SINGAPORE

INSTITUTE FOR HUMANITARIAN STUDIES
SINGAPORE RED CROSS ACADEMY

SRFAC

STANDARD FIRST AID

PROVIDER

MANUAL

CONTENTS

Chapter 1 – Essentials of First Aid **01**

1) Definition and Aims of First Aid 02
2) Roles and Limitations of a First Aider 03
3) Universal Precautions 04
4) First Aid Kit Content and Maintenance 05
5) Primary Survey 07
6) Secondary Survey 10
7) Record and Report 13
8) SCDF's myResponder Mobile Application 14

Chapter 2 – Unconscious Casualty (Non-Cardiac Arrest) **16**

1) Head and Spinal Injuries 19
2) Heat Disorders 22
3) Fits 24
4) Fainting 25
5) Low Blood Sugar 26
6) Stroke 27
7) The Recovery Position 28

Chapter 3 – Respiratory Problems **30**

1) Adult Foreign Body Airway Obstruction (FBAO) 36
2) Asthma 41
3) Hyperventilation 44
4) Fumes Inhalation 45
5) Allergic Reaction 47

Chapter 4 – Shock, Bleeding and Wounds **49**

1) Shock 52
2) Types of Bleeding 55
3) Types of Wounds 57
4) Bandaging Techniques 63

Chapter 5 – Musculoskeletal Injuries **74**

1) Fracture and Dislocation 76
2) Soft Tissue Injuries 90
3) Immobilisation techniques 94

Chapter 6 – Burn Injuries **97**

1) Burns Depth and Severity of Burns 99
2) Classification and Treatment of Burns 101

Chapter 7 – Other First Aid Knowledge **105**

1) Eye Injuries 107
2) Epistaxis (Nose Bleeding) 110
3) Poisoning 111
4) Transportation of Casualty 113

Chapter 8 – CPR(Hands-Only)+AED *Refer to SRFAC's CPR(Hands-Only)+AED Manual*

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This Standard First Aid manual is referenced from the following:

- *Ministry of Manpower (MOM) – National First Aid Council (NFAC) Occupational First Aid (OFA) Manual (2005 Edition)*
- *Part 15: First Aid - 2015 American Heart Association and American Red Cross Guidelines - Update for First Aid*
- *European Resuscitation Council Guidelines for Resuscitation 2015 – Section 9. First Aid*
- *10th Edition First Aid Manual (jointly produced by St John Ambulance UK, St Andrew's First Aid and British Red Cross)*
- *International First Aid and Resuscitation Guidelines 2016 (by International Federation of Red Cross and Red Crescent Societies)*

Majority of the pictures used in this manual were derived from the MOM-NFAC Occupational First Aid Manual (2005 Edition) with the exception of the following:

- Fig. 2: https://www.healthhub.sg/live-healthy/471/keepyourhandsclean
- Fig. 3: https://thescoutshop.co.uk/?attachment_id=6800; https://www.firstaid4sport.co.uk/first-aid-equipment-c48/dressings-and-bandages-c102/crepe-bandage-p3; https://www.amconlabs.com/product/6298/305/Gauze-Pads-Sponges-Non-Sterile-2-x-2/; https://www.firstaid4sport.co.uk/strapping-and-taping-c3/surgical-tape-c33/hypoallergenic-silk-tape-p127; http://www.trackexports.net/products/dressing-&-bandage-products/triangular-bandage; https://www.blueridgeoutdoors.com/go-outside/climb-higher-a-guide-selects-his-go-to-climbing-gear/; https://www.blackwoods.com.au/safety-site-environmental/first-aid/sharps-clean-up-kit/pins-safety-assorted-856944-12/p/00845911; https://forextribune.com/tag/disposable-gloves-insights/; http://www.ophthalmicsolution.in/eye-shield-1908265.html; https://www.a1firstaid.co.nz/product/eye-pads/; https://mywellsafety.en.made-in-china.com/product/YjMQEBoUZcVs/China-M-P01-Medical-Grade-PVC-Pocket-Mask.html; https://www.ebay.co.uk/itm/10pcs-CPR-Face-Shield-Mask-Mouth-to-Mouth-Guard-CPR-Mask-Keychain-One-Way-Valve-/302898509649; https://www.superiorhealthcare.com.au/PSBX661_dash_1/Sodium-Chloride-0.9%25-for-Irrigation-100mL/pd.php; https://nextthing.co/p/1657232/opoway-penlight-medical-diagnostic-batteries
- Fig. 6: https://hasshe.com/plain-body-graph-5c148c278719620724a38b15/
- Fig. 7: https://www.scienceabc.com/humans/medulla-oblongata-definition-structure-and-functions.html
- Fig. 8: http://www.theindependentbd.com/magazine/details/55861/Head-injury
- Fig. 9: https://forensic-analysis.com/forensic-services/environmental; https://www.necksolutions.com/whiplash-neck-injury/; http://poolaccidents.blogspot.com/2011/03/diving-accidents-fast-facts.html
- Fig. 13: https://www.mountsinai.org/health-library/diseases-conditions/spinal-cord-trauma
- Fig. 14: https://health.howstuffworks.com/medicine/first-aid/first-aid5.htm
- Fig. 15 to Fig. 19: SRFAC BCLS+AED manual
- Fig. 20: https://www.thinglink.com/scene/466274591791120384
- Fig. 21: https://www.sharewhy.com/why-does-fluid-build-up-in-lungs/
- Fig. 22: http://www.bikes.org.uk/how-to-breathe-correctly-while-cycling/
- Fig. 24: SRFAC BCLS+AED manual
- Fig. 30: https://learn.allergyandair.com/asthma-and-cold-weather/
- Fig. 31: https://physiology.kitware.com/_inhaler_methodology.html
- Fig. 32: Courtesy of KK Women's and Children's Hospital

- Fig. 34: http://content.myteamsafe.com/epipen-safety/
- Fig. 38: https://www.healthline.pw/tag/hemorrhage-symptoms/
- Fig. 41: https://www.texaschildrens.org/health/when-your-athlete-has-strain-sprain-or-contusion
- Fig. 51: https://thescoutshop.co.uk/?attachment_id=6800
- Fig. 52: https://www.amconlabs.com/product/6298/305/Gauze-Pads-Sponges-Non-Sterile-2-x-2/
- Fig. 53: https://www.firstaid4sport.co.uk/first-aid-equipment-c48/dressings-and-bandages-c102/crepe-bandage-p3
- Fig. 54: http://www.trackexports.net/products/dressing-&-bandage-products/triangular-bandage
- Fig. 68: Courtesy of Singapore First Aid Training Centre
- Fig. 69: http://www.tommilance.com/ortho.htm; https://www.pinterest.es/pin/505599495665248935/?autologin=true&nic=1a
- Fig. 71: https://www.stjohn.org.nz/First-Aid/First-Aid-Library/Fractures-and-Dislocations/
- Fig. 72: https://www.physiotherapyroom.com/Shoulder
- Fig. 73: https://produto.mercadolivre.com.br/MLB-1074838673-tala-moldavel-modelo-splint-imobilizaco-resgate-sos-_JM
- Fig. 79: https://quizlet.com/47008855/flexor-forearm-flash-cards/
- Fig. 83: https://www.texaschildrens.org/health/when-your-athlete-has-strain-sprain-or-contusion
- Fig. 88: Courtesy of Mr Loke Jun Hao
- Fig. 90: http://dxline.info/diseases/subcutaneous/
- Fig. 91 to Fig. 93: https://burnsurvivor.com/burn_types_third/
- Fig. 94: http://piculig.pw/adult-burn-chart.html; https://www.surgery.wisc.edu/2017/10/05/assessment-and-referral-of-burn-patients/
- Fig.95: https://studylib.net/doc/18397213/safety-data-sheet

The term “casualty” may be used interchangeably between “victim” or “patient” in this manual. Similarly, the terms “he, she or they” refers to the casualty, with no intended discrimination.

Chapter 1

Essentials of First Aid

1) Definition and Aims of First Aid
2) Role and Limitations of a First Aider
3) Universal Precautions
4) First Aid Kit Content and Maintenance
5) Primary Survey
6) Secondary Survey
7) Record and Report
8) SCDF's myResponder Mobile Application

1.1 – Definition and Aims of First Aid

WHAT IS FIRST AID?

First Aid is the immediate management of a person who is injured or has suddenly taken ill.

AIMS OF FIRST AID

The four aims of First Aid are:

1. To preserve life.
    a. Provide chest compressions/CPR if casualty is not breathing normally.
    b. Control any serious bleeding.
2. To prevent condition from worsening.
    a. Cover wounds.
    b. Immobilise open wounds and fractures.
    c. Place casualty in a comfortable position.
3. To promote recovery.
4. To provide comfort and relief.
    a. Relieve pain and discomfort.
    b. Reassure and comfort.
    c. Protect casualty from extreme heat or cold.

1.2 – Roles and Limitations of a First Aider

The **roles** of a First Aider:

1. Provide First Aid to the casualty until medical help arrives.
2. As a First Aider, you should:
    - Be familiar with the layout of places frequented, eg. workplace, home, school, shopping malls, etc.
    - Understand the processes and associated hazards before embarking on any work/activity to anticipate possible types of incidents and be prepared to render appropriate First Aid.
    - Take note of the casualty's condition, type and time of treatment provided and basic details of the casualty. A more detailed report may be required in workplaces or schools; therefore, it is important for the First Aider (employed/contracted) to be familiar with the documentation and reporting procedure of the organisation.
    - Periodically check that the First Aid kit and contents are in order and are replenished regularly.
3. However, for appointed First Aiders with duty of care within the organisation/workplace:
    - You may be required to administer prescribed medication, based on the organisation/workplace Standard Operation Procedures (SOPs) to the casualty with the diagnosed condition.
    - You may refer to the Workplace Safety and Health Act to understand the details of the specific roles and responsibilities. (https://www.mom.gov.sg/workplace-safety-and-health/workplace-safety-and-health-act and https://sso.agc.gov.sg/Act/WSHA2006)

The **limitations** of a First Aider:

1. A First Aider should not be prescribing any medication to the casualty.
2. Please seek consent before administering First Aid treatment. Deemed consent will apply to casualties who are unconscious.

1.3 – Universal Precautions

Infections by blood-borne pathogens may be transmitted during life saving activities.

Use Personal Protective Equipment (PPE) (see figure 1) whenever possible while providing First Aid. Examples are:

Fig. 1 – Personal Protective Equipment (PPE)

1. Keep open wounds covered with dressings to prevent contact with blood.
2. Use disposable latex/nitrile gloves in every situation involving blood or other body fluids. If disposable latex/nitrile gloves are not available, use the most waterproof material or extra gauze dressing to form an impervious barrier.
3. Whenever possible, use a mouth-to-barrier device with a one-way valve for protection when performing ventilations (if trained) as there may be blood, vomit, body fluids or unknown contaminants in the casualty's mouth.
4. Wash the area immediately with soap and running water when exposed to blood or other body fluids and dispose of soiled items appropriately.
5. Wash hands with soap and water thoroughly (see figure 2) after the incident, as soon as possible.

Fig. 2 – Hand Washing Technique

1.4 – First Aid Kit Content and Maintenance

Appointed First Aiders must be familiar with the First Aid kit's location, content and usage.

First Aid kit should not contain materials other than those required for First Aid treatment (see figure 3). It is essential that First Aid kit be checked frequently to make sure they are fully equipped, and all items are usable. Used or expired items should be replaced as soon as possible.

Medication should not be stored in the First Aid Kit. Co-workers/staff or residents with diagnosed conditions may carry life-saving medication with them. The First Aider will need to know how to assist the casualty when their condition is triggered.

No.	Content	Sample Image	Quantity
1	Individually wrapped sterile adhesive dressings		20 – 40
2	Crepe bandage (5 cm)		1 - 4
3	Crepe bandage (10 cm)		1 - 6
4	Absorbent gauze (sealed packets)		5 - 15
5	Hypoallergenic tape		1 - 2

6	Triangular bandages		4 - 6
7	Scissors		1
8	Safety pins		4 - 6
9	Disposable gloves (pairs)		2 - 4
10	Eye shield		2 - 6
11	Eye pad		2 - 6

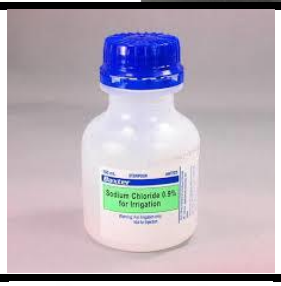
12	Resuscitation mask with one-way valve or Disposable face-shield		1 – 2
13	Sterile water or saline in 100 ml disposable containers		1 - 3
14	Penlight		1

Fig. 3 – The above table serves as a reference and is not intended as an endorsement of the respective products' brand/model.

The number of First Aid kit required depends on the physical layout of the premises and the number of people within the premises.

The First Aid kit should be adequately equipped, properly maintained, checked regularly, identifiable and placed in a well-lit and accessible location, under the charge of a person appointed by the workplace or organisation.

1.5 – Primary Survey

As an emergency is a sudden unexpected event that creates a risk to life and limb. Rapid action is necessary to rescue the casualty. This would require an immediate but systematic plan to ensure the safety of the casualty and self, as well as to perform triage of the casualty to determine the priority required to save a life. Thus, an Emergency Action Plan is needed, which comprises of two main portions – Primary and Secondary Surveys.

Factors to consider when carrying out Primary Survey

1. Environmental conditions
   Assess dangers and difficulties in removing the casualty:
   a. Moving vehicles
   b. Fumes and poisonous gases
   c. Unsafe structures
   d. Trapped casualty
2. Hazards
   a. Look out for fire, smoke, faulty electrical wires, spilled water, etc.
   b. Unseen dangers such as toxic gases, risk of falling objects, etc.
3. Mechanisms of injury
   Try to find out the mechanism of injury. This helps to identify the extent of injuries:
   a. Fall from height – look for multiple fractures.
   b. Ejection from a vehicle – look for multiple injuries.
   c. Sudden deceleration – look for blunt abdominal or chest injury due to these areas hitting the steering wheel.

