other containers.
- Confusion, unconsciousness.
- Vomiting
- Shortness of breath.
- Odors from clothing or the casualty.
- Restlessness/agitation.
- Drowsiness/Lethargy.
- Seizures

## Ways to Prevent Poisoning

**1.** Always read labels prior to using products and become familiar with hazard symbols.

**2.** Keep medications out of reach of infants, children and pets with lids properly secured.

**3.** If using products which produce toxic fumes, wear appropriate protective equipment and allow for proper ventilation.

4. Do not eat foods which are potentially contaminated, or spoiled.

5. Replace product labels which have faded or are unreadable.

6. Do not store poisonous substances in containers which will be used later for storage of products for human consumption.

7. Do not remove products from their original container. If this becomes necessary, label the new container with appropriate information.

## Four Routes of Entry in Which Poisons Can Enter the Body

1. **Inhalation:** This is the most common route of entry for poisons and occurs when a casualty breathes in toxic fumes, vapors or gases through the mouth or nose directly into the lungs. Examples of inhaled poisons are carbon monoxide gas, paint fumes, and chlorine.

**Signs and Symptoms**

- Difficulty breathing.
- Chest pain
- Headache
- Dizziness
- Confusion/Disorientation.
- Drowsiness
- Changes in Level of Consciousness.
- Unconsciousness
- Respiratory/Cardiac Arrest.

2. **Ingestion:** Occurs when a casualty purposefully or accidentally swallows a poison. These poisons go directly to the stomach and gastrointestinal tract and may enter the bloodstream. Examples of ingested poisons are alcohol, antifreeze, drugs, cleaning products and pesticides.

**Signs and Symptoms**

- Burns or redness to the mouth, lips, tongue, or throat.
- Chemical odors emanating from the mouth.
- Odors from clothing or the casualty.

- Nausea/Vomiting.
- Diarrhea
- Abdominal cramps.

**3. Absorption:** Occurs when poisons enter the body through the skin or thinly lined tissues found in the mouth, nose and eyes. Examples of absorbed poisons are Poison Ivy, pesticides, fertilizers and certain industrial chemicals.

**Signs and Symptoms**

- Burns
- Swelling
- Redness
- Blisters
- Rashes of the skin.
- Fever
- Headache
- Generalized weakness.
- Nausea
- Difficulty breathing.

**4. Injection:** Occurs when a casualty is injected with a poison through the skin. Examples of injected poisons are stings/bites from insects, animals, snakes and from contaminated hypodermic needles.

**Signs and Symptoms**

- Skin irritation at the injection site.
- Localized swelling, redness.
- Anaphylaxis
- Decrease level of consciousness
- Unconsciousness
- Respiratory and Cardiac Arrest (e.g. heroin overdose)

## Facts/Clues to Help you Determine the History of a Poisoning Emergency

**1.** What was the source of the poison?

**2.** What was the route of entry?

**3.** How much of the poison was ingested, absorbed etc…?

**4.** What time did the poisoning take place?

**5.** Did the casualty vomit?

**6.** Was an antidote administered (e.g. activated charcoal)?

**7.** Label on product or container

## First Aid for a Conscious and Unconscious Casualty When a Poison has Been:

**a) Taken by Mouth**



- Scene Survey: Look for clues to what may have happened such as, empty pill bottles, powders around the mouth, odd odors etc... (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1** and Poison Control.
- A,B,C's.



- If you have to perform CPR, wipe away any chemicals from the casualty's mouth and nose. **Use a barrier device for protection.**
- If the casualty is unconscious and breathing, place him/her in the Recovery Position.
- If the casualty vomits, protect and clear his/her airway.



- **DO NOT** provide anything by mouth and **DO NOT** induce vomiting unless under the advice of Poison Control.



- Inducing vomiting with such substances as Syrup of Ipecac has only shown to remove 30% of the poison ingested and may cause more damage than good.



- Treat for Shock.
- Provide Ongoing Casualty Care.



- Vomiting can cause additional tissue damage when chemical such as corrosives have been ingested.
- Some substances can be diluted with water, such as acids and alkalis.
- Certain products contain First Aid procedures on the label as well as a phone number to call if ingestion occurs.
- ALWAYS follow the advice of Poison Control.

**b) Inhaled**



- Scene Survey: Be aware that certain gases may be odorless. (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Remove the casualty from the source of the poison if it is safe to do so and try to provide him/her with fresh air.
- Determine Responsiveness (tap and shout).
- **Call 9-1-1** and Poison Control.
- A,B,C's.



- If you have to perform CPR, wipe away any chemicals from the casualty's mouth and nose. **Use a barrier device for protection.**
- If the casualty is unconscious but breathing, place him/her in the Recovery Position.
- If the casualty vomits, protect and clear his/her airway.



- Initiate a Secondary Survey.
- Follow Poison Control instructions.
- Treat for Shock.
- Provide Ongoing Casualty Care.

**c) Absorbed Through the Skin**



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1** and Poison Control.
- A,B,C's.



- **Liquid poisons:** Flush the area with copious amounts of room temperature water and remove all clothing which has come in contact with the poison.
  **Dry chemicals:** Brush off excess chemicals with a clean, dry cloth prior to flushing with copious amounts of room temperature water. Remove all clothing which has come in contact with the poison and discard.
- Wash the affected area thoroughly with soap and water.
- Treat for Shock
- Provide Ongoing Casualty Care.

**(d) Injected Through the Skin**



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1** and Poison Control.
- A,B,C's.
- Prevent the poison from further absorbing in the blood stream by placing the casualty at rest, keeping the affected area below the level of the heart.
- **Insect Stings:** Remove the stinger by scraping it away from the skin with either the side of a credit card, the flat edge of a knife or other similar object.



- **DO NOT** remove stingers with tweezers as this can rupture the venom sack attached to the stinger.



- Wash the area with soap and water.
- Apply ice or a cool compress to decrease pain and swelling
- Rubbing alcohol or a mixture of baking soda and water can be applied to reduce pain and discomfort at the site.



- **Watch for signs and symptoms of Anaphylaxis**



- Treat for Shock.
- Provide Ongoing Casualty Care.



**A casualty who has sustained a contaminated needle-stick injury should seek medical attention immediately.**

# *First Aid For Poisoning*

**Poison Control Centers**

Each province in Canada has a specific Poison Control Centre to help treat poison emergencies. These centers run 24 hours a day, seven days a week and provide telephone consultation to the general public and health care professionals when poisoning or the potential for poisoning has occurred. The Poison Control Centre phone number should be readily accessible at a moments notice and should be kept near a phone in case of emergency. Remember to **always call 9-1-1** for a suspected or confirmed poisoning, even if Poison Control has been called.

**Ontario Poison Centre 1-800-268-9017 (Toll Free) 416-813-5900 (Toronto)**

**General First Aid Principles for Poisoning**



- Scene Survey: Look for clues to what may have happened, such as, empty pill bottles, powders around the mouth, odd odors etc... (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Remove the casualty from the source of the poison/toxin if it is safe to do so.
- Determine Responsiveness (tap and shout).
- **Call 9-1-1** and Poison Control.
- A,B,C's.
- If you have to perform CPR, wipe away any chemicals from the casualty's mouth and nose. **Use a barrier device for protection.**



- If the casualty is unconscious but breathing, place him/her in the Recovery Position.
- If the casualty vomits, protect and clear his/her airway.



- Initiate a Secondary Survey.
- Follow instructions from Poison Control.
- Treat for Shock.
- Provide Ongoing Casualty Care.