The Primary Survey

The Primary Survey (see figure 4) comprises of the following 6 steps:

- **Danger** – Ensure personal safety
- **Response** – Check for casualty's responsiveness
- **Shout for Help** – Get help and call 995 for Singapore Civil Defence Force (SCDF), which will dispatch the appropriate resources for the incident
- **AED** – Have a nearby AED brought to the casualty
- **Breathing** – Look for normal breathing
- **Chest Compressions** – Start Chest Compressions if breathing is absent or unsure

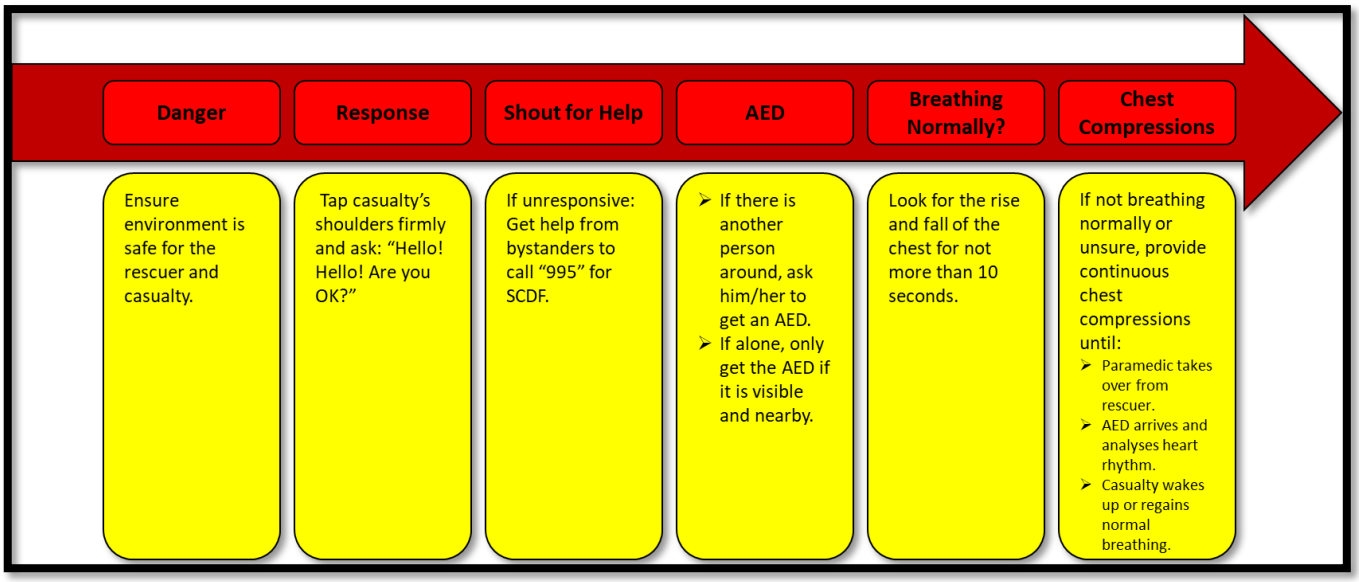


Fig. 4 – The Primary Survey (DRSABC)

The purpose of the Primary Survey is to ensure that the casualty receives immediate priority and treatment for life-threatening conditions:

- If casualty is unresponsive but breathing normally, check and manage any external injuries found. Monitor the casualty regularly (see Chapter 2).
- If casualty is bleeding severely, apply direct pressure on the wound. Apply a tourniquet if a limb is amputated and record the time of application (see Chapter 4).
- If casualty is unresponsive and not breathing, start chest compressions and apply an AED (see Chapter 8).

Rapid Body Survey

Do a head-to-toe examination of the body to look for injuries, bleeding and wounds:

1. Check for external bleeding/deformities at:
    a. Head and neck.
    b. Chest and abdomen.
    c. Back and lower extremities.
    d. Upper extremities.
2. Expose and examine the injury site.
3. Provide appropriate emergency care accordingly: Arrest bleeding, cover wounds and immobilise fractures.

1.6 – Secondary Survey

The Secondary Survey should be performed after the Primary Survey has been conducted and when casualty's life is not in any immediate danger. The information collected should be passed on to the paramedics who are taking over the care of the casualty. The Secondary Survey covers the following:

1. History.
2. Vital Signs.
3. Head-to-toe examination.

History

1. Chief complaint
    - What did the casualty say?
2. Details of chief complaint
    - Note the following:
        - Location and description of injury.
        - Nature of pain.
3. Medical History
    - Previous health and/or history of illness.
    - Previous/current treatment given by a doctor.
    - Allergies – any sensitivity to drugs, food or environment.
    - Check for Medic Alert Tag or Medic AWAS Card.

Vital Signs

Assess the following four vital signs after Primary Survey and Secondary Survey at regular intervals. Record the time and information collected. Additional information may be collected if the supporting

1. Check the level of consciousness (AVPU) (see figure 5)
    - The casualty is alert and conscious.

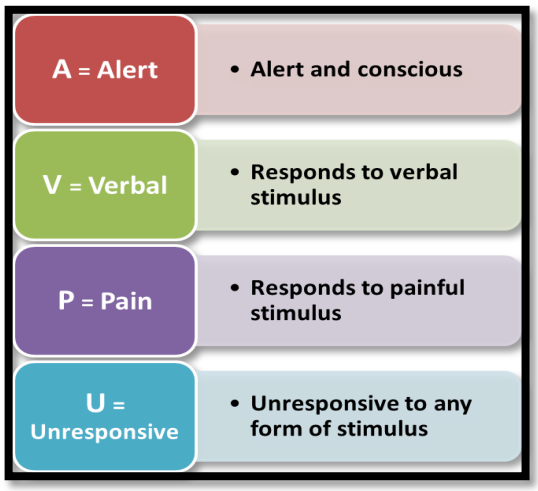


Fig. 5 – AVPU Scale

- The casualty responds to verbal stimulation.
- The casualty responds to painful stimulus.
- The casualty is completely unresponsive.

2. Pulse rate
    - Assess the rate, rhythm and strength.
3. Breathing rate
    - Look for normal breathing which is regular and not laboured.
    - Assess the rate, rhythm and depth.
4. Skin colour
    - Normal skin is pink, warm and dry.
    - When in shock, the skin may appear pale/bluish grey, cold and sweaty.

Head-to-toe Examination

Examine the body in the same order as Rapid Body Survey except more time is taken to confirm any abnormalities – injury, wounds and deformities.

This includes sorting of casualty (Triage) by:

1. Priority of attention.
2. Urgency for evacuation.
3. Evacuation and transport.

1. Priority of attention

a. Unconscious casualties – Check that there is normal breathing. Place casualty in recovery position (see Chapter 2) if spinal/head injuries are not suspected.
b. Serious casualties – Chest Injury (Injury to the respiratory or cardiovascular system); head injuries but conscious; fractures and wounds.
c. Minor injuries: minor wounds.

2. Urgency for evacuation

a. Urgent evacuation — All unconscious casualties, all casualties with chest or abdominal wounds, all casualties with head injuries.
b. Less urgent evacuation — Other wounds and fractures.
c. Non-urgent evacuation — Walking injured, minor injuries.

3. **Evacuation and transportation plan**
    a. Stretcher for spinal injury, multiple injuries, chest and abdominal wounds.
    b. One rescuer assisted evacuation, two or three rescuers assisted evacuation for casualties who are unable to walk unsupported but are conscious; an alternative is to use a chair to evacuate the casualty.

1.7 – Record and Report

When Singapore Civil Defence Force (SCDF) officers arrive, you will be required to provide some basic information regarding the incident and the treatment provided. If in doubt, take que from the SCDF Officer's instructions. Additionally, your workplace may require you to provide a written report – follow your workplace's reporting process.

The following pointers can be used as a reference:

1. Scene of incident – Hazards, site location, etc.
2. Mechanism of injury if known – Look at circumstances in which injury was sustained, extent and type of injuries sustained due to impact.
3. History: chief complaint and the details – Symptoms of illness or trauma; any past allergies; any past medical conditions.
4. Provide a written report (if required by your workplace) covering the following:
    a. Casualty's name, department and staff ID (if any).
    b. History of the incident or illness.
    c. Vital signs - Note level of consciousness, pulse, breathing and skin colour.
    d. Any unusual behaviour.
    e. Any treatment given and when – List all first aid treatment given. Record injuries from head to toe. Use a diagram (see figure 6).
    f. Response – Note response to treatment (eg. Reduction of pain, improved level of consciousness, etc).
    g. Progress – Note the change of vital signs if any.

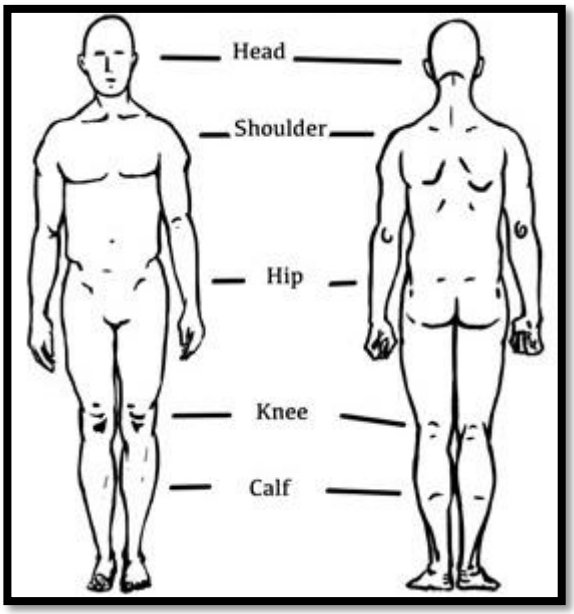


Fig. 6 – Diagram used for marking out injuries

1.8 – SCDF's myResponder Mobile Application

In Singapore, many of the emergency cases SCDF responds to could be quickly attended to by members of the public even before SCDF's arrival. For example, more than 2,500 people suffer from Out-of-Hospital Cardiac Arrest (OHCA), with a survival rate of just 5%, which could be improved by simple medical intervention within the first few critical minutes. At the same time, there are more than 1,000 minor fires (such as rubbish chute/bin fire) that could easily be extinguished using publicly-available means.

Cardiac Arrest	• Accept the myResponder alert, and proceed to the given location • You may use the app to locate nearby AEDs • Upon arrival at the patient's side, perform CPR, or apply an AED • Hand-over the case to the SCDF paramedics when they arrive
Minor Fire	• Accept the myResponder alert, and proceed to the given location • Extinguish the fire using available means, such as nearby extinguishers, buckets of water, domestic water taps and hoses, or drencher systems for rubbish chutes • Provide SCDF with up to 3 photos for scene assessment
Major Incident	• Accept the myResponder alert, but do not proceed any closer to the given location • Provide SCDF with up to 3 photos and 1 video of the developing incident, if it is safe to do so • If you receive any instructions for evacuation, do so immediately

myResponder is an application by SCDF to alert members of the public to nearby fire and medical cases, and thereby save lives and increase the survival rate for OHCA, as well as mitigate minor fires in the first few critical minutes.

myResponder is also a means by which members of the public may be asked to provide onsite information (via submission of photos and videos) for SCDF to gain an understanding of the situation. Through the 'Call 995' button in the app, users can also send their geolocation to SCDF's 995 Operations Centre, enabling SCDF to dispatch the emergency resources to the scene sooner.

myResponder works by notifying members of the public – also known as Community First Responders (CFRs) – of cardiac arrest and fire cases within 400m of their location. myResponder will also highlight nearby AEDs that may be available to responders, and provide guided advisories in the mitigation of minor fires. CFRs can then proceed to the stated location and assist by performing CPR or applying an AED to revive the patient, mitigating minor fires using available extinguishing means, or providing further information to SCDF's 995 Operations Centre.

Response is entirely voluntary, and we only encourage volunteers to respond when they are available within safe and reasonable means.

The above QR code works for both Apple iOS and Google Android OS and will direct to the App Store or Google Play respectively. The myResponder function is also available within the SGSecure application.

Chapter 2

Unconscious Casualty

1) Head/Spinal Injuries
2) Heat Disorders
3) Fits
4) Fainting
5) Low Blood Sugar
6) Stroke
7) The Recovery Position

Definition of Unconsciousness

Unconsciousness is defined as impairment of awareness. It can range from drowsiness and confusion to total lack of response.

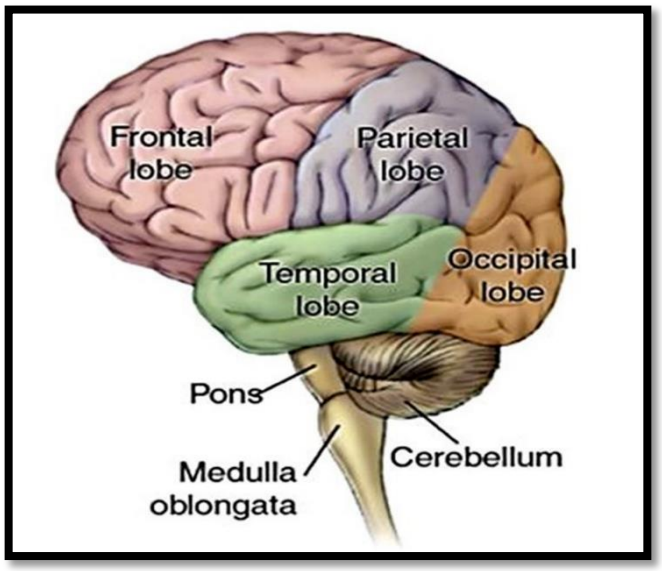


Fig. 7 – The basic structure of the brain

Frontal lobe – The frontal lobes are involved in motor function, problem solving, spontaneity, memory, language, initiation, judgement, impulse control, and social and sexual behaviour.

Parietal lobe – The parietal lobe receives and processes sensory information from all over the body and are also important for understanding spatial orientation and for proper navigation.

Temporal lobe – The temporal lobe is involved in primary auditory perception, such as hearing, and holds the primary auditory cortex.

Occipital lobe – The occipital lobe is responsible for processing visual information from the eyes.

Pons – The pons helps to regulate the respiratory system by assisting the medulla oblongata in controlling breathing rate and is also involved in the control of sleep cycles and the regulation of deep sleep. It also inhibits movement during sleep.

Cerebellum – The cerebellum coordinates voluntary movements such as posture, balance, coordination, and speech, resulting in smooth and balanced muscular activity.

Medulla Oblongata – The medulla oblongata helps regulate breathing, heart and blood vessel function, digestion, sneezing, and swallowing.

Spinal Cord – Its three major roles are to relay messages from the brain to different parts of the body, to perform an action, to pass along messages from sensory receptors to the brain, and to coordinate reflexes that are managed by the spinal cord alone.

Causes

Unconsciousness can be due to:

- Cardiac Arrest
- Head injury
- Electrocution
- Poisoning
- Drowning
- Fainting
- Fits
- Stroke
- Low blood sugar
- Alcohol/drug related causes

Important Notes

- Ensure the scene is safe to enter.
- Call 995 for SCDF.
- **Do not** give the casualty anything by mouth.
- **Do not** move the casualty unnecessarily.
- Treat any obvious injuries.
- Perform the Primary Survey. If casualty is unresponsive and not breathing, start chest compressions and apply an AED (see Chapter 8).
- If the casualty is breathing normally on his/her own, place in the recovery position to keep the airway clear. However, do not turn or move the casualty if neck or spinal injury is suspected (see chapter 2.1 on page 19) – based on the how the injury was sustained, and the force or height involved.
- Do not leave the casualty unattended at any time. Monitor the casualty and record the vital signs at regular intervals.

2.1 – Head/Spinal Injuries

Head and spinal injuries may occur in a variety of sporting activities where impact is great or in accidents involving sudden deceleration or heights.

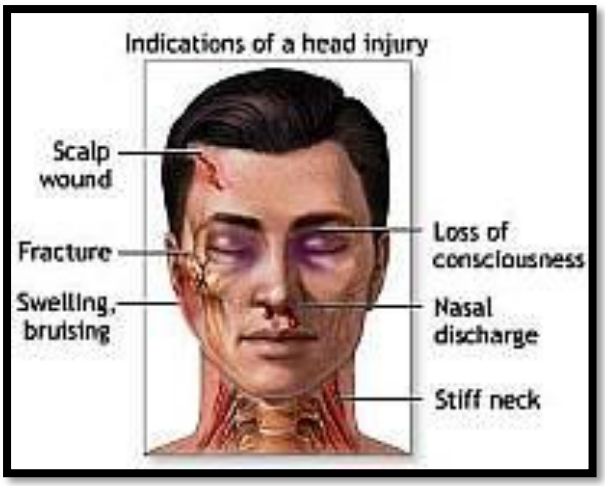
<table>
<tr><th></th><th colspan="2">Causes</th></tr>
<tr><td>Head Injury</td><td>Caused by a direct or indirect force resulting in the following:
Concussion: brain is shaken resulting in partial loss of consciousness
Compression: pressure exerted on the brain by swelling/bleeding or a blood clot
Skull Fracture: a partial or complete break of the skull bone, large force is involved to cause such injury</td><td> 

Fig. 8 – Common Signs of Head Injury</td></tr>
<tr><td>Spinal Injury</td><td>Fall from height
Diving into shallow waters
Being thrown off a motor vehicle
Hit across the back by a heavy object or force
Injury to the head or face</td><td> 

Fig. 9 – Causes of Spinal injury</td></tr>
</table>

Recognition

Concussion

- Brief or partial loss of consciousness.
- Dizziness on recovery.
- Loss of memory of events at the time of, or immediately preceding the injury.
- A mild, generalised headache.

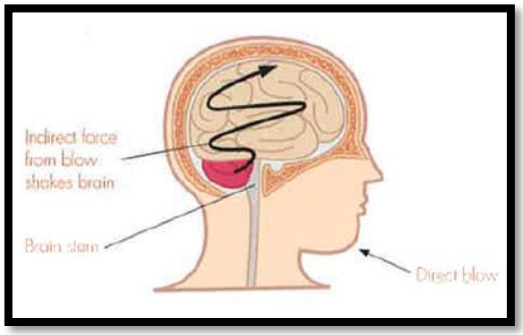


Fig. 10 – Concussion

Compression

- A headache which grows with intensity.
- Breathing becomes slow and noisy. Pulse is slow and strong.
- Pupils are unequal or dilated.
- Weakness or paralysis down one side of the face or body.
- Flushed face.
- Irritability.

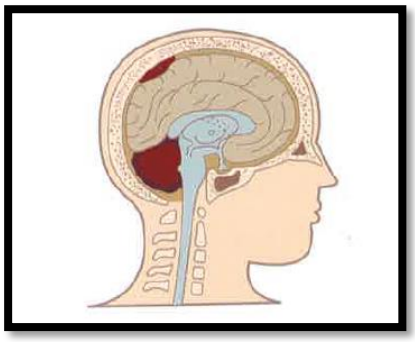


Fig. 11 – Compression

Skull Fracture

- A wound or bruise on the head.
- Progressive deterioration in the level of consciousness.
- Clear fluid (cerebro-spinal fluid) or watery blood coming out from the nose or ear.
- Bleeding into the whites of the eyes.

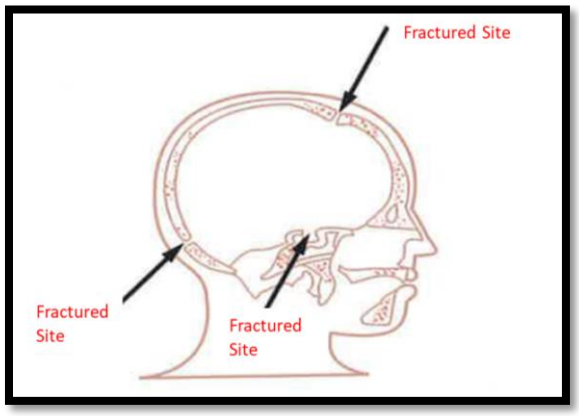


Fig. 12 – Skull Fracture

Spinal Injury

When spinal column (vertebrae) is damaged:

- Severe pain at the fracture site.
- A deformity in the normal curve of the spine.
- Tenderness on gently feeling the spine.

When spinal cord is also damaged:

- Inability to move the lower limbs.
- Abnormal/loss of sensation.
- Limb weakness/paralysis of all four limbs if the cord is damaged at the neck.
- Difficulty in breathing if the injury is high up the neck.

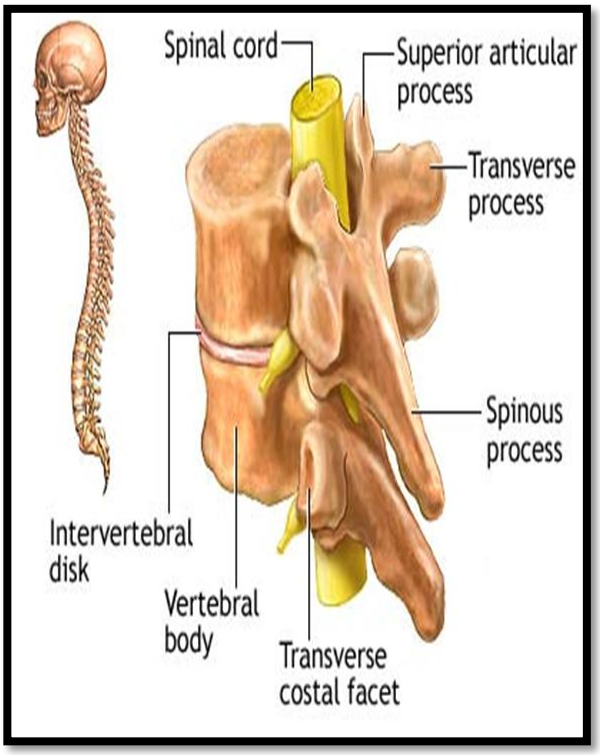


Fig. 13 – Spinal column and Spinal Cord

Actions to Take

Head Injury (Concussion, Compression and Skull Fracture):

- ✓ Call for 995 for SCDF.
- ✓ Perform the Primary Survey. If casualty is unresponsive and not breathing, start chest compressions and apply an AED (see Chapter 8).
- ✓ If the casualty is breathing normally on his/her own, place in the recovery position to keep the airway clear. However, do not turn or move the casualty if neck or spinal injury is suspected.
- ✓ If the casualty is conscious, place in a comfortable position.
- ✓ Stop any external bleeding if found.
- ✓ If there is discharge (blood or fluid) from the ear or nose, position the casualty such that the affected ear or nose is lower than the unaffected one.
- ✓ Monitor and record vital signs and level of consciousness every 5 minutes.

Spinal Injury:

- ✓ Call for 995 for SCDF.
- ✓ Do not move the casualty.
- ✓ If the casualty is conscious, reassure the him/her and advise not to move.
- ✓ Immobilise and support the head in the position found with a head grip or with objects (eg. waist pouch, books, rolled-up jacket, etc) to prevent further movement (see figure 14).

Fig. 14 – Immobilise the head with objects

2.2 – Heat Disorders

Heat disorders are a group of physically related illnesses caused by prolonged exposure to hot temperatures, insufficient fluid intake, or failure of temperature regulating mechanisms of the body. Disorders of heat exposure include heat cramps, heat exhaustion, and heat stroke. Proper rest, hydration, warm-up and acclimatisation before any strenuous activity is crucial in helping to prevent heat disorders.

Recognition

Heat Cramps:

- Over-exertion of a particular muscle group
- Lack of warm-up activity
- Insufficient water intake

Heat Exhaustion:

- Severe tiredness due to loss of body fluid through excessive sweating from strenuous activity
- Muscle cramps in legs, arms or abdomen
- Weakness, dizziness or headache
- Pale, clammy skin
- Rapid pulse and breathing
- Nausea or vomiting

Heat Stroke:

- The body temperature rises while the sweating mechanism fails, and the body is unable to cool down. Body temperature may rise above 40°c due to:
    - Prolonged heat exposure
    - Insufficient water intake
- Throbbing headache, dizziness and acute discomfort
- Restlessness and confusion
- Hot, flushed and dry skin
- Rapid and weak pulse
- May lead to unconsciousness

Actions to Take

Heat cramps:

- ✓ Stop all activity and sit in a cool place.
- ✓ Drink enough water.
- ✓ Seek medical attention if the cramps do not subside in 1 hour.
- ✓ Do not return to strenuous activity for 2 hours after the cramps subside.

Heat Exhaustion:

- ✓ Help to move casualty to a cool place and lay him/her down.
- ✓ Remove clothing if possible.
- ✓ Monitor and record vital signs and level of consciousness regularly.
- ✓ Give frequent small sips of isotonic drink or water to hydrate the casualty.
- ✓ Even if the casualty recovers quickly, ensure that he/she consults a doctor.

Heat Stroke:

- ✓ Heat Stroke is a life-threatening emergency. Call 995 for SCDF.
- ✓ Perform the Primary Survey. If casualty is unresponsive and not breathing, start chest compressions and apply an AED (see Chapter 8).
- ✓ If the casualty is breathing normally on his/her own, place in the recovery position to keep the airway clear. However, do not turn or move the casualty if neck or spinal injury is suspected.
- ✓ Quickly move casualty to a cool place and lay him/her down.
- ✓ Remove clothing if possible.
- ✓ Cool the casualty rapidly with whatever methods available.
- ✓ Wrap the victim in a cool wet sheet and keep it wet until body temperature falls to 38°c. If no sheet is available, constantly fan the victim or sponge him/her with cool water.
- ✓ Slow down the cooling measures when the casualty starts shivering.
- ✓ Casualty may not be fully conscious, do not feed the casualty anything.
- ✓ Monitor and record vital signs and level of consciousness regularly.

2.3 – Fits

Fits is the uncontrolled shaking of limbs and disturbance of consciousness. Anyone having two or more unprovoked fits or seizures can be said to have Epilepsy and it may vary widely in its forms, causation and severity.

Recognition

- Involuntary contractions of many of the muscles, caused by a disturbance in the function of the brain.

Actions to Take

- ✓ Perform the Primary Survey. If casualty is unresponsive and not breathing, start chest compressions and apply an AED (see Chapter 8).
- ✓ If the casualty is breathing normally on his/her own, place in the recovery position to keep the airway clear. However, do not turn or move the casualty if neck or spinal injury is suspected.
- ✓ Support or ease their fall and lay the casualty down in a quiet place.
- ✓ Call 995 for SCDF.
- ✓ Remove any possible sources of harm.
- ✓ Do not attempt to insert anything into the casualty's mouth.
- ✓ Turn the casualty to the side to allow drainage of fluids from the mouth.
- ✓ Stay with the casualty.
- ✓ After the fits has stopped, ensure casualty is breathing normally and has no severe injuries before placing in the recovery position.

2.4 – Fainting

Fainting is the **temporary** loss of consciousness in response to sever pain, unpleasant sights, prolonged standing or hunger.

Recognition

- Sudden loss of consciousness.
- May have warning symptoms of dizziness.

Actions to Take

- ✓ Lay the casualty on a flat surface with legs elevated if there is no evidence of trauma.
- ✓ Loosen tight clothing.
- ✓ Check breathing and pulse.
- ✓ Advise the casualty to seek medical attention.

2.5 – Low Blood Sugar

Loss of consciousness can be due to a lack of blood sugar. While it can occur to casualties who are diabetic, it may also affect any person who had insufficient food intake.

Recognition

- Rapid loss of consciousness.
- The casualty has not taken any food after their diabetes medication or injection.

Action to Take

- ✓ Give a sweet beverage if the casualty can drink.
- ✓ Call 995 for SCDF and stay with the casualty.
- ✓ Do not feed anything by mouth if the casualty turns unconscious.

2.6 – Stroke

A stroke is a condition in which the blood supply to the brain is suddenly impaired by a blood clot or a ruptured blood vessel.

Recognition

- Altered level of consciousness
- Slurred or garbled speech
- Loss of movement and sensation, usually on one side of the body
- Severe headache
- Identify signs of Stroke with the acronym "**FAST**":
    - **F**acial weakness – Can the person smile? Is his/her eye or mouth drooping? Does one side of the face droop?
    - **A**rm weakness – Can the person raise both arms? Does one arm drift downwards?
    - **S**peech difficulty – Can the person speak clearly and understand what you say? Does the speech sound slurred or strange?
    - **T**ime to act fast – Call 995 for SCDF.

Actions to take

- ✓ Perform the Primary Survey. If casualty is unresponsive and not breathing, start chest compressions and apply an AED (see Chapter 8).
- ✓ Call 995 for SCDF.
- ✓ If the casualty is breathing normally on his/her own, place in the recovery position to keep the airway clear. However, do not turn or move the casualty if neck or spinal injury is suspected.
- ✓ Reassure the casualty. He/she may be able to understand you even if they are unable to communicate.
- ✓ Support the casualty's head and shoulders if he/she is conscious.
- ✓ Monitor and record vital signs and level of consciousness regularly.

2.7 – The Recovery Position

The recovery position is used in the management of a casualty who is unresponsive but is breathing normally.

When an unresponsive casualty is lying supine (facing up) and breathing normally, his/her airway may be obstructed by the tongue, mucus and/or vomit.

These problems may be prevented when the casualty is placed in the recovery position. This position keeps the airway open as fluid can drain easily from the mouth.