**Remember to monitor for changes in casualty condition as the poison is absorbed over time.**

# *First Aid For Bites And Stings*

**Animal Bites/Human Bites**

"Mans best friend", a.k.a. dogs are responsible for 80-90% of all animal bites. Bites from rabid animals such as skunks, raccoons, bats, dogs, cats and foxes can carry the deadly rabies virus in their saliva. Bites from animals can cause avulsions, abrasions, lacerations and puncture wounds. If you come across an animal that is easily excited or angered, irritable, restless or nervous, or who looks paralyzed, do not attempt to make any contact as they may be carrying the rabies virus. If a casualty has been bitten by an animal, attempt to remove both yourself and the casualty from the immediate environment to prevent a further attack. A casualty bitten by an animal should seek medical attention immediately where a physician will determine whether or not a series of vaccine injections is required to prevent the development of rabies.



Human bites generally cause damage to tissue by crushing or tearing and are often found on the hands and arms. Regardless of the source of the bite, the highest cause for concern is the potential for serious infection to the casualty.

**First Aid for Animal and Human Bites**

- Inspect the wound to determine if the skin has been broken.



- Clean the wound thoroughly with soap and water and cover with a clean, sterile, dry dressing secured with a bandage.
- If bleeding and tissue damage is severe, rest the casualty and apply direct pressure.

- Seek medical attention immediately for further wound cleansing and possible antibiotic treatment if wounds are severe and/or highly contaminated.

Minor wounds can be treated at home with proper wound cleansing and the application of antibiotic ointments. Be aware of signs and symptoms of infection such as redness, pain, swelling, increased warmth at the injury site, puss or oozing fluids. Seek medical attention immediately if there is evidence of infection.

**Tetanus shots are generally administered every 10 years. If a casualty received a tetanus shot greater than 5 years prior to suffering from a major wound injury, a booster shot may be administered. To ensure effectiveness, this must occur within the first 48 hours post injury.**

### Snake Bites

The rattlesnake is the only venomous snake found in Canada and is a member of a class of snakes referred to as pit vipers. The majority of all snake-bite related deaths are caused by rattlesnakes.

### Signs and Symptoms of Snake Bites

- Immediate pain and possible burning sensation at the injury site.
- Swelling
- Numbness/Tingling/Paralysis.
- Difficulty breathing.
- Nausea/Vomiting.
- Skin discolouration.
- Weakness
- Sweating
- Blurred vision.



**First Aid for Snake Bites**

**1.** Ensure the scene is safe and remove yourself and the casualty from the environment in which the snake is contained.

**2.** Position the casualty in a Semi-Sitting Position.

**3.** Have the casualty remain still if transport will be provided by EMS or other means.

**4.** Remove any restrictive clothing or jewelry as swelling can be rapid.

**5.** Flush the bite wound with soapy water.

**6.** Immobilize the limb as you normally would any fracture. Ensure minimal movement if you are choosing to immobilize

**7.** Treat for Shock.

**8.** Provide Ongoing Casualty Care.



- **DO NOT** use a tourniquet (This can create more harm than good and may cost the casualty a limb).
- **DO NOT** apply ice (Ice can cause a thermal injury and it does not de-activate the venom).
- **DO NOT** cut the wound to allow for further bleeding (This can cause more damage to tissue and increase the risk of infection).
- **DO NOT** use alcohol (Alcohol causes blood vessels to dilate and increase in size, therefore distributing more venom into the blood).
- **DO NOT** suck on the wound.

## Insect Bites and Stings



To the general population, insect stings are usually benign but there are still a significant amount of individuals who are highly allergic to certain insect stings and may have life-threatening anaphylactic reactions as a result.

If a casualty has been stung or bitten by an insect, inquire as to whether the casualty has ever suffered an allergic reaction in the past as a result of insect bites or stings. If the casualty is unconscious and unable to respond, look for a medic alert for further clues.

## First Aid for Bites and Stings

- Remove the stinger by scraping it away from the skin with either the side of a credit card, the flat edge of a knife or a similar object.

- **DO NOT** remove stingers with tweezers as this can rupture the venom sack attached to the stinger.

- Wash the area with soap and water.
- Apply ice or a cool compress to decrease pain and swelling.
- Rubbing alcohol or a mixture of baking soda and water can be applied to reduce pain and discomfort at the site.
- **Watch for signs and symptoms of Anaphylaxis.**
- Treat for Shock.
- Provide Ongoing Casualty Care.

**If a casualty is having an Anaphylactic reaction, life-saving epinephrine can be administered with an EpiPen Auto-Injector. Look to see if the casualty is carrying one**

## Bites from Leeches

Leeches generally reside in fresh water habitats such as lakes and ponds. One of the favorite pastimes of a leech is to clench onto human flesh with its ferocious jaw, creating a wound and sucking blood from its gracious host. Once a leech has attached itself to a host, it cannot simply be peeled off. A potential hazard of improper leech removal is that remnants of the leeches jaw may be left in the wound, risking infection. Leeches carry bacteria, generally housed in their stomachs. Improper leech removal techniques can cause the leech to regurgitate its stomach contents, transferring bacteria into the casualty's wound. Once attached, never scrape or tear away a leech from its host.

**First Aid for Leech Bites**

**1.** Locate the anterior sucker which is located on the small end of the leech.

**2.** Place your fingernail directly beside the small end of the leech.

**3.** Slide your finger gently towards the site at which the leech is feeding. This is an attempt to push away the sucker from the side. This should start to lift the leeches sucker off the casualty, thus breaking the seal.

**4.** Begin flicking the leech at the small end to ensure it does not reattach itself.

**5.** Once removed, clean the wound with soap and water and apply a clean, sterile dressing and bandage.

**6.** Monitor for infection over the next few days to a week.

**7.** If infection occurs, seek medical help immediately.

**If the above technique proves to be unsuccessful, a First Aider can implement the following techniques.**

Apply a flame, a match, a lit cigarette, turpentine, oil, salt, vinegar or lemon juice to the leech in the hope that it will cause the leech to detach without regurgitating its stomach contents



Make sure not to burn the casualty if using a flame or other heat source.

## Bites from Ticks

Ticks are parasites with a lust for blood-sucking of unsuspecting human hosts. Ticks are generally found in grass and shrubs and reside mainly in forests and wooded areas. A tick must come into physical contact with its host in order to latch on as it cannot fly or jump. Ticks can secrete toxins, venoms and can pass along certain microorganisms to its host (Lyme disease). The First Aid treatment for a casualty who has a tick bite is to remove the tick as soon as possible.

### First Aid for Tick Removal

**1.** Remove the tick with either tweezers, forceps, or a fingernail.

**2.** Latch onto the tick as close to the casualty's skin as possible.

**3.** Gently and steadily remove the tick, pulling straight out from the skin making sure not to squeeze or break the body of the tick, as this can result in possible disease transmission into the casualty's open wound.

**4.** Once removed, clean the wound with soap and water.

**5.** Application of antibiotic ointment can prevent infection.

**6.** Casualty should be instructed to seek medical help to determine if disease transmission has occurred.

**7.** Watch for signs of infection over the next few days to a week.

## Jellyfish Stings

Jellyfish are gelatinous marine animals whose sack-covered (nematocysts) tentacles are filled with poison (venom) that can cause a painful and sometimes life-threatening sting. Jellyfish are generally non-aggressive and can be found near the surface of water when light is diminished, floating in the water column or on a beach.