If there is no evidence of trauma, place the casualty on his/her side in the recovery position. The recovery position keeps the airway open. The following steps are recommended:

Step 1: Position the casualty

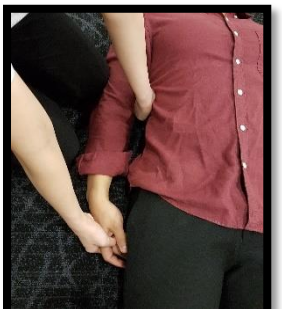


Fig. 15 – Tuck the hand under the casualty's hip

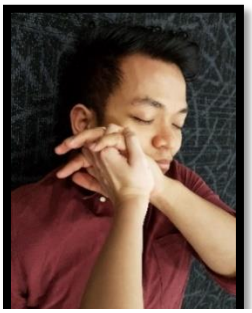


Fig. 16 – Place the back of hand against the casualty's cheek

- Tuck the hand nearer to you, arm straight and palm upward under the casualty's hip (see figure 15).
- Bring the other arm (further from you) across the casualty's chest and place the back of his/her hand against his/her cheek (see figure 16).
- Put your palm against the casualty's palm that is on the cheek and maintain this position.
- Using your other hand, bend the casualty's far knee to a 90-degree angle, hold the casualty's far hip and roll him/her towards you (see figure 17).

Fig. 17 – Bend the casualty's far knee to a 90-degree angle

Fig. 18 – Turn casualty towards you

Step 2: Roll the casualty towards the rescuer

- Use your knees/thighs to support the casualty's body as you turn him/her towards you to prevent him/her from rolling too far forward (see figure 18).

Step 3: Final Recovery Position

- Ensure that the casualty's cheek is resting on the back of his/her palm.
- Check that the casualty's other hand is positioned alongside his/her body with palm facing upwards.
- The former far leg should preferably be bent at the knee to a 90-degree angle (see figure 19).
- Stay with the casualty and monitor his/her breathing continuously.

Fig. 19 – The Recovery Position

Chapter 3

Respiratory Emergencies

1) Adult Foreign Body Airway Obstruction
2) Asthma
3) Hyperventilation
4) Fumes Inhalation
5) Allergic Reaction

The Respiratory System

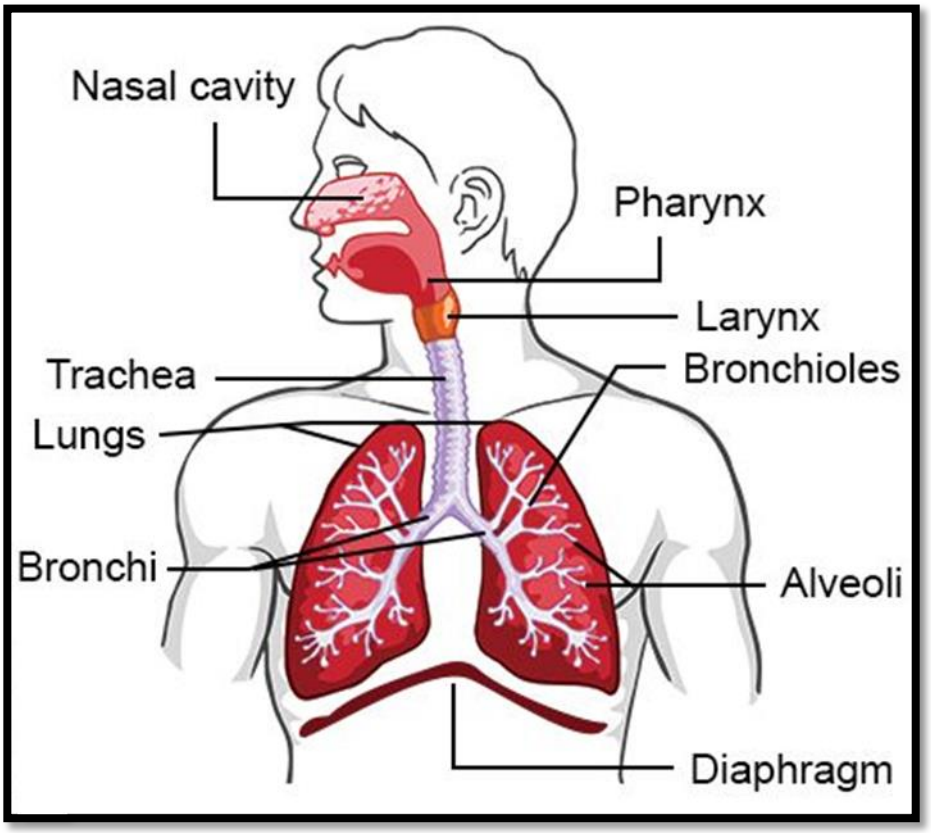


Fig. 20 – The structure of the respiratory system

Structure

The respiratory system comprises of:

- Nasal cavity
- Pharynx
- Larynx
- Trachea
- Lungs
- Bronchi
- Bronchioles
- Alveoli
- Diaphragm

Function

The functions of the respiratory system are:

- To provide oxygen for use in the body
- To excrete carbon dioxide

Respiration involved the process of breathing and the exchange of gases, oxygen and carbon dioxide in the lungs, and in cells throughout the body.

We breathe in air in order to take oxygen into the lungs and breathe out to expel the waste gas carbon dioxide, a by-product of respiration. When we breathe, air is drawn in through the nose and mouth into the airway and the lungs.

In the lungs, oxygen is taken from air sacs (alveoli) into blood vessels (pulmonary [lung] capillaries). At the same time, carbon dioxide is released from the capillaries into the alveoli and expelled as we breathe out (see figure 21).

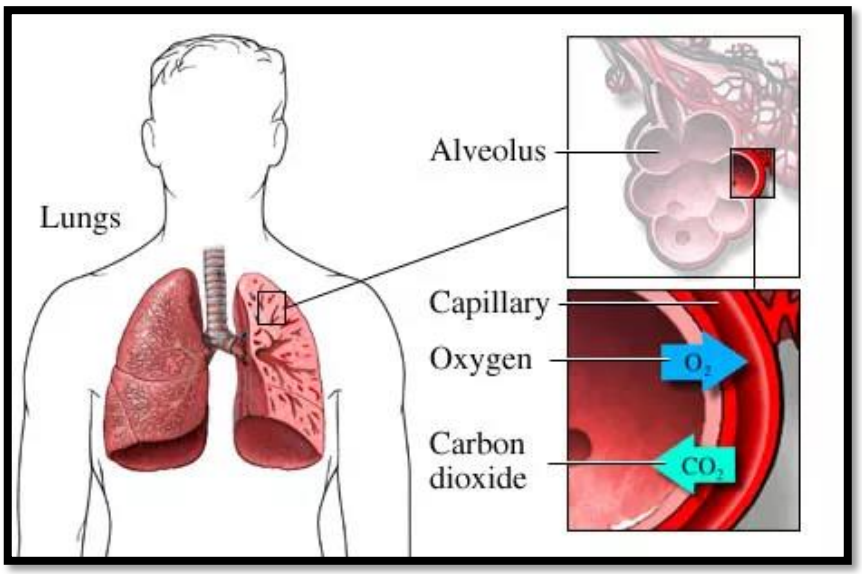


Fig. 21 – Gas exchange process

Mechanism of Breathing

During inspiration (breathing in) the chest cavity is enlarged. The lungs which are elastic, expand to fill up the increased space, and air is sucked in. Two main factors enlarge the chest cavity:

- Upward and outward movement of the ribs caused by the action of the inter-costal muscle.
- Flattening downward movement of the diaphragm.

- During expiration (breathing out) the lungs contract, the cavity returns to normal size and air is forced out.

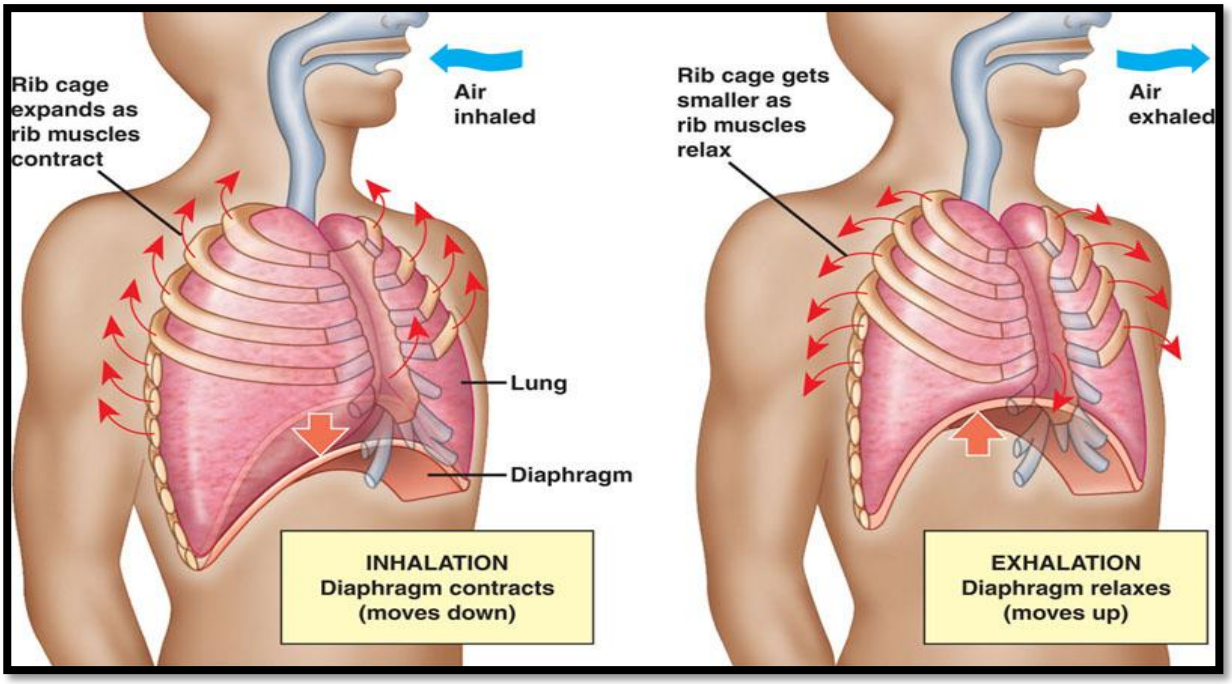


Fig. 22 – Mechanism of breathing

Requirements for Normal Breathing

For breathing to proceed normally, the following are required:

- Oxygen, which is present in the air (about 21%).
- The respiratory tract consists of:
  - The airway, a passage leading from the nose to the lungs. This passage allows a free flow of air in and out of the lungs during respiration.
  - Muscles of the chest wall and diaphragm, to draw air into the lungs.
  - The respiratory centre in the brain and connective nerves to the respiratory muscles, to control and maintain autonomic regular breathing movements.
  - The lungs, where oxygen is taken from the air into the blood, in exchange for carbon dioxide which is then breathed out.

Blood which carries oxygen absorbs from the lungs to the tissues throughout the body. The oxygen is carried and attached to the haemoglobin, a pigment in the red blood cells of the blood.

The heart pumps the blood and keeps it flowing to all parts of the body where oxygen is needed.

Breathing Rates for Normal Persons at Rest

Adult: 12 – 16 breaths per min

Babies and young children: 20 – 30 breaths per min.

Respiratory Emergencies

Respiratory emergencies occur when the casualty is having laboured breathing or breathing is in distress.

Recognition:

- Difficulty in breathing and gasping for breath
- Use of accessory (neck) muscles to breathe
- Casualty appears anxious, restless and panicky
- Casualty cannot speak a few words between breaths
- Casualty's skin is bluish in colour (cyanosis)
- Confusion, disorientation leading to unconsciousness
- Breathing or heart may stop

Causes

Common causes of respiratory problems are:

- Choking
- Fumes inhalation
- Drowning
- Hanging, Strangulation and Throttling
- Hyperventilation
- Bronchial Asthma/Chronic Obstructive Pulmonary Disease
- Heart Failure

Important Notes

- Ensure the scene is safe to enter. In cases of poisoning by gases, fumes or lack of oxygen in and enclosed space, the casualty should be moved to a well-ventilated place.
- Reassure the casualty to allay his anxiety and panic.

- Find out from the casualty what happened to him to determine the cause for his breathing difficulty, if he is conscious.
- Perform the Primary Survey and commence CPR and use the AED if the casualty is not breathing.
- If the casualty does not respond, call 995 for SCDF.
- Check to see whether there are any obstructions in the mouth, e.g. foreign bodies, food, dentures, vomitus etc.
- If the casualty is unconscious but breathing normally, place him/her in the recovery position (see Chapter 2). However, do not turn or move the casualty if neck or spinal injury is suspected.
- Do not leave the casualty unattended at any time. Monitor the casualty and record the vital signs at regular intervals.

3.1 – Foreign Body Airway Obstruction

Complete airway obstruction is an emergency that will result in death within minutes, if not treated immediately. A casualty can develop airway obstruction from either intrinsic (tongue and epiglottis) or extrinsic (foreign body) causes.

Causes

Intrinsic Causes

- The tongue can fall backward into the pharynx in an unconscious casualty in the supine position.
- Blood from head and facial injuries can flow into the airway.
- Regurgitated stomach contents can enter the airway.

Extrinsic Causes

Foreign bodies, e.g. food, dentures etc.

Contributing Factors

- Large, poorly chewed pieces of meat/food.
- Elevated blood alcohol levels.
- Dentures.
- Playing, crying, laughing and talking with food in the mouth.

Precautions

- Cut food into small pieces. Chew slowly and thoroughly, especially if wearing dentures.
- Avoid excessive intake of alcohol.
- Avoid laughing and talking when the mouth is full.

Recognition

Fig. 23 – The universal sign of choking

Foreign Body Airway Obstruction (FBAO) can be either partial or complete. Coughing is the body's natural defence against airway obstruction.

A casualty with **partial** (mild) airway obstruction will cough to expel the foreign body. If the casualty is wheezing (breathing noisily with a wheezing sound) or coughing, this means that the airway is partially obstructed. Do not interfere. Allow the casualty to cough to expel the object himself/herself.

In **complete** (severe) airway obstruction, the casualty is unable to speak, breathe or cough and may become cyanotic (blue). The casualty will clutch the neck with thumb and fingers, the universal distress signal for choking (see figure 23) that requires immediate action (see figure 24).