### Signs and Symptoms of a Jellyfish Sting

- Intense pain at site of injury
- Hives
- Itchiness
- Nausea, vomiting, diarrhea
- Abdominal pain
- Numbness and tingling

- Muscle spasms
- Shortness of breath
- Seizure, coma, death

### First Aid for Jellyfish Stings

Treatment is centered on inactivation of the venom load and prevention of further envenomation. Jellyfish stings should be washed with copious amounts of vinegar (4-6% acetic acid solution) as soon as possible, for a minimum of 30 seconds. After the nematocysts are removed/deactivated, pain from the sting should be treated with hot water immersion when possible.

**Two actions are necessary for jellyfish stings**

1. The prevention of further nematocyst discharge and pain relief. Topical treatments are available but a critical evaluation of the literature shows that vinegar is the most effective for inactivation of the nematocysts.

2. Hot water immersion, as hot as tolerable, for a minimum of 20 minutes, is the most effective for the treatment of pain associated with the sting.

# Chapter 32
## Environmental Emergencies

Have you ever left your cell phone in your car on a blustery and frigid winter day only to return and find it not working, or slow to respond? Have you had your car overheat and conk out on you after driving for hours in sweltering hot conditions? Most objects have specific temperature ranges in which they optimally function and deviations from these specific ranges can cause malfunction or complete failure. The human body is no different. A Core Body Temperature (CBT) of 36.8 ºC or 98.6 ºF is what millions of cells in the human body thrive on and is an ideal body temperature for generating effective/efficient metabolism and maintaining **homeostasis**; a constant state within the body in which optimal body functioning occurs. If body temperature drops by 2 or more degrees, without correction, the body's cellular processes become adversely affected, begin to malfunction, eventually fail and will result in death. If body temperature exceeds a critical temperature range and remains uncorrected, a downward spiral will again occur leading to body dysfunction, eventual failure and death.

A region of the brain called the **Hypothalamus** controls body temperature and is in constant contact with other areas of the body, gathering specific information on both the internal and external environments to maintain and manage temperatures in the optimal range. The human body, in response to changing conditions can either generate heat through muscle contractions (shivering) and increased metabolism or it can remove heat through the skin by means of sweating and blood vessel dilation. When the body loses more heat than it can generate, Core Body Temperature will drop.

# *Measures to Prevent Cold Injuries*

## Five Mechanisms of Heat Loss Which Can Aggravate the Effect of Exposure to Cold

1. **Conduction:** The process of transferring heat from a warmer object to a cooler object through direct contact (e.g. body on pavement).
2. **Convection:** The process by which air or water, located near the body, becomes heated, transfers away, and is replaced by cool air or water (e.g. cool air passing over exposed skin).
3. **Evaporation:** The process of heat loss through sweating and breathing.
4. **Radiation:** The process of transferring heat from a hot object (the body) to a colder object (outside air) without direct contact (e.g. heat loss from our head into the cold environment).
5. **Breathing:** The process of losing heat when cold air is inhaled and warmed by our lungs and subsequently exhaled.



## Five Safety Measures to Prevent Cold Injuries

1. Avoid excessive exertion in cold weather.
2. Prevent getting wet in cold weather by wearing water proof boots and jackets.
3. Wear a hat, scarf, gloves/mittens and make sure jacket sleeves are close to your wrists.
4. Wear several layers of loose-fitted clothing.
5. Avoid alcohol, caffeine, nicotine, and drug consumption.

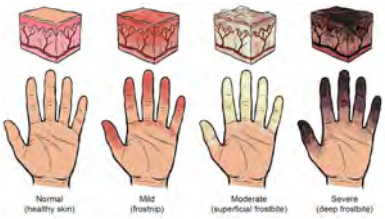
# *Recognizing Cold Injuries*

## Frostbite



Frost bite results when the environment causes freezing of skin and the tissues below. Ice crystals form in the body's tissues which can cause shearing and rupturing of surrounding cells. Sites susceptible to frostbite injuries are the ears, nose, face, hands and feet.

There are four different degrees of frostbite. Extent and severity of the injury are dependant upon the duration of exposure, the particular body part affected and the process in which thawing occurs.




**1st Degree (Frost Nip):**

- Tingling, burning, numb or itchy feeling.
- Skin may appear red or white.
- Skin is stiff to the touch.
- Tissue remains intact below injury site.
- No permanent damage will result.

**2nd Degree (Superficial)**

- Skin may appear white or blue.
- Skin appears hard or even frozen.
- Tissue remains intact below injury site.

• Occurrence of blistering anywhere from 6-24 hours later (clear or milky fluid).

**3rd Degree (Deep)**

• Skin may appear, white, blotchy or bluish-gray.
• Skin appears hard and frozen.
• Tissues below injury site are damaged.
• Appearance of blisters; either red or purple and filled with blood.

**4th Degree**

• Significant tissue destruction.
• Muscles, tendons, nerves, blood vessels and bone are all frozen.
• Skin appears black or rubbery.



## First Aid for Cold Injuries

**First Aid for Frostbite**



• Remove the casualty from the environment.
• Prevent additional movement of the casualty.
• Place the injured body part up against your armpit or close to your core for passive re-warming.
• Place the injured body part in a container of lukewarm water (approximately 40 °C) for 20-40 minutes.



• Ears, nose, cheeks and other areas which cannot be immersed can be re-warmed by a bystander's warm hands or with the application of warm cloths.



• Apply a clean, sterile, dry dressing after re-warming. If fingers and toes are frostbitten, place gauze in between them.
• Protect the area from re-freezing.
• Elevate the injury site if possible, and maintain warmth.



**DO NOT**

• Break blisters.

- Rub the injury site.
- Allow the casualty to walk if feet are frostbitten.
- Re-warm injured tissue if there is a chance of re-freezing.
- Apply direct heat to the injury site as this will do more harm than good.

## Hypothermia

Hypothermia occurs when Core Body Temperature dips below 35 °C or 95 °F where normal muscular and neurological functions are impaired. Hypothermia will develop when the body is unable to generate enough heat to meet the demands of the environment, when there is an increase in the amount of heat lost, or a combination of the two. The most devastating effects of hypothermia are Respiratory and Cardiac Arrest. Illness and death can be prevented for a casualty with suspected cold weather injuries by quick recognition and subsequent treatment by a First Aider.



- A hypothermic casualty often times stumbles and mumbles and may appear as though he/she is having a stroke, is intoxicated, or high on drugs. Look at the "big picture" when treating a hypothermic casualty.
- Temperatures do not have to be below zero for certain casualties to suffer from hypothermia.

**Those at Increased Risk for Hypothermia**

- Homeless
- Diabetics
- Very young or very old.
- Those under the influence of drugs and/or alcohol.
- Those who are overly tired or malnourished.
- Individuals with heart conditions.
- Individuals who are prescribed psychiatric medications.

## Three Progressive Stages of Hypothermia

**Mild (32-35 °C)**

- Skin is cool to the touch.
- Uncontrolled shivering.
- Hands and feet are cold/numb.
- Decreased coordination.
- Increased pulse rate and breathing rate.
- Poor judgment.

**Moderate (30-32 °C)**

- Slurred speech (Casualty may appear as though he/she is having a stroke).
- Extremely uncoordinated (Casualty may appear intoxicated).
- Cold, pale skin.
- Stiff posture.
- Confusion
- Heart arrhythmias.
- Shivering stops.
- Dilated pupils.
- Decrease pulse rate and breathing rate.

**Severe (<30 °C)**

- Loss of Consciousness.
- Blue skin.
- Hallucinations
- Unresponsive
- Respiratory Arrest.
- Cardiac Arrest→Death.

## Frozen Casualties

A casualty who has endured temperatures below zero for an extended period of time may be in what is called a **"frozen state"**. You can recognize a casualty in a frozen state when:

**1.** Attempting to open the casualty's airway, you notice the neck and jaw are rigid and immovable.

**2.** Skin appears white and waxy.

**3.** Skin and tissues are hard and cannot be depressed.

**4.** The casualty moves as a solid unit when you attempt to move him/her.

### First Aid for Frozen Casualties

If you discover a casualty who is suspected of being in a frozen state, **call 9-1-1** immediately and **DO NOT** attempt any First Aid procedures.



# *First Aid for Cold Injuries*

## First Aid for Hypothermia



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- If possible, remove the casualty from the cold. If you are unable to move the casualty, protect him/her from the cold and wind as best you can.
- Remove wet clothing and replace with dry clothing. Clothing can be cut to limit casualty movement.
- Cover the head to prevent further heat loss.
- Insulate the casualty from cold surfaces by providing warm blankets or jackets. Lay the casualty down, face up.

- Skin to skin contact can warm a casualty.
- If the casualty is conscious, provide warm fluids which are non-alcoholic and non-caffeinated.
- Cover the casualty with a warm blanket.
- Monitor vitals signs, especially breathing and pulse rate.
- Treat for Shock.
- Provide Ongoing Casualty Care.

- **DO NOT** rub the casualty. Handle the casualty very gently as movement can cause Cardiac Arrest in a hypothermic casualty because the cold affects the heart's electrical conduction pathway.
- **DO NOT** provide the casualty with alcohol, cigarettes, or caffeinated drinks as their effects can result in further heat loss.
- **DO NOT** apply direct heat to the casualty or warm him/her too quickly as this can result in Shock and subsequent Cardiac Arrest.

### The Minimum Time for a Pulse Assessment before Beginning CPR on a Suspected Hypothermic Casualty

A pulse assessment should last between 45-60 seconds in duration for a casualty who is suspected of being in a hypothermic state as often times the pulse rate is very slow and faint and therefore difficult to detect.



# *Environmental Emergencies*

### Immersion Foot (Trench Foot)

**Foot immersion injury** happens when a person's feet are kept in cold, wet, or unsanitary conditions for a long time. Unlike frostbite, the tissue doesn't freeze, but the constant moisture and lack of circulation cause damage to the skin, muscles, and nerves.



Think of it like your feet "**drowning" in their own sweat or water.**

Instead of freezing, it's the combination of wetness, pressure, and cold that injures the tissue.

**What's happening inside the body**

- The feet are trapped in wet socks or boots for hours or even days.
- The blood vessels tighten to preserve body heat.
- This reduces blood flow, so oxygen and nutrients can't reach the tissues.
- The skin becomes soft, pale, and wrinkled, like "prune skin" after swimming, but much worse.
- If exposure continues, the nerves and muscles begin to die, leading to pain, numbness, and sometimes tissue loss.

## Common causes and risk groups

- Working outdoors for long hours in wet, cold conditions (construction, emergency response, military).
- Hiking, camping, or hunting with damp boots or socks.
- Wearing tight or non-breathable shoes for extended periods.
- Homeless or vulnerable individuals who can't change or dry footwear regularly.

If your socks squish when you walk, your feet are already at risk of trench foot.



**Signs and symptoms**

Immersion foot usually develops gradually over several hours or days.

**What the person might say or feel:**

*"My feet are numb."*

*"They burn or tingle."*

*"My feet feel heavy, stiff, or hard to move."*

**What you might see:**

- Pale, white, or gray skin (early stage)
- Wrinkled, soggy-looking skin

- Cold to the touch
- Swelling in the feet and ankles
- Red, blue, or purple blotches once rewarmed
- In serious cases, blisters, sores, or blackened areas of tissue

**First aid treatment**



- Remove wet socks and footwear immediately. Get the feet clean and dry as soon as possible.
- Gently pat the feet dry. Do not rub — the skin is fragile and can tear easily.
- Warm the feet slowly. Let them air-dry at room temperature. Avoid direct heat like fire, heaters, or hot water.
- Elevate the feet. Raising them helps reduce swelling.

Leave blisters intact. Do not pop them — this can lead to infection.



Encourage rest. Avoid walking if the injury is painful or severe. Pressure can worsen the damage.

Put on clean, dry socks and shoes once the feet are fully dry.

## When to call for medical help

**Get medical care if:**

- There is severe swelling, blistering, or blackened skin.
- The person can't walk due to pain or numbness.
- There are signs of infection (fever, pus, red streaks, foul smell).
- The feet don't improve within 24 hours of drying and warming.

**Prevention tips**

- Change into clean, dry socks as often as possible (at least daily, more if wet).
- Air out your boots or shoes whenever you rest.
- Carry spare socks and footwear when outdoors for long periods.
- Keep feet warm, clean, and dry, especially in cold, damp environments.
- Check your feet regularly for redness, swelling, or early signs of damage.

## Snow Blindness

**Snow blindness** is a temporary but painful condition that happens when your eyes are exposed to too much ultraviolet (UV) light

It's most common in snowy or icy environments because sunlight reflects off bright white surfaces and shines directly into your eyes.

Think of it as a sunburn on your eyes.

Instead of burning your skin, the clear front part of your eye, called the cornea, gets burned by UV rays.

### What's happening inside the eye

The cornea is the transparent "window" at the front of your eye that lets light in. When UV light exposure is too strong, it damages the surface cells of the cornea. These cells begin to peel away, leaving tiny raw spots.

Your body reacts with inflammation, which causes pain, redness, swelling, and heavy tearing. That's why your eyes feel gritty, watery, and extremely sensitive to light after being in bright snow or sun for too long.



## Common causes and risk factors

- Spend hours in the snow without UV-protective eyewear (skiing, snowboarding, snowmobiling).
- Are at high altitude, where the air is thinner and UV rays are stronger.
- Are near very reflective surfaces like ice, glaciers, water, or sand.
- Don't wear proper UV-blocking sunglasses — regular glasses or tinted lenses may not be enough.
- Even on cloudy days, most UV rays still pass through clouds, so eye protection is always important.

### Signs and symptoms

Snow blindness doesn't usually appear right away. Symptoms often show up a few hours after exposure.



**What the person might say or feel:**

*"It feels like there's sand in my eyes."*

*"My eyes are burning or stinging."*

*"Everything looks blurry."*

*"It hurts too much to open my eyes in the light."*

**What you might see:**

- Red, bloodshot eyes
- Constant tearing
- Squinting or eyes kept tightly closed
- Covering eyes with hands, scarf, or glasses
- Restlessness or irritability from pain
- Temporary blurred vision or disorientation

**Did You Know? Welder's flash** is a painful eye injury caused by exposure to intense ultraviolet (UV) light from welding arcs. Snow blindness causes the same type of injury when UV light reflects off snow, damaging the surface of the eye and leading to pain, tearing, and light sensitivity.



**First aid treatment**



- **Get out of the sun.**
  Move indoors, into a tent, or at least into a shaded area to stop further UV exposure.
- **Protect the eyes from light.**
  Give them dark sunglasses, ski goggles, or cover the eyes gently with a cloth to reduce discomfort.
- **Apply cool compresses.**
  Place a clean, damp, cool (not ice-cold) cloth over the closed eyes to relieve pain and reduce inflammation.
- **Do not rub the eyes**.
  Rubbing can worsen the injury and slow healing.

- **Use artificial tears if available.**
  Lubricating eye drops can wash out debris, soothe dryness, and reduce discomfort.
- **Encourage rest.** Keep the person in a dim or dark environment.