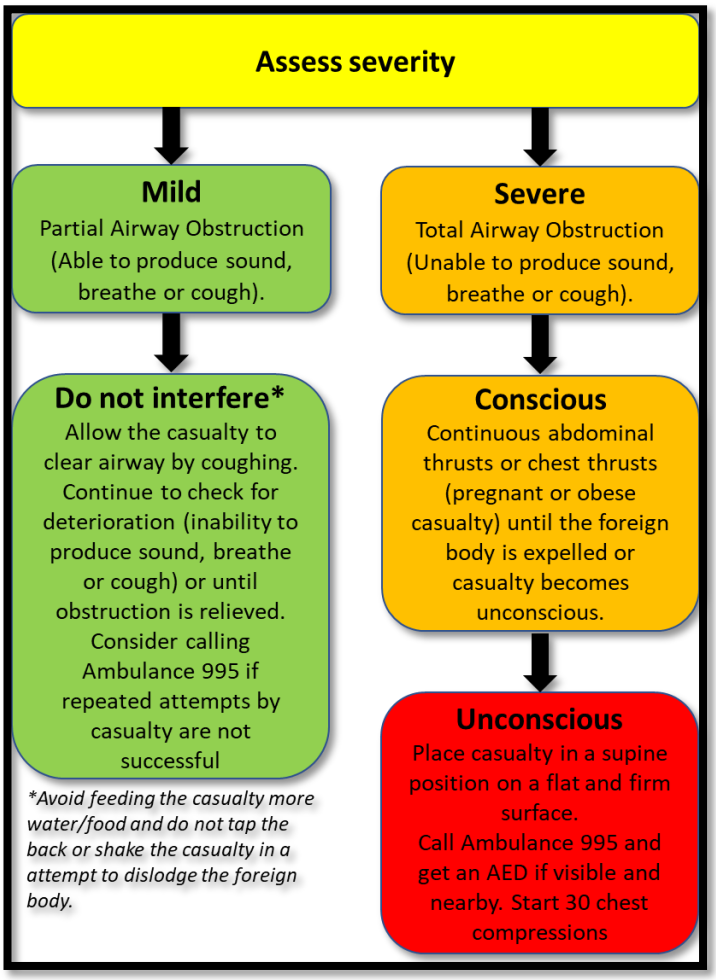


Fig. 24 – Summary of adult FBAO relief

Actions to Take

Techniques used to relieve FBAO include the Heimlich Manoeuvre (abdominal thrusts) and chest thrusts for pregnant and obese casualties.
The **Heimlich Maneuver**, also known as the sub-diaphragmatic abdominal thrusts or abdominal thrusts is recommended for the relief of FBAO in responsive adults (more than 8 years of age) and children (1 to 8 years of age). The Heimlich Maneuver elevates the diaphragm and increase airway pressure, which forces air out from the lungs. This creates an artificial cough which can expel the foreign body from the airway.
In obese or pregnant casualties, **chest thrusts** should be used instead of abdominal thrusts.

Abdominal Thrust

- ✓ Ask if the casualty is choking. A choking casualty will not be able to speak, breathe or cough but may nod his/her head. Tell the casualty that you can help.
- ✓ If the casualty can cough, instruct the casualty to cough as hard as possible. If casualty is unable to cough, perform the Heimlich Maneuver.
- ✓ If the casualty is standing, the First Aider should stand behind the casualty. If the casualty is seated, the First Aider should be kneeling behind the seated casualty. Wrap the arms around the casualty's abdomen.
- ✓ Locate the navel and place 2 fingers above the navel and well below the tip of xiphoid process.
- ✓ Make a fist with the other hand with the thumb in the palm (see figure 25).
- ✓ Place the thumb side of the fist against the casualty's abdomen in the midline and just above the 2 fingers' spacing.

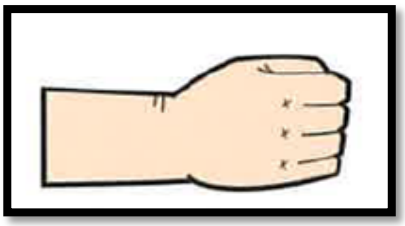


Fig. 25 – Make a fist with thumb in the palm

- ✓ Lean the casualty forward with one hand, while maintaining the fist against the abdomen.
- ✓ Grasp the fist with the other hand and provide quick inward and upward abdominal thrusts in one motion into the casualty's abdomen (see figure 26).
- ✓ Deliver each abdominal thrust firmly and distinctly with the intent of relieving the obstruction until the foreign body is expelled or the casualty becomes unconscious.

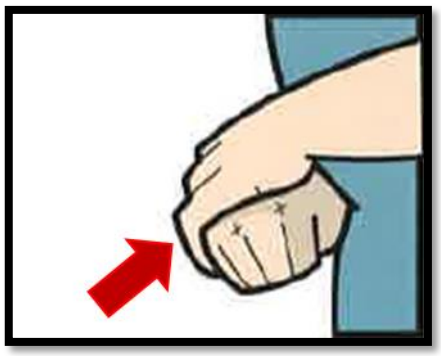


Fig. 26 – Provide quick inward and upward abdominal thrusts

Chest Thrusts

This technique is used as an alternative for obese or pregnant casualties.

- ✓ Ask If the casualty is choking, the casualty will not be able to speak, breathe or cough but may nod his/her head. Tell the casualty that you can help.
- ✓ If the casualty can cough, instruct the casualty to cough as hard as possible. If casualty is unable to cough, perform the Chest Thrust.
- ✓ If the casualty is standing, the First Aider should stand behind the casualty. If the casualty is seated, the First Aider should be kneeling behind the seated casualty. Wrap the arms around the casualty's abdomen.
- ✓ Place your arms under the casualty's armpits encircling the chest.
- ✓ Make a fist with one hand with the thumb in the palm (see figure 27).
- ✓ Place thumb-side of fist on the middle of the casualty's sternum (breastbone).
- ✓ Grasp your fist with your other hand and bring yourself close to the casualty before giving quick backward thrusts (see figure 28).
- ✓ Deliver each backward thrust firmly and distinctly with the intent of relieving the obstruction until the foreign body is expelled or the casualty becomes unconscious.

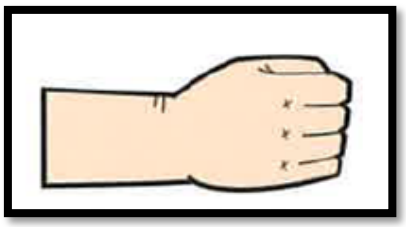


Fig. 27 – Make a fist with thumb in the palm

Fig. 28 – Deliver quick backward thrusts

Unconscious Choking Casualty

If the casualty becomes unconscious, proceed with the following steps:

- ✓ Support and position the casualty lying on his/her back on a firm flat surface.
- ✓ Call 995 for SCDF and get an AED if visible and nearby.
- ✓ Locate the landmark and perform 30 chest compressions using the same location (see figure 29) and techniques as Cardio Pulmonary Resuscitation (see Chapter 8).

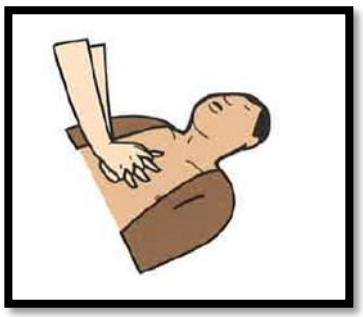


Fig. 29 – Provide chest compressions

- ✓ After 30 chest compressions, check the mouth and remove any foreign body if seen.
- ✓ **DO NOT** perform blind finger sweep as it may push the object back or further into the airway.
- ✓ Continue with 30 chest compressions and check the mouth after every 30 chest compressions until help arrives and takes over or the casualty starts breathing, coughing, talking or moving.

3.2 – Asthma

Asthma is a condition where there is difficulty in breathing due to the muscles of the air passages (bronchi and bronchioles) going into spasm (see figure 30).

Sometimes there is a recognized trigger for an asthmatic attack, such as an allergy, cold weather, a particular drug, dust or pollen. At other times, no obvious trigger can be identified.

Asthmatics can usually deal with their own attacks. They carry inhalers that they use regularly to prevent attacks. The drugs in the inhalers dilate the air passages, easing the difficulty in breathing.

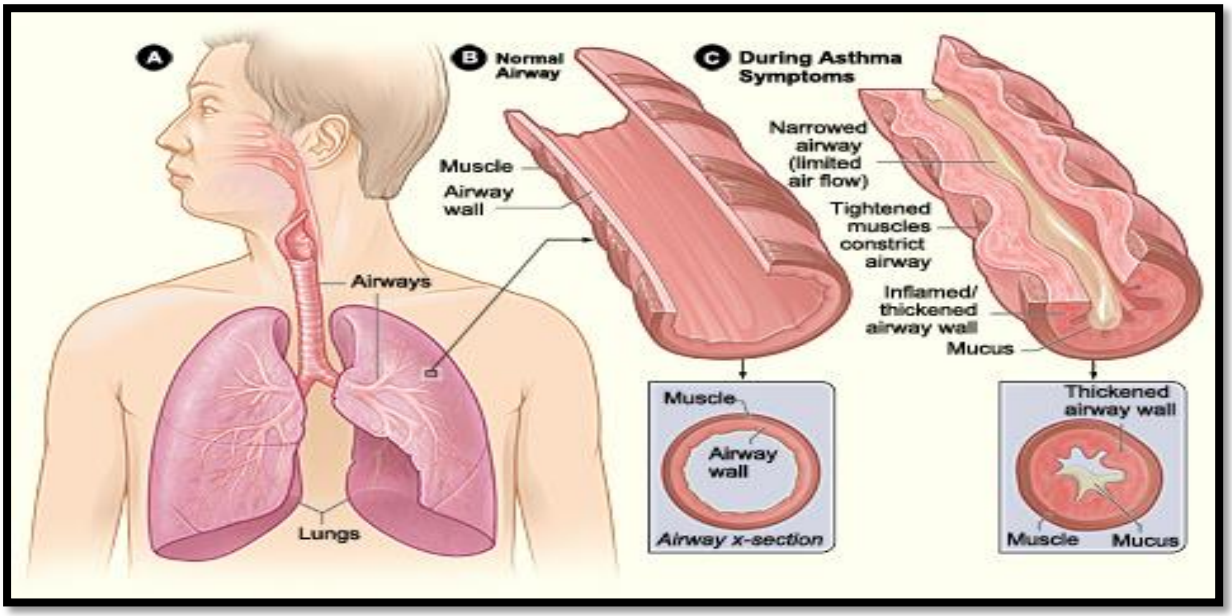


Fig. 30 – Changes in the Bronchioles during an asthma attack

Causes

- Environmental triggers like cold air, pollen, cigarette smoke and perfumes.
- Occupational exposures such as dust, fumes and industrial smoke.

Recognition

- Difficulty in breathing.
- Wheezing during expiration.

- Blueness of the skin (cyanosis).
- Distress and anxiety.
- In severe attacks, the effort of breathing will tire out the casualty.

Actions to Take

- ✓ Place the casualty in a position that he/she finds most comfortable, which is often sitting down. Do not lay the casualty down.
- ✓ Ask him/her to breathe slowly and deeply.
- ✓ Ensure a good supply of fresh air – open windows etc.
- ✓ Ask casualty about any asthma medication and assist to use the Metered Dose Inhaler (MDI). Some casualties may require a spacer (see figure 31) to administer the medication.
- ✓ If the casualty has an Asthma Action Plan, follow the plan closely (see figure 32).
- ✓ If the attack is prolonged or does not respond to medication, or severe respiratory distress occurs, call 995 for SCDF.
- ✓ Commence chest compressions and use the AED if the casualty is not breathing.

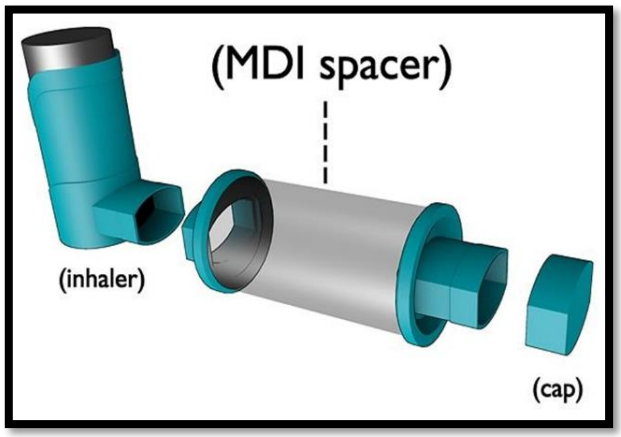


Fig. 31 – Metered Dose Inhaler with Spacer

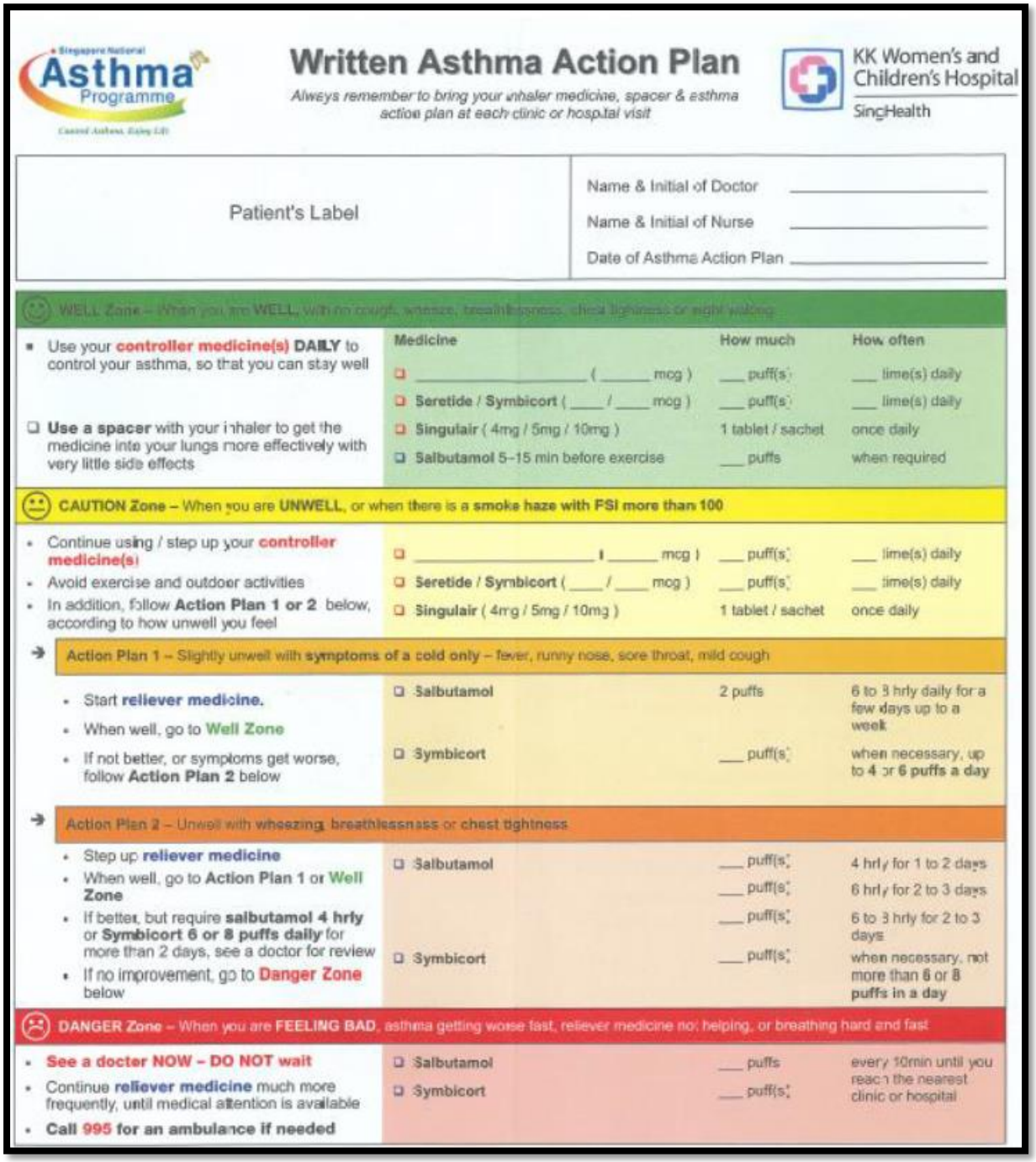
Direct MDI use

- ✓ Remove the cap from the MDI and shake well.
- ✓ The casualty should seal their mouth over the MDI's mouthpiece.
- ✓ Casualty should inhale and exhale deeply before use. Each puff should be coordinated with a deep breath and held for about 10 seconds.