Symptoms usually improve within 24–48 hours if the eyes are rested and protected from further light.

**When to seek medical help**

**Most cases of snow blindness heal on their own, but get medical care if:**

- The pain is severe and not improving after a day or two.
- Vision does not return to normal within 48 hours.
- There are signs of infection (yellow or green discharge, pus, or swollen eyelids).
- The person is in a remote area and cannot safely move around due to vision problems.

**Prevention tips**

- Always wear wraparound sunglasses or goggles that block 100% of UV rays. Side shields offer extra protection.
- Wear a hat or helmet with a visor to reduce overhead glare.
- Avoid being outside during the strongest sunlight hours (10 a.m. to 2 p.m.).
- Don't skip eye protection on cloudy days, UV rays still penetrate through clouds
- Make sure children and adults wear proper eye protection in bright snow or on reflective surfaces.
- If the snow or sun is bright enough to make you squint, it's strong enough to burn your eyes — protect them every time.

## Hyperthermia

**Heat illnesses occur when:**

1. High environmental temperatures overwhelm the body's ability to compensate for the extremes in temperature and therefore become ineffective in cooling the body.
2. Excessive exercise is preformed in environments with high temperatures and/or humidity.
3. The area in the brain that regulates temperature fails (elderly, ill casualties).



# *Measures To Prevent Heat Illness*

## Conditions which Can Lead to Heat Illness

**1.** Exposure to high temperature environments.

**2.** Excessive exercise in high temperature environments.

**3.** Wearing excessive clothing in high temperature environments.

**4.** Substance use/abuse with subsequent exposure to high temperature environments.

**5.** Lack of fluid replacement and excessive sweating in high temperature environments.

**Individuals Who are at Higher Risk for Heat Related Illnesses**

- Very young or very old.
- Those with predisposing medical conditions.
- Individuals on psychiatric medications, heart medications, or blood pressure medications.
- Overweight individuals.
- Those with poor nutrition.

## Safety Measures to Prevent Heat Illnesses

**1.** Drink plenty of fluids if you will be in high temperature environments.

**2.** Wear clothing that is loose-fitted and not constricting. Avoid wearing black.

**3.** Seek shelter from the heat such as shaded areas or those with air-conditioning.

**4.** Be extra vigilant in hot environments if you are taking medications which put you at increased risk for heat related illnesses.

**5.** Avoid enclosed spaces, such as cars, when temperatures are high. Never leave pets or children in cars in hot weather.



# *Recognizing Heat Illnesses*

## Signs and Symptoms of Specific Heat Related Illnesses

**a) Heat Cramps:** High temperature environments cause a casualty to lose excessive amounts of fluids and sodium from profuse sweating. The loss of sodium causes involuntary muscle spasms, often times painful.



One to three littres of water can be lost per hour through sweating in high temperature environments.

### Signs and Symptoms

- Casualty is stable and has generally been working or exercising in a hot/humid environment.
- Nausea
- Cramps in fingers, arms, legs and stomach muscles.
- Cool, pale skin.
- Fully conscious and alert.

**First Aid for Heat Cramps**



- Remove the casualty from the environment to a cool or shaded area and have him/her lie down.



- Provide a drink which contains both water and salt (e.g. sports drinks).
- Provide as much liquid as the casualty can tolerate.
- Increasing salt alone or ingesting too much salt in a water solution can increase nausea, lead to vomiting and can increase the likelihood of heat-related illnesses.
- Gently massaging the affected area along with mild stretching may reduce discomfort.
- If the casualty remains in distress, seek medical attention by calling 9-1-1.



**Heat cramps may be an early warning that a casualty is in the early stages of a more severe heat-related illness.**



**b) Heat Exhaustion:** Heat exhaustion often occurs when individuals work or exercise excessively and for prolonged periods of time in high temperature environments. Core Body Temperature generally hovers around 39 ºC (103 ºF) when heat exhaustion is present. It is in this stage that the body's mechanism for regulating temperature, the hypothalamus, becomes overwhelmed and begins to fail. Signs and symptoms can be reversed with prompt recognition, removal of the casualty from the hot environment and with appropriate and adequate fluid replacement.

**Signs and Symptoms of Heat Exhaustion**

- Changes in level of awareness.
- Profuse sweating.
- Nausea/Vomiting.
- Dizziness
- Headache
- Cool, pale skin.
- Shallow breathing.
- Fatigue

- Decreased blood pressure.
- Possibility of fainting.
- Signs and symptoms of Shock.

**First Aid for Heat Exhaustion**





- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- Remove the casualty from the environment and place in an environment which is preferably cool or shaded.
- Remove all excess clothing.
- Position the conscious casualty in the Shock Position (on his/her back, legs elevated).
- If the casualty is unconscious but breathing, place him/her in the Recovery Position and monitor.
- Sponge with cool water.
- Provide a fully-conscious casualty a drink which contains both water and salt (as much as the casualty can tolerate).
- Treat for Shock.
- Provide Ongoing Casualty Care.



**c) Heat Stroke:** When the body's temperature regulating mechanism completely fails to compensate for high temperature environments and Core Body Temperature reaches 42 ºC (106 ºF) and above, heat stroke will occur. Significant organ damage can result and mortality rates can range from 25-50%. There are two types of Heat Stroke:

**i) Classic Heat Stroke:** Generally occurs in elderly, heart disease casualties, the obese, infants and casualties who are debilitated. Periods of sustained high temperature and humid environments are generally the cause. Commonly, Core Body Temperatures slowly increase over days until compensatory mechanisms completely fail.

**ii) Exertional Heat Stroke:** Typically occurs in healthy, young individuals, such as athletes, who exercise vigorously in hot/humid environments. In these situations, heat builds up faster than the rate in which it is removed bye the body. Exertional Heat Stroke generally occurs over hours and not days.



**Regardless of the cause, the primary goal when providing First Aid for a casualty suffering from heat stroke is to cool the body as rapidly as possible to prevent further brain and organ damage/failure.**

**Signs and Symptoms of Heat Stroke**

- Tired
- Weak
- Nausea/Vomiting.
- Headache
- Dizziness
- Irritability
- Decreased level of awareness.
- Seizures
- Combative
- Flushed, hot and dry skin (Classic heat stroke).
- Flushed, hot and moist skin (Exertional heat stroke).



**First Aid for Heat Stroke**



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1**.
- A,B,C's.
- Remove the casualty from the environment into a cool or shaded area.
- Immediate immersion in cold water if possible.

- Lie the casualty down and place him/her in the Shock Position.
- If the casualty is unconscious but breathing, place him/her in the Recovery Position.
- Immediate cooling of the entire body is required for heat stroke and immersion is most effective.
- Remove excess clothing.
- Cool the casualty by either covering him/her in wet sheets, fanning the casualty while the skin is wet, sponging with cool water, or placing the casualty in a cool (not cold) bath.
- Cold compresses to the head, neck, armpits, chest and groin are effective methods for cooling.
- **DO NOT** place an unconscious casualty in a bath.
- Place dry sheets over the casualty once he/she is cooled.
- **DO NOT** provide anything by mouth (liquids or solids). EMS will provide fluid support for the casualty.
- Treat for Shock.
- Provide Ongoing Casualty Care.

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# Chapter 33
## Drowning

**Drowning** is when someone is submerged underwater, without the ability to help themselves, this can happen for many reasons like fatigue, inability to swim, misjudgement of water conditions and more. The definition of drowning is death through inhalation and submergement of water, while death can occur there are possibilities of better outcomes when the proper steps are taken.

**Drowning Risk factors:**

- Lack of supervision: children or weak swimmers without being closely monitored.
- Ignorance or misjudgment: not knowing the dangers or water depth and conditions.
- Inability to cope: poor swimming ability, panic, fatigue, or being met with unexpected water conditions.
- Lack of safety conditions: this can be both in or out of the water, lack of secure fencing and deterrents around private pools, or no lifejacket, flotation or ill fitted devices inside the water.
- Environmental hazards: cold water, melting ice, strong currents, undertows, sudden drop offs or hidden objects.
- Injury or illness in the water: diving into unknown waters, getting too close to the motor of a boat, sudden medical emergencies while swimming.

**Risk factor highlights:**

- Swimming alone or outside supervised areas
- Alcohol or drug use near or in water

- Lack of physical ability paired with improper assistive equipment like lifejackets
- Overconfidence and fatigue
- Seasonal risks

## How Drowning Happens - The Process

**Instinctive drowning response:**

When someone begins drowning, it often is not the same as the movies. The person may not be splashing, yelling, or weaving their arms, oftentimes all of their energy goes towards pushing their body to the surface and trying to keep their mouth above water to breathe. The attempt at keeping their head above water may only last about 20-60 seconds before they completely submerge. Young children may not have the strength or forethought to even attempt to get their head to the surface, and upon ending up in water too deep or at the first sign of fatigue, submerge completely.

**Progression of drowning:**

**Airway Struggle:** the victim is unable to keep their head above water and breathe effectively, panic and fatigue set in quickly.

**Aspiration:** small amounts of water enter the lungs, leading to coughing and gagging.

**Loss of Consciousness:** once someone has aspirated water, if they are unable to cough it out and take in fresh oxygen, the oxygen level in their blood drops which causes them to lose consciousness.

**Cardiac Arrest:** within minutes of loss of consciousness from lack of oxygen, the victim will go into cardiac arrest, where the heart stops pumping blood. Without immediate intervention the victim will die

**Biological Death:** without water rescue, CPR and AED use, the victim will succumb to irreversible brain injury, which is followed by death.

## Water Safety and Drowning Prevention:

Most drownings are preventable, following a few simple habits and tips reduces the risk for you and those around you.

**Always supervise children:** young children should never be alone when in or near the water, not for a moment, keep constant watch.

**Swim with a buddy:** Even experienced swimmers can run into trouble while swimming, having someone with you who can get help if something happens is a key part in prevention.

**Choose supervised areas:** Public beaches and pools with trained lifeguards provide an added layer of safety and ability to help if and when something does go wrong.

**Wear a life jacket or PFD:** This is especially important for boating and activities in open water, swimming in unfamiliar areas, and swimming far distances.

**Know your limits:** Fatigue, injury, or illness can strike quickly and the water is a very dangerous place for any of these to happen, rest or swim in before you get tired and stay within your comfort zone.

**Stay sober around water:** Alcohol and drug use reduce judgment, coordination and reaction time, this creates a more dangerous environment for yourself and everyone around.

**Be aware of safety equipment nearby:** If the pool or beach you're swimming at has reaching poles or life rings, be aware of where these objects are in case of an emergency.

**Special reminders for parents:**

- Bath time requires constant supervision, babies and toddlers can drown in just a few inches of water.
- Floatation toys, like water wings or inflatable arm floaties are not life saving devices, only certified life jackets and PFDs provide real protection.
- If a home that your child is visiting someone who has a private pool, ensure that the pool has secure fencing surrounding it ensuring no accidents.

## Recognizing Drowning

- A swimmer suddenly vertical in the water, kicking but not moving forward
- Hair covering the face, or head tilted back unnaturally
- Arms pushing down on the surface instead of stroking forwards
- A child who disappears beneath the surface without a splash, or appears motionless under the surface
- Someone floating face down for more than a few seconds

**How to Help**

Not everyone is trained as a lifeguard, but bystanders can still make a lifesaving difference if they know what to do

## Rescue Techniques:

**Reach:** Use a long object (reaching pole, brand, towel) to extend to the person

**Throw:** Toss any floating object (life ring, lifejacket, pool noodle)

**Once the person is out of the water:**

**Check responsiveness and breathing:** If the victim is unresponsive and not breathing, call 911 and start compressions immediately, use an AED if available.

**If the victim is breathing but unconscious: Call 9-1-1** and place them in the recovery position to keep the airway clear, and continuously monitor breathing.

**If the victim is coughing and breathing on their own: Call 9-1-1** and keep them warm, calm, and supervised until EMS arrival.

**A word of caution:** Never enter the water for someone without training, and discourage others who want to, the person is in a panic and will likely grab onto anyone and anything around them in an attempt to get to the surface. Due to the victim's panic, if someone gets too close they oftentimes will get dragged under the water as the victim is in a desperate attempt to get air.

# Chapter 34
## Mental Health Emergencies

Mental health emergencies are urgent situations where a person's thoughts, emotions, or behaviors put themselves or others at risk of harm. In Canada, 1 in 5 people experience a mental illness each year. As a first aider, recognizing and responding to these situations can save lives while waiting for professional help.

### Types of Mental Health Emergencies

**1. Suicidal Crisis**

**Definition:** When someone expresses intent to end their life.

**Common Traits:** Verbal threats, giving away belongings, hopelessness, withdrawal.

**Recognition:** "I don't want to live anymore," or preparing for death.

**First Aid Actions:** Stay with them, remove dangers, listen without judgment, encourage talking.

**When to call 9-1-1:** If they have a plan, access to means, or an attempt is in progress.

**2. Severe Depression**

**Definition:** Persistent sadness or loss of interest that impairs daily life.

**Common Traits:** Poor hygiene, appetite/weight changes, fatigue, hopelessness.

**Recognition:** Person appears withdrawn, neglects care, expresses "nothing matters."

**First Aid Actions:** Offer empathy, encourage connection to support, avoid dismissive language.

**When to call 9-1-1:** If suicidal intent emerges, refusal of food/fluids, or inability to care for self.

**3. Acute Psychosis**

**Definition:** Loss of contact with reality (hallucinations, delusions).

**Common Traits:** Paranoia, hallucinations, disorganized

speech/behavior.

**Recognition:** Talking to voices, appearing terrified, erratic behavior.

**First Aid Actions:** Ensure safety, reduce stimulation, use calm/short sentences.

**When to call 9-1-1:** If violent, severely agitated, or cannot be managed safely.

**4. Panic Attack**

**Definition:** Sudden intense fear with physical symptoms.

**Common Traits:** Hyperventilation, chest pain, trembling, fear of dying.

**Recognition:** Rapid breathing, clutching chest, saying "I can't breathe."

**First Aid Actions:** Reassure, guide slow breathing, grounding techniques.

**When to call 9-1-1:** If chest pain persists, person collapses, or cardiac emergency cannot be ruled out.

**5. Severe Agitation / Aggression**

**Definition:** Heightened restlessness that may escalate to violence.

**Common Traits:** Yelling, pacing, clenched fists, threatening posture.

**Recognition:** Throwing objects, threatening language.

**First Aid Actions:** Keep distance, don't argue, use de-escalation, ensure escape routes.

**When to call 9-1-1:** Immediate if person is violent, using a weapon, or imminent harm is likely.

### 6. Delirium / Acute Confusion

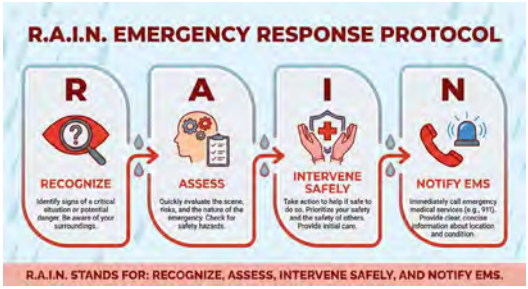
**Definition:** Sudden, fluctuating confusion due to medical causes (infection, stroke).