MDI with Spacer

- ✓ Insert the MDI into the spacer before the casualty should seal their mouth over the spacer's mouthpiece (a face mask may be required for children under 6 years of age).
- ✓ Each puff into the spacer should be followed by normal 6 breaths through the spacer.

- ✓ If more than 1 puff is needed (as prescribed by their doctor – not more than 8 sprays), rest for 1 minute before commencing the above steps until the required number of puffs have been completed.



Written Asthma Action Plan

Always remember to bring your inhaler medicine, spacer & asthma action plan at each clinic or hospital visit

Asthma Programme

KK Women's and Children's Hospital
SingHealth

Patient's Label

Name & Initial of Doctor _____

Name & Initial of Nurse _____

Date of Asthma Action Plan _____

WELL Zone – When you are **WELL**, with no cough, wheeze, breathlessness, chest tightness or night waking

- Use your **controller medicine(s) DAILY** to control your asthma, so that you can stay well
- ❑ **Use a spacer** with your inhaler to get the medicine into your lungs more effectively with very little side effects

Medicine	How much	How often
❑ _____ (_____ mcg)	___ puff(s)	___ time(s) daily
❑ **Seretide / Symbicort** (____ / ____ mcg)	___ puff(s)	___ time(s) daily
❑ **Singulair** (4mg / 5mg / 10mg)	1 tablet / sachet	once daily
❑ **Salbutamol** 5–15 min before exercise	___ puffs	when required

CAUTION Zone – When you are **UNWELL**, or when there is a **smoke haze with PSI more than 100**

- Continue using / step up your **controller medicine(s)**
- Avoid exercise and outdoor activities
- In addition, follow **Action Plan 1 or 2** below, according to how unwell you feel

❑ _____ (_____ mcg)	___ puff(s)	___ time(s) daily
❑ **Seretide / Symbicort** (____ / ____ mcg)	___ puff(s)	___ time(s) daily
❑ **Singulair** (4mg / 5mg / 10mg)	1 tablet / sachet	once daily

Action Plan 1 – Slightly unwell with **symptoms of a cold only** – fever, runny nose, sore throat, mild cough

- Start **reliever medicine.**
- When well, go to **Well Zone**
- If not better, or symptoms get worse, follow **Action Plan 2** below

❑ **Salbutamol**	2 puffs	6 to 8 hrly daily for a few days up to a week
❑ **Symbicort**	___ puff(s)	when necessary, up to **4** or **6 puffs a day**

Action Plan 2 – Unwell with **wheezing**, **breathlessness** or **chest tightness**

- Step up **reliever medicine**
- When well, go to **Action Plan 1** or **Well Zone**
- If better, but require **salbutamol 4 hrly** or **Symbicort 6 or 8 puffs daily** for more than 2 days, see a doctor for review
- If no improvement, go to **Danger Zone** below

❑ **Salbutamol**	___ puff(s)	4 hrly for 1 to 2 days
	___ puff(s)	6 hrly for 2 to 3 days
	___ puff(s)	6 to 8 hrly for 2 to 3 days
❑ **Symbicort**	___ puff(s)	when necessary, not more than **6** or **8 puffs in a day**

DANGER Zone – When you are **FEELING BAD**, asthma getting worse fast, reliever medicine not helping, or breathing hard and fast

- **See a doctor NOW – DO NOT wait**
- Continue **reliever medicine** much more frequently, until medical attention is available
- **Call 995 for an ambulance if needed**

❑ **Salbutamol**	___ puffs	every 10min until you reach the nearest clinic or hospital
❑ **Symbicort**	___ puff(s)	

Fig. 32 – Example of a Written Asthma Action Plan (Courtesy of KK Women's and Children's Hospital)

3.3 – Hyperventilation

Hyperventilation is a condition of over-breathing. This is commonly seen in cases of acute anxiety and may accompany hysteria or a panic attack. It may also be seen in a casualty who has received an emotional shock.

Over-breathing causes and excessive loss of carbon dioxide from the blood, leading to a tingling sensation and numbness of the hands and legs. As breathing returns to normal, the casualty gradually recovers.

Causes

- Anxiety
- Hysteria
- Panic attack
- Fright

Recognition

- Unnaturally fast, deep breathing
- Dizziness, faintness, trembling or marked tingling in the hands
- Cramps in the hands and feet

Actions to take

- ✓ Reassure the casualty.
- ✓ Lead the casualty to a quiet place, where he/she may be better able to regain control of his/her breathing.
- ✓ Advise casualty to see a doctor.

3.4 – Fumes Inhalation

Fumes or smoke that have accumulated in a confined space can quickly overcome anyone who is not wearing protective equipment. A burning building presents not only the fire itself, but also falling structures as well as dangers from fumes and smoke.

Any person who has been enclosed in a confined space during a fire should be assumed to have inhaled smoke. Smoke from burning plastics, foam padding and synthetic wall coverings will probably contain poisonous fumes. Casualties should also be examined for other injuries sustained as a result of the fire.

Recognition

Fumes Inhalation:

- Difficulty in breathing from spasm and swelling of the air passages.
- Burns in or around the nose or mouth.
- Unconsciousness.
- The heart may stop.

Carbon Monoxide Inhalation:

This highly dangerous gas prevents the blood from carrying oxygen. It is tasteless and odourless. A large amount of carbon monoxide in the air, such as in a confined space, can kill a person very quickly. Lengthy exposure to a slow leak from a faulty gas heater may also cause severe, possibly fatal poisoning.

- Difficulty in breathing
- Headache/Dizziness
- Nausea and vomiting
- Confusion
- Unconsciousness
- May lead to respiratory and cardiac arrest

Actions to Take

Fig. 33 – Remove casualty to safety

- ✓ **DO NOT** enter a gas or smoke-filled room without proper safety equipment. Look after yourself and do not end up being a casualty.
- ✓ Call for help. Call 995 for SCDF.
- ✓ If you are sure that it is safe to do so, remove the casualty from danger.
- ✓ Perform the Primary Survey and commence CPR and use the AED if the casualty is not breathing.
- ✓ If the casualty is unconscious but breathing normally, place him/her in the recovery position (see Chapter 2). However, do not turn or move the casualty if neck or spinal injury is suspected – based on the how the injury was sustained, and the force or height involved.
- ✓ Treat other injuries e.g. burns, open wounds, etc.
- ✓ Do not leave the casualty unattended at any time. Monitor the casualty and record the vital signs at regular intervals.

3.5 – Allergic Reaction

Allergies are an overreaction of the body's natural defence system that helps fight infections (immune system). The immune system normally protects the body from viruses and bacteria by producing antibodies to fight them. In an allergic reaction, the immune system starts fighting substances that are usually harmless (such as dust mites, pollen, or a medicine) as though these substances were trying to attack the body.

An allergic reaction may not occur during the first exposure to an allergy-producing substance (allergen). For example, the first time you are stung by a bee, you may have only pain and redness from the sting. If you are stung again, you may have hives or trouble breathing. This is caused by the response of the immune system.

Many people will have some problem with allergies or allergic reactions at some point in their lives. Allergic reactions can range from mild and annoying to sudden and life-threatening.

Anaphylactic shock is failure of the circulation due to a severe allergic reaction within the body in response to something either taken by mouth, or comes into contact with the body, or was injected.

Recognition

Mild to Moderate Allergic Reaction

- Widespread or localised (over one area only) red, blotchy skin rashes
- Swelling of the face and neck
- Puffiness around the eyes

Life-threatening Allergic Reaction (Anaphylaxis)

- Impaired breathing, ranging from a tight chest to severe difficulty; the casualty may wheeze and gasp for air.
- Persistent cough, hoarse voice, difficulty in swallowing or swollen tongue.
- Pale or dizziness/sleepy, may become unconscious.

Action to Take

- ✓ Place a conscious casualty in a sitting position to relieve any breathing difficulty.
- ✓ In mild to moderate cases, advise the casualty to seek treatment at a clinic. If unsure or in severe cases, call 995 for SCDF.
- ✓ Ask if the casualty is carrying their prescribed medication (eg. Antihistamines or Epinephrine auto injector) to treat their known allergic reaction.
- ✓ If the casualty indicates the need to use an auto injector, ask whether you should help inject the medication. This is usually done by pressing the auto injector against the person's thigh (see figure 34) for 3 to 10 seconds and massaging the area for 10 seconds (or follow the specific instructions indicated on the auto-injector).
- ✓ Loosen tight clothing and cover the person with a blanket. Do not give the casualty anything to drink.
- ✓ If there's vomiting or bleeding from the mouth, turn the casualty to the side to prevent choking.
- ✓ Commence chest compressions and use the AED if the casualty is unconscious and not breathing.
- ✓ Call 995 for SCDF even if symptoms start to improve as it is possible for symptoms to recur. Monitoring in a hospital is usually necessary.

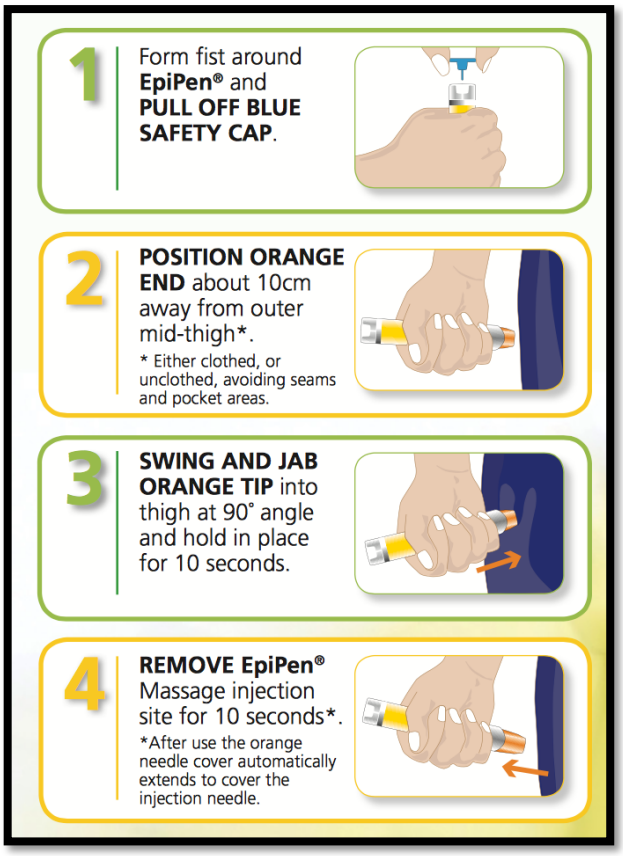


Fig. 34 – Use of Epinephrine auto injector

Chapter 4

Shock, Bleeding and Wounds

1) Shock
2) Bleeding
3) Wounds
4) Bandaging

The Circulatory System

The circulatory system is made up of the heart and blood vessels (see figure 35).

Four to six litres of blood circulate around the body to distribute oxygen and nutrients to the tissues and carry waste products away.

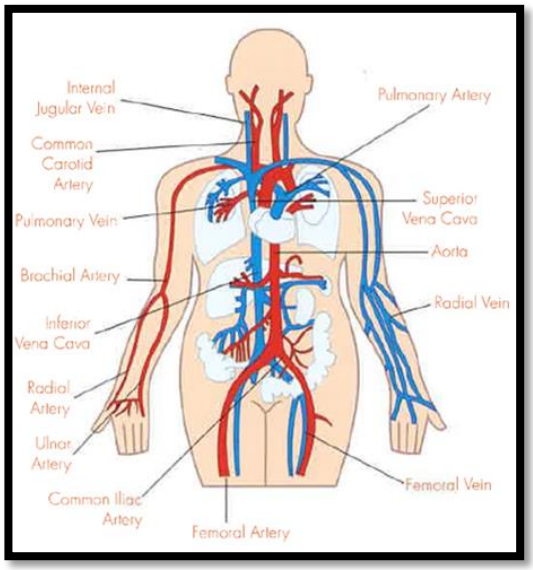


Fig. 35 – The circulatory system

Blood Vessels

There are three types of blood vessels: arteries, veins and capillaries.

Arteries – Strong, muscular, elastic-walled vessels which carry blood away from the heart towards the tissues.

Veins – Thin-walled vessels which carry blood back to the heart. Blood is squeezed through the veins by action of the surrounding muscles and is kept flowing towards the heart through one-way valves.

Capillaries – Arteries subdivide to form a dense network of fine, thin-walled vessels called capillaries within the body tissues. The thin capillary walls allow for the exchange of gases and other materials between cells of the body and the blood. The capillaries then rejoin to become veins.

Blood Pressure

The force with which the heart pumps blood through the vessels and around the body is known as “blood pressure”.

- Systolic pressure in adults = 100 – 140 mm Hg
- Diastolic pressure in adults = 60 – 90 mm Hg

The Pulse

This is the pressure wave along arteries, generated by the contraction of the heart. It can be felt where the artery is close to the surface of the body. The

pulse rate may increase with exertion, fear, fever, blood loss and certain illness. On the other hand, fainting, severe head injuries and heart disorders may slow it down.

Where the pulse may be felt

The pulse can be felt at the wrist (radial pulse). It can also be felt at the neck (carotid pulse) (see figure 36).