**Common Traits:** Disorientation, hallucinations, wandering, sudden behavior changes.

**Recognition:** Elderly person suddenly not recognizing loved ones, wandering unsafely.

**First Aid Actions:** Ensure safety, provide reassurance, stay with them.

**When to call 9-1-1:** Always — delirium is a medical emergency.




## Acronyms and Tips for First Aiders

**R.A.I.N. – Recognize, Assess, Intervene Safely, Notify EMS**

**Grounding technique (5-4-3-2-1):** Name 5 things you see, 4 you feel, 3 you hear, 2 you smell, 1 you taste.

**Red Flags to Call EMS:**
Violence, suicidal intent, unresponsiveness, chest pain, confusion.

## Canadian Resources

**9-8-8 Suicide Crisis Helpline (Canada-wide, 24/7)**

**Canadian Mental Health Association (CMHA) – crisis resources**

**CAMH Crisis Lines – Toronto & Ontario supports**

## Occupational stress injury and self-care management of the workplace first aider

### What is an Occupational Stress Injury?

An **Occupational Stress Injury (OSI)** is any persistent psychological or emotional strain that results from exposure to stressful or traumatic events in the workplace.

**For a workplace first aider, this can include:**

- Responding to serious injuries or medical emergencies
- Witnessing distressing scenes
- Feeling responsible for outcomes
- Balancing normal job duties with the emotional weight of first aid situations
- Over time, these experiences can lead to stress, anxiety, sleep changes, irritability, compassion fatigue, or burnout.

### Recognizing the Signs of Stress Injury:

- Common indicators include:
- Difficulty sleeping or increased fatigue
- Feeling on edge, anxious, or irritable
- Trouble concentrating or remembering details
- Loss of motivation or interest in activities
- Withdrawing from coworkers or friends
- Physical symptoms such as headaches, upset stomach, or muscle tension

Recognizing these early signs allows for faster recovery and prevents long-term impacts.

## Self-Care and Management

As a first aider, caring for yourself is just as important as caring for others. You can help manage and prevent OSI by:

- Debriefing after incidents: Talk with a supervisor, coworker, or wellness representative about what happened.
- Seeking support early: If symptoms persist, reach out to your Employee Assistance Program (EAP), a mental health professional, or trusted colleague.
- Maintaining routine self-care: Prioritize sleep, hydration, nutrition, and regular exercise.
- Setting boundaries: It's okay to acknowledge when you need a break or to say no to additional responsibilities if you feel overwhelmed.
- Peer connection: Stay connected with coworkers who understand the demands of being a first aider, support from peers reduces isolation.
- Grounding and relaxation techniques: Breathing exercises, short walks, or mindfulness can help calm the body's stress response after an incident.

## Duty of Care: Looking After Yourself First

Just as you would never approach a dangerous scene without ensuring it's safe, you must apply the same principle to your mental health.

A first aider's duty of care includes caring for their own wellbeing. You cannot effectively help others if you are exhausted, overwhelmed, or struggling yourself. Prioritizing rest, boundaries, and emotional recovery helps you remain capable, calm, and compassionate in future emergencies.

### When to Get Help

If you notice ongoing symptoms that interfere with work, relationships, or daily activities, it's important to reach out for professional support.

Experiencing stress after helping others does not mean weakness, it means you are human.

Early intervention leads to quicker recovery and better wellbeing.

# Chapter 35
## Emergency Childbirth and Miscarriage

The birth of one's child can be one of the most wonderful events a woman can experience. It can also be physically/mentally exhausting, prolonged, painful and distressful. Stress is often heightened when childbirth occurs in settings which are not ideal or conducive for such an experience. Becoming involved in the process of childbirth can cause one to be fraught with apprehension and anxiety. If you become involved in a situation in which imminent delivery is certain, your job as a First Aider is to help deliver the baby, provide care for both the mother and newborn and prepare to handle delivery of the placenta while awaiting EMS arrival. As a First Aider, you are only there to assist. Remember, the mother will be doing the hard part.





Blood loss during the birthing process is normal, however, if it continues after the baby is born, this is abnormal and can put the mother at risk for Shock.

# *Recognizing When Childbirth Is Imminent*



### Definition of Labour

**Labour** can be defined as the onset of uterine contractions resulting in the eventual delivery of a newborn. The three stages of labour are:

**Stage 1: Onset of uterine contractions with complete cervical dilation (10cm)**



This is the longest stage and can range anywhere from 6-18 hours if a first-time birth, to as little as 2 hours for a woman who has had previous deliveries.

**Stage 2: Delivery of the baby**



Often times the most painful stage and may last minutes to hours.

**Stage 3: Delivery of the placenta**



Generally within 20 minutes after delivery of the baby.



## Three Signs that Indicate the Beginning of Labour

**1.** Amniotic sac may rupture ("Water breaking").

**2.** Uterus begins regular, rhythmic contractions.

**3.** Cervix begins to dilate and open.

## Signs of Imminent Delivery

**1.** Contractions every 2 minutes or less, lasting 60-90 seconds.



Contractions every 5 minutes may represent imminent delivery for a woman who has had previous deliveries.

**2.** Contractions accompanied by the woman's urge to push or to void her bowels or bladder.



It is not uncommon for the expectant mother to void her bowels or bladder prior to, or during delivery. Toxins and bacteria present in both can be detrimental to the newborn. Use a clean towel to wipe away any urine, or fecal matter if this occurs.

**3.** "Bloody show" (loss of mucous plug) visible or expelled from the vaginal opening.



A mucus plug, which may be tinged with blood, protects the developing fetus from microorganisms and potential infection.

**4.** Crowning: The baby's head becomes visible from the vaginal opening.

# *Preparations For An Emergency Delivery*



## Materials Which Will Assist the First Aider in an Emergency Delivery

**1.** Wash hands thoroughly and if available, dawn non-latex medical exam gloves.

**2.** Clean towels or sheets should be placed underneath the mother's backside.

**3.** Materials which are absorbent to help aid in the control of bleeding.

**4.** First Aid supplies such as bandages and scissors for tying off and cutting of the umbilical cord if required.

**5.** Plastic bag or a container to house the placenta once delivered.

## Preparing the Expectant Mother for Delivery

**1.** First and foremost, **call 9-1-1**.

**2.** Calm and reassure the mother and let her know EMS is en-route.

**3.** Have the mother remove any clothing which may interfere with the birthing process.

**4.** Lay the expectant mother on her back with knees raised and spread apart, on clean sheets, towels, or blankets. The mother's upper back and neck should be raised slightly with a pillow or rolled blankets.

**5.** Cover the mother with another sheet, towel or blanket for privacy.

**6.** Time how far apart contractions are. Start at one contraction and end at the beginning of the next contraction (This information is helpful to EMS).

**7.** Help the mother breath through contractions.

**8.** Discourage pushing or bearing down. Instead, encourage the mother to pant or blow through the contractions.

**9.** Position someone by the mother's head, in case she vomits. This will ensure the airway does not become compromised.



# *First Aid In An Emergency Delivery*

**Normal Delivery**



**1.** If the baby's head becomes visible, place one hand atop the baby's head and apply slight pressure (This prevents the head from expelling too quickly and forcefully so as not to tear the vagina or cause harm to the baby).