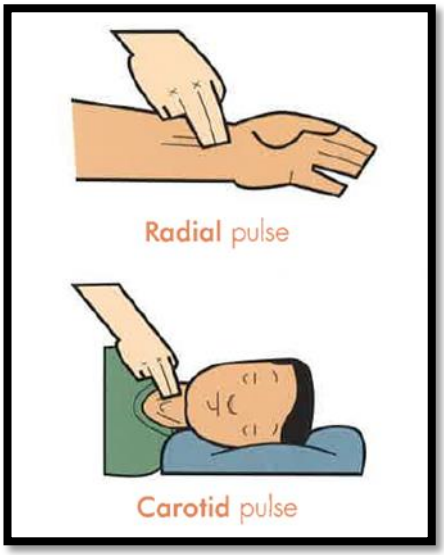


Fig. 36 – Sites to check pulse rate

Pulse rate for a normal person at rest

- Adult = 60 – 80 beats per min
- Child = 80 – 120 beats per min
- Infant = 100 – 160 beats per min

Abnormal pulse

Rate

- Tachycardia > 100/min – fast heart rate
- Bradycardia < 60/min – slow heart rate.

Rhythm

- Irregular heartbeat or abnormal beats in heart disease

Strength

- Weak e.g. in shock or low pressure.

4.1 – Shock

Shock is defined as a life-threatening condition which may be progressive and may lead to the collapse of the circulatory system.

Recognition

Types of Shock

Hypovolemic Shock

Hypovolemic shock is failure of the circulation due to more than 20 percent (one-fifth) of the body's blood or fluid supply being lost either internally or externally. This severe fluid loss makes it difficult for the heart to pump enough blood to the rest of the body. The signs and symptoms vary with the degree of severity of shock.

Cardiogenic Shock

Cardiogenic shock is failure of circulation due to a heart attack or any condition that damages the heart muscle.

Septic Shock (A form of distributive shock)

Septic shock is a potentially fatal medical condition that occurs when organ injury or damage in response to infection, leads to dangerously low blood pressure and abnormalities in cellular metabolism.

Anaphylactic Shock (A form of distributive shock)

Anaphylactic shock is failure of the circulation due to a severe allergic reaction within the body in response to something either taken by mouth, or comes into contact with the body, or was injected. Visible signs include widespread or localised (over one area only) red, blotchy skin rashes, swelling of the face and neck, puffiness around the eyes as well as Impaired breathing, ranging from a tight chest to severe difficulty; the casualty may wheeze and gasp for air.

Neurogenic Shock (A form of distributive shock)

Neurogenic shock results in low blood pressure, occasionally with a slowed heart rate, due to the disruption of the autonomic pathways within the spinal cord. It can occur after damage to the central nervous system, such as spinal cord injury and traumatic brain injury. Low blood pressure occurs due to decreased systemic vascular resistance as a result of lacking sympathetic tone which in turn causes pools of blood staying within the extremities and not being redirected to the core body.

Signs associated with types of Shock

Vital Sign	Hypo-volemic	Cardio-genic	Septic	Anaphylactic	Neuro-genic
Skin Temp.	Cool, Clammy			Warm, Dry	
Skin Colour	Pale, Cyanosed (light blue)		Pale, Mottled (blotchy)	Pink	
Blood Pressure	Drops				
Level of Consciousness	Altered				Lucid (Normal)
Capillary Refill Time	Delayed				Normal

Response to blood loss

Volume	Signs & Symptoms
300 – 500 ml	➢ Little or no effect
500 – 1500 ml	➢ Increased blood pressure (diastolic) ➢ Slightly increased pulse rate ➢ Pale, cool and clammy skin
1500 – 2000 ml	➢ Increased pulse rate ➢ Shallow and rapid breathing ➢ Pale, cool and clammy skin ➢ Nausea ➢ Drowsiness
More than 2000 ml	➢ Pulse becomes undetectable ➢ Loss of consciousness ➢ Breathing may cease and heart may stop

Actions to Take

Fig. 37 – Raise the legs above the level of the heart

- ✓ Reassure the casualty.
- ✓ Call 995 for SCDF.
- ✓ Raise the casualty's legs above the level of the heart (see figure 37), unless there is a fracture of the lower limb, pelvis, head or spinal injury.
- ✓ Control severe bleeding and bandage any wounds or burns.
- ✓ Immobilize any fractures.
- ✓ Loosen any tight clothing and keep the casualty comfortable.
- ✓ Moisten the lips if the casualty complains of thirst.
- ✓ Do not leave the casualty unattended at any time. Monitor the casualty and record the vital signs at regular intervals.
- ✓ Perform the Primary Survey and commence CPR and use the AED if the casualty is not breathing.
- ✓ If the casualty is breathing normally on his/her own, place in the recovery position to keep the airway clear. However, do not turn or move the casualty if neck or spinal injury is suspected.

4.2 – Bleeding

TYPES OF BLEEDING

There are three types of bleeding: arterial bleeding; venous bleeding and capillary bleeding (see figure 38).

Recognition

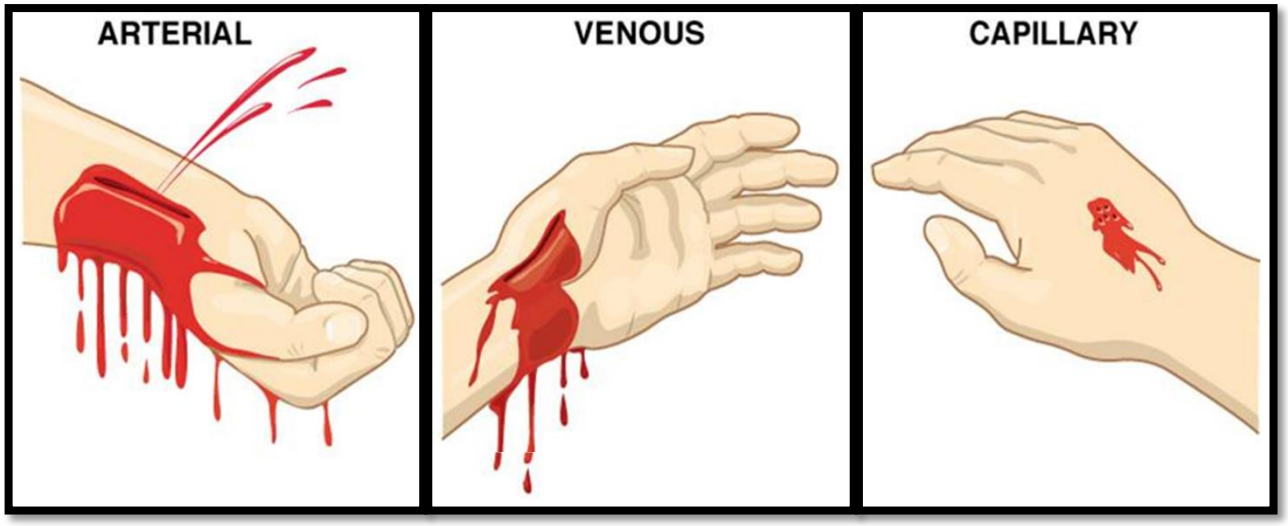


Fig. 38 – Types of external bleeding

Arterial Bleeding

Arterial blood is bright red in colour and spurts from wounds in time with each heartbeat. Bleeding from a big artery can quickly lead to shock.

Venous Bleeding

Venous blood is dark red. If flows steadily rather than spurts from a wound. Bleeding from a large vein can quickly lead to shock.

Capillary Bleeding

If capillaries are cut, blood will ooze from the wound.

Internal bleeding

- Bleeding in the lungs may result in blood streaked sputum being coughed out.
- Bleeding in the stomach or intestines may result in coffee ground vomitus, passing of black, tarry stools or even fresh blood.

- Bleeding in the urinary tract may result in passing of urine which is smoky in appearance.
- Pain, tenderness and rigidity of abdominal muscles.
- Signs and symptoms of shock may be present if bleeding is severe.

Actions to Take

External Bleeding

- ✓ Apply direct pressure to the wound using a gloved hand and place a clean dressing over the wound as soon as possible (see figure 39).
- ✓ Direct Pressure can help control minor to moderate bleeding.
- ✓ Apply a bulky pad extending beyond the edges of the wound, and bandage firmly. If bleeding continues, leave the dressing in place and bandage another one on top (see figure 40).
- ✓ Do not disturb the pads or bandages once bleeding is controlled.

Fig. 39 – Apply direct pressure over to wound with a clean dressing

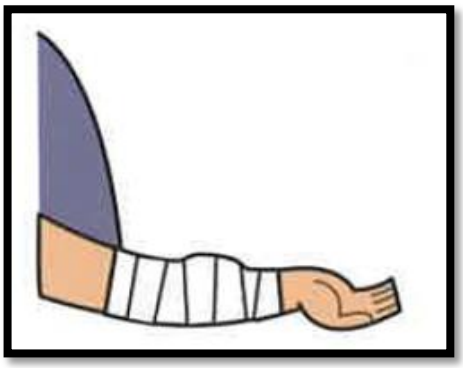


Fig. 40 – Apply bulky pad over and beyond the wound

Internal Bleeding

- ✓ Call 995 for SCDF.
- ✓ Perform the Primary Survey.
- ✓ Lay the casualty down and raise the casualty's legs above the level of the heart, unless there is a fracture of the lower limb, pelvis, head or spinal injury.
- ✓ Loosen tight clothing.
- ✓ DO NOT leave the casualty unattended at any time. Monitor the casualty and record the vital signs at regular intervals.
- ✓ Commence chest compressions and use the AED if the casualty is not breathing.
- ✓ Give nothing by mouth and reassure the casualty.

4.3 – Wounds

A wound is an injury to body tissues which can be closed or open.

- An open wound is a break in the skin
- A closed wound is a wound where the skin is intact. Blood escapes into the surrounding tissues.

Types of Wounds

- Contusion
- Abrasion
- Incision
- Laceration
- Avulsion
- Amputation
- Bites and Stings

Recognition

Contusion

- Most commonly caused by a fall or bump
- Skin is not broken but appears swollen and discoloured
- Pain and tenderness upon touch

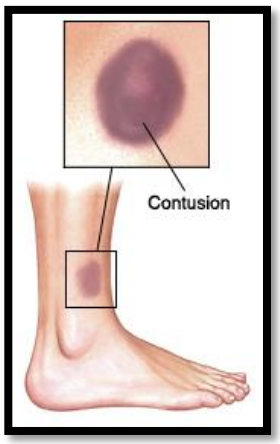


Fig. 41 – Contusion

Abrasion

- Most commonly caused by a sliding fall or a friction burn
- The top layers of the skin are scraped off, leaving a raw tender area.
- Abrasions often contain embedded foreign particles that may cause infection

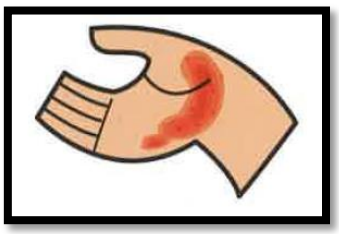


Fig. 42 – Abrasion wound

Incision

- A cut by a sharp edge, such as a blade or broken glass
- There may be profuse bleeding because the blood vessels have been cut
- Tendons and other structures may have also been cut

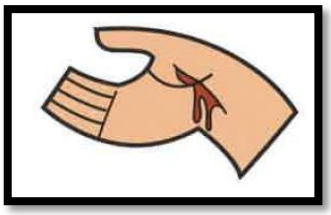


Fig. 43 – Incision wound

Laceration

- A rough tear caused by a crushing or ripping force such as from machinery, barbed wire and animal claws
- Wound edges are irregular (jagged)
- Bleeding may be less profuse than from clean-cut wounds, but there is more bruising and tissue damage
- The risk of infection is high as contamination from germs often occur

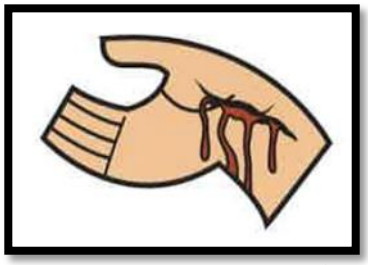


Fig. 44 – Laceration wound

Avulsion

- Torn tissues from the body are left hanging as a flap
- It may involve ears, fingers, hands or a muscle tissue

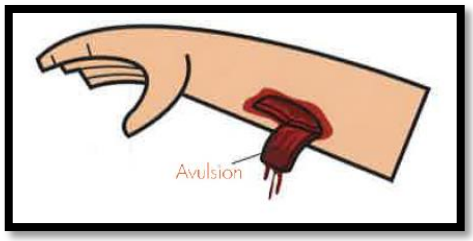


Fig. 45 – Avulsion wound

Penetrating Object

- A deep wound caused by a nail, needle or a sharp pointed object.
- Object may be left embedded in the wound.

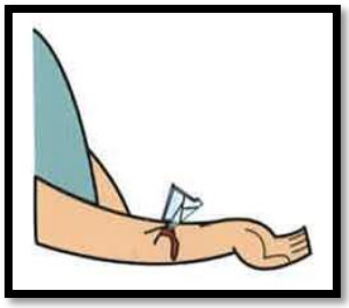


Fig. 46 – Puncture wound

Amputation

- A body part has been completely cut or torn off
- Examples are fingers, toes, hands, feet, arms or legs

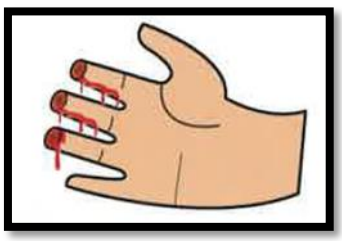


Fig. 47 – Amputation

Bites and Stings

- Bite/puncture marks or stinger left behind on the skin
- Swelling and discolouration on the affected area
- Pain and tenderness at the affected area, may spread to other parts
- Allergic reaction may affect the casualty's breathing

Actions to Take

Contusion

- ✓ Apply cold pack to the wound.
- ✓ Casualty should seek medical help if:
  - Sharp pain or numbness is experienced
  - Swelling does not subside

Abrasion

- ✓ Cleanse the wound thoroughly with normal saline.
- ✓ You may also wash the wound under a running tap.
- ✓ Gently apply a clean non-stick dressing.

Incision and Laceration

- ✓ Control the bleeding by applying direct pressure.
- ✓ Apply a sterile dressing.
- ✓ Casualty should seek medical help if:
  - Bleeding does not stop
  - The wound was caused by dirty/rusty objects
  - The wound is deep/wide as stitching may be required

Avulsion

- ✓ Call 995 for SCDF.
- ✓ Cover the wound with sterile or clean material.
- ✓ Apply direct pressure and bandage firmly.
- ✓ Raise and rest the affected part. Take any detached tissue to the hospital.