**2.** As the head presents itself, it is important that the mother controls her breathing to discourage a forceful birth. Focus the mother on her breathing and encourage her to start "panting".

**3.** Once the head is entirely presented, stop the mother momentarily from pushing. This provides the First Aider an opportunity to inspect the head and neck making sure the umbilical cord is not tethered around the baby's neck. It also ensures that no membranes are blocking the baby's mouth or nose. If you notice any of the aforementioned complications then:

- Remove the umbilical cord from around a baby's neck.
- If you cannot slip the cord over the baby's head, wrap the cord around the shoulders when they emerge.
- Remove any membranes over the baby's mouth or nose.

**4.** The baby will begin to rotate in order to successfully deliver the shoulders and eventually, the rest of the body.

**5.** Gently guide the shoulders as they pass, one at a time in a controlled fashion without pulling or tugging.

**6.** As the rest of the body emerges, carefully support the newborn as the baby tends to be very slippery.

**7.** Since fluids tend to accumulate in the mouth and nose, clear the baby's airway by securing the head, neck and feet, positioning the newborn with his/her head lower than the body to encourage drainage.



A bulb syringe may be used to clear the airway. Always suction the mouth before the nose. Gauze may also be used.

**8.** Once the airway is clear, place the baby on a clean sheet between you and the mother.

**9.** Most healthy newborns should immediately start to cry, which is a sign he/she is breathing on his/her own. Feet and hands which may have appeared bluish will now start to turn pink in colour. If the newborn remains, pale, bluish or limp, provide manual stimulation by flicking the souls of his/her feet, and rubbing his/her back. **If stimulation proves to be unsuccessful and the baby still remains limp and not breathing, begin infant CPR**.

**10.** Newborns lose heat very quickly. That being said, it is imperative to dry and wrap the baby in a towel or blanket, preferably ones which have been warmed.

**11.** Inspect the umbilical cord to see if it is still pulsating and if so, leave the baby in between the mother's legs on a level plane with the vagina. If the cord is not pulsating, "tie off" the cord (see step 12) and place the baby on its side in the arms of the mother. It is safe to nurse the newborn at this time.



Hormones stimulated by nursing trigger uterine contractions which can help minimize bleeding.

**12.** Inspect the vagina for bleeding. Minor bleeding is normal. If bleeding is minimal or has ceased, the umbilical cord does not need to be cut. If vaginal bleeding is severe, the cord must be cut to prevent the potential for blood loss from the newborn into the placenta. To cut the cord, you must first "tie it off" (if this has not already been done) in two places using a clean cloth, shoelace or piece of string. Place one 6 inches from the infant's stomach and another one, 2-3 inches away from the initial location. Once the cord is "tied off", use sterile scissors to cut in between the two points.

13. The placenta, which is attached to the umbilical cord, generally takes 20 minutes to deliver and is aided by uterine contractions stimulated by nursing of the newborn. Place the delivered placenta into a clean plastic bag or container and hand over to EMS.
14. Additional bleeding can be treated with sanitary napkins, and clean towels with the application of direct pressure. DO NOT place anything inside the vagina, even if bleeding is present. Direct pressure must be applied from the exterior. Bulky dressing may also be used to treat a bleed.
15. Treat for Shock.
16. Provide Ongoing Casualty Care.



**Multiple Births**

An expectant mother, generally speaking, should be aware that she is carrying multiple babies. Treat each birth as a separate entity, following steps 1-16. A mother will have separate contractions for each birth and may have one or more placentas to deliver.

**Deliveries with Complications**

**Umbilical Cord Presentation:** In rare instances, the umbilical cord will be seen protruding or hanging out from the vaginal opening while the baby remains concealed in the birthing canal. This is a medical emergency (**call 9-1-1** immediately) as the umbilical cord's blood supply can become compromised if squished between the baby and the birthing canal wall. Blood and oxygen will not reach the baby and death will ensue within minutes. **DO NOT** tug or pull on the cord. Instead, have the mother position herself on all fours with her knees to her chest, head down and buttocks up. This position can help reduce pressure on the umbilical cord with the aim at maintaining adequate circulation to the undelivered baby.

**Hemorrhage:** Bleeding can occur during childbirth or immediately after. The source of the bleeding can be internal (from the abdominal cavity), vaginal or external, with internal hemorrhaging posing the greatest risk for maternal death. If bleeding is not controlled and arrested, the mother will go into Shock. This now becomes a medical emergency. Place the mother in the Shock Position, apply direct pressure at the opening of the vagina (Do not pack anything inside the vaginal opening) and treat for Shock. Provide Ongoing Casualty Care until EMS arrival. If bleeding is minimal, simply massaging the casualty's lower abdomen can trigger uterine contractions which can help slow down and prevent further blood loss.

### Providing Care for the Newborn Baby

1. Ensure the baby's airway is clear, that he/she is crying and breathing on his/her own.
2. Ensure the nostrils remain clear of fluid and mucus, as newborns are "nose" breathers.
3. Ensure the baby is dry and kept warm by wrapping him/her in pre-warmed blankets.
4. Do not cut the umbilical cord unless it is necessary.

### Providing Care for the Mother until EMS Arrival

1. Ensure the mother is kept warm.
2. Control any further bleeding and maintain cleanliness around the birthing area.
3. If the placenta has yet to be delivered, attempting to massage the lower abdomen can trigger uterine contractions helping to stimulate the delivery of the placenta.
4. Monitor both the mother and baby for signs and symptoms of Shock.
5. Monitor vital signs and provide ongoing casualty care until EMS arrival.



# *Recognizing The Signs Of A Miscarriage*

### Definition of Miscarriage

A **Miscarriage/Spontaneous Abortion** can be defined as the termination of pregnancy prior to the twentieth week occurring naturally as a result of defects to the fetus or womb. Approximately 40% of all pregnancies end in spontaneous abortion.

### Signs and Symptoms of a Miscarriage

- Cramping
- Vaginal spotting, vaginal bleeding (most common).
- Lower back and abdominal pain/discomfort.
- Leaking fluid or the passing of tissue or clots.
- Shock signs and symptoms.

# *First Aid For A Miscarriage*



### First Aid for a Woman who has had a Miscarriage



- Scene Survey (Assess hazards, PPE, Obtain consent, Support head/neck if suspected head and/or spinal injury).
- Determine Responsiveness (tap and shout).
- **Call 9-1-1.**
- A,B,C's.
- Rest, reassure the casualty, maintain her privacy and provide emotional support.
- Control any bleeding present.
- Position the casualty in the most comfortable position. If Shock is present or impending, place the casualty in the Shock Position.
- While maintaining the casualty's dignity, tissue and blood-soaked clothing or dressings should be kept for EMS to deliver to the attending hospital physician.
- Treat for Shock.
- Provide Ongoing Casualty Care.

**“It’s better to lose a minute of your life than to lose a life in a minute.”**
Learn what you need.

Don't waste your time in a CPR/AED course that meets your license requirements but doesn't make a difference in your understanding. Heaven WILL wait for your patients if you certify with Heaven Can Wait.

— Carilynne Yarascavitch
Head of the Discipline of Dental Anaesthesia, Faculty of Dentistry, University of Toronto

One of the huge benefits of Heaven Can Wait is that all staff and instructors are paramedics. This lends itself well to providing practical and real life experiential instruction to participants.

— Jordan Kachur
Captain/Lead Paramedic, York Region Paramedic Services

Thank you, from the bottom of my heart. Without your help, I may have lost a daughter.

— Judy Kingston

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