Penetrating Object

- ✓ Call 995 for SCDF.
- ✓ Control bleeding by applying direct pressure with clean dressing around the bleeding edges of the wound.
- ✓ Keep the wound as clean as possible.
- ✓ **DO NOT** remove embedded object in the wound. Stabilise the embedded object if its movement cause more pain or bleeding (see figure 48).
- ✓ Apply paddings that would stabilise the protruding object while controlling the bleeding around the edges.
- ✓ Bandage over the pads around or over the embedded object without pushing the object deeper (see figure 49).
- ✓ Rest the injured part in a comfortable position.

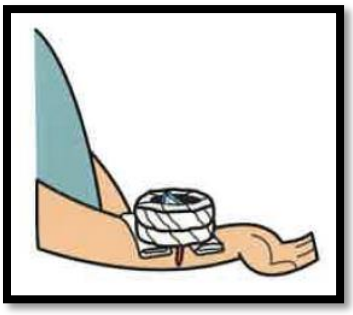


Fig. 48 – Stabilise the embedded object

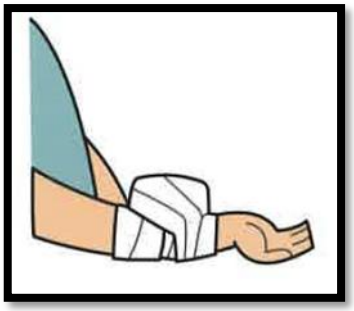


Fig. 49 – Bandage around or over the object

Amputation

- ✓ Call 995 for SCDF.
- ✓ Control bleeding with direct pressure.
- ✓ Apply a tourniquet (see figure 68 on page 73) – Record the time of the application and inform the SCDF officer taking over the casualty.
- ✓ Treat the casualty for shock.
- ✓ Find the amputated part and preserve it as (see figure 50):
  - Step A - Wrap the amputated part in dry clean gauze or cloth
  - Step B - Place it in a small plastic bag
  - Step C - Place the plastic bag in a container of ice

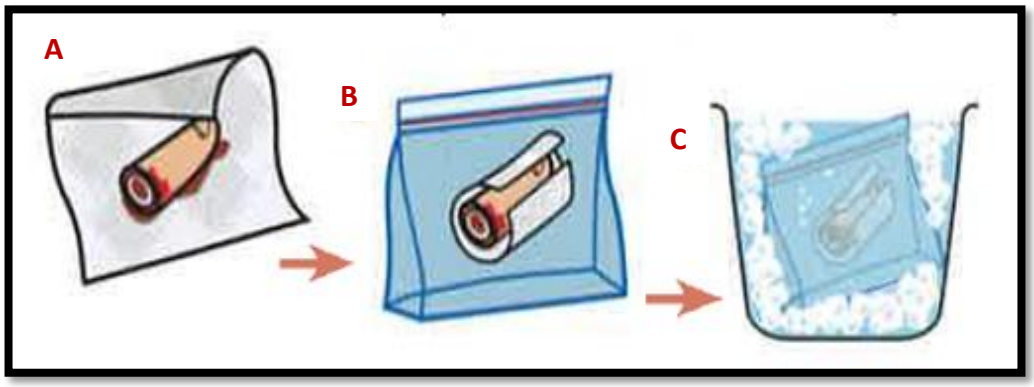


Fig. 50 – How to preserve the amputated part

- ✓ The amputated part must travel with the casualty when the ambulance arrives.

Bites and Stings

Bee Sting:

- ✓ If the bee's stinger is in the wound, remove it with a pair of tweezers or with the edge of a card.
- ✓ Apply a cold compress to relieve pain.
- ✓ Advise the casualty to see a doctor if the pain and swelling persist.
- ✓ For a sting in the mouth, give the casualty some ice to suck on or cold water to sip and get medical attention.
- ✓ Monitor for allergic reaction.

Scorpion Sting:

- ✓ Apply a cold compress to relieve pain.
- ✓ Immobilize the injured area.
- ✓ Call 995 for SCDF.
- ✓ Monitor for allergic reaction.

Snake Bite:

- ✓ Calm the casualty.
- ✓ **DO NOT** suck the bite wound or apply tourniquet for snake bites.
- ✓ Immobilize the bitten area and keep it lower than the heart position.
- ✓ Cover the wound with a sterile dressing.
- ✓ Apply a pressure bandage at the site of the bite wound and apply another pressure bandage further up the limb (from the bite wound) to slow the spread of the venom.
- ✓ Call 995 for SCDF, tell them it is a snake bite and, if possible, give them a detailed description of the snake.

Jellyfish Sting:

- ✓ Call 995 for SCDF.
- ✓ Sit the casualty down. Pour large amounts of vinegar or sea water to stop the stinging cells from releasing venom for at least 30 seconds.
- ✓ Immersion of the wounded part into warm water (about 40 Degrees Celsius) may help to relieve the pain. Cold compress (a less effective alternative) may be used if warm pack or water is not available.
- ✓ Monitor the casualty for difficulty in breathing.

Animal Bite:

- ✓ Call 995 for SCDF.
- ✓ Wash the wound with running water, if bleeding is mild.
- ✓ Control bleeding by applying direct pressure and cover wound with sterile dressing or a clean pad and bandage.
- ✓ Treat for signs of shock if condition worsens.

4.4 – Bandaging

Dressings

Dressings are used to control bleeding, absorb any fluids from the wound and prevent infection of the wound.

Common dressings: Individually wrapped sterile adhesive dressing (also known as plasters) and absorbent gauze.

Fig. 51 – Individually wrapped sterile adhesive dressing (plaster)

Individually wrapped sterile adhesive dressing (plaster):

- These are adhesive strips plasters of various shapes and sizes used to cover small wounds.
- Ensure skin is dry before applying the plaster.

Absorbent Gauze:

- Absorbent gauze are non-adhesive layers of weaved cotton which may be available in sterilised and non-sterilised versions.
- They can be used to stop bleeding when pressure is applied, allowing blood to clot on a bleeding wound or used as a light dressing to cover over a burn to prevent infection.
- Bandages or adhesive tape are used to secure the dressings in place.

Fig. 52 – Absorbent gauze

Bandages

Bandages found in the First Aid kit are used to maintain direct pressure to control bleeding, to keep dressings in place, to prevent undesirable movement of an injured limb, to support an injured limb or joint and to limit swelling.

There are two types of bandages: Crepe and Triangular

Crepe Bandages:

- They are made of cotton, gauze or linen materials.
- Available in varying lengths and width to suit different parts of the body.
- Elastic crepe bandages are preferred as they conform to the body part's contours and can provide even pressure over the injury.

Fig. 53 – Crepe bandage

Triangular Bandages:

- Triangular Bandages are usually used as arm slings or to immobilise limbs.
- They may also be used as paddings between splints and the limb to provide more comfort.
- It can also be used as additional paddings to increase pressure to control severe bleeding.
- Triangular bandage can be improvised as a tourniquet when needed.

Fig. 54 – Triangular bandage

Important Notes:

Pain, tingling and numbness are indications of a bandage that is too tight. If any of these symptoms appear, remove the bandage immediately and re-apply the bandage to the area less tightly. If bleeding is already controlled, the bandage need not be so tight since its main purpose is to hold the dressing in place.

Different Folds of a Triangular Bandage

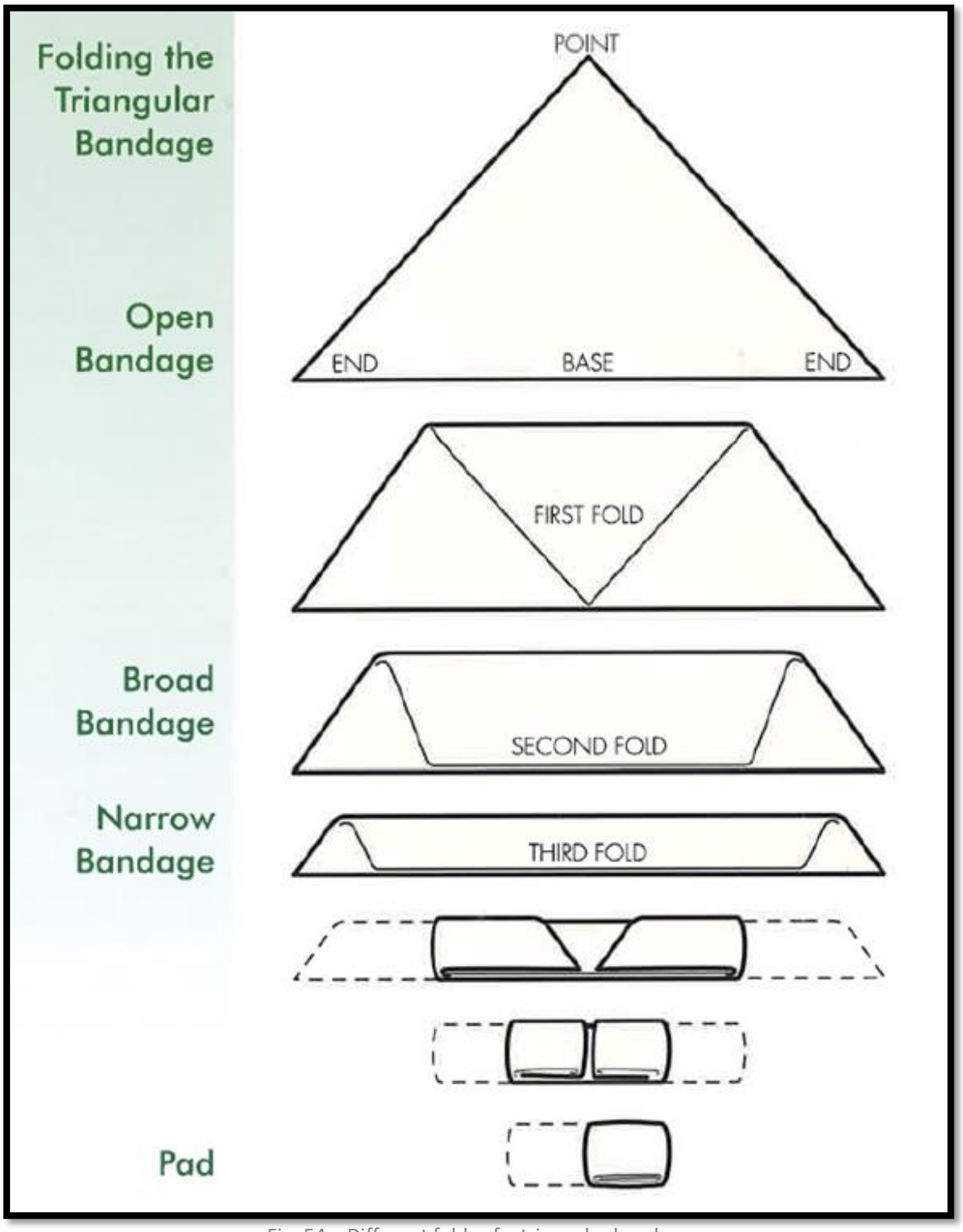


Fig. 54 – Different folds of a triangular bandage

Tying a Reef Knot

A Reef Knot (see figure 55), or also known as a Square Knot, is widely practiced in First Aid training courses as a simple way to secure the ends of bandages while ensuring a comfortable flat knot when resting on the body.

An additional advantage of this knot is the ability to be quickly undone, allowing adjustments to be made.

However, it should be noted that a Reef Knot is not the only knot that must be used. In an emergency, the ability to apply a secure knot to provide suitable support for the various slings and immobilisation should be the focus.

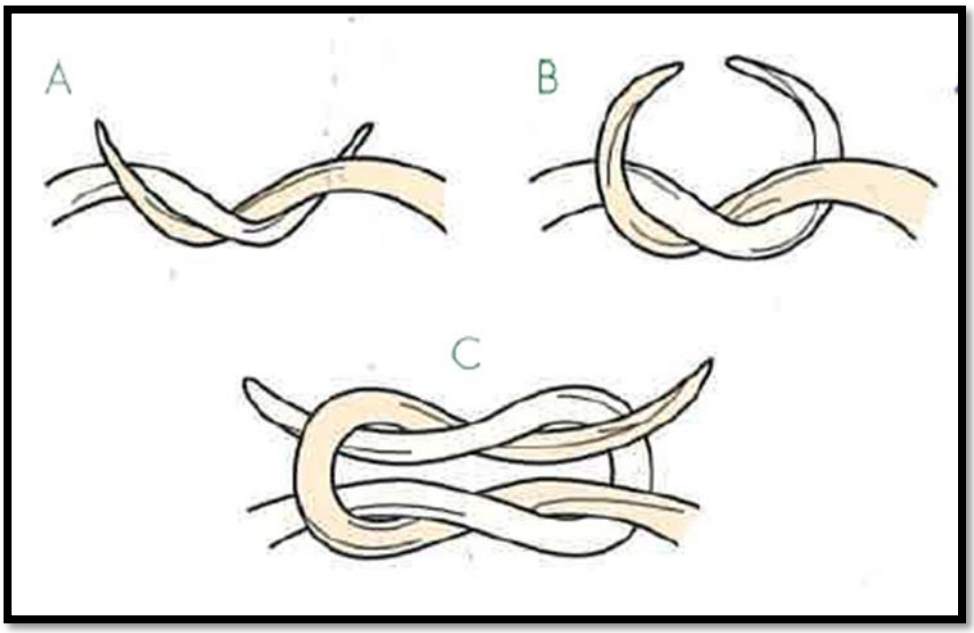


Fig. 55 – Steps in tying a Reef Knot

Making a Ring Pad

A ring pad (see figure 56) is an ideal padding when immobilising embedded/impaled object. Sizing of the embedded/impaled object must be done before creation of the ring pad.

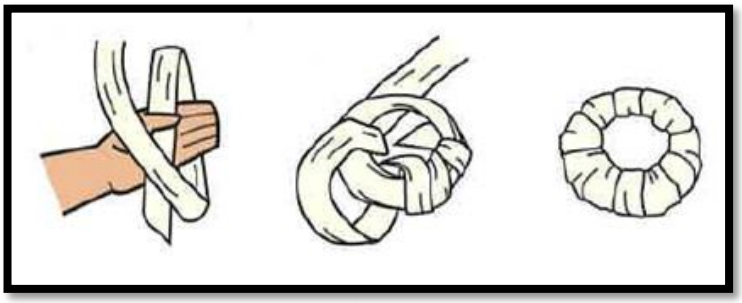


Fig. 56 – Making a Ring Pad

Despite the advantages of the ring pad, the first aider will need to consider the time required to create a ring pad for the embedded object. Alternatively, improvisation can come in the form of pads from folded triangular bandages or folded gauze.

Applying a Crepe Bandage

Application of a crepe bandage is a relatively simple process (see figure 57). This is usually done to secure dressings in place and should be done in a manner that does not restrict blood flow. It is ideal to ensure bleeding has been controlled with direct pressure before application of the crepe bandage.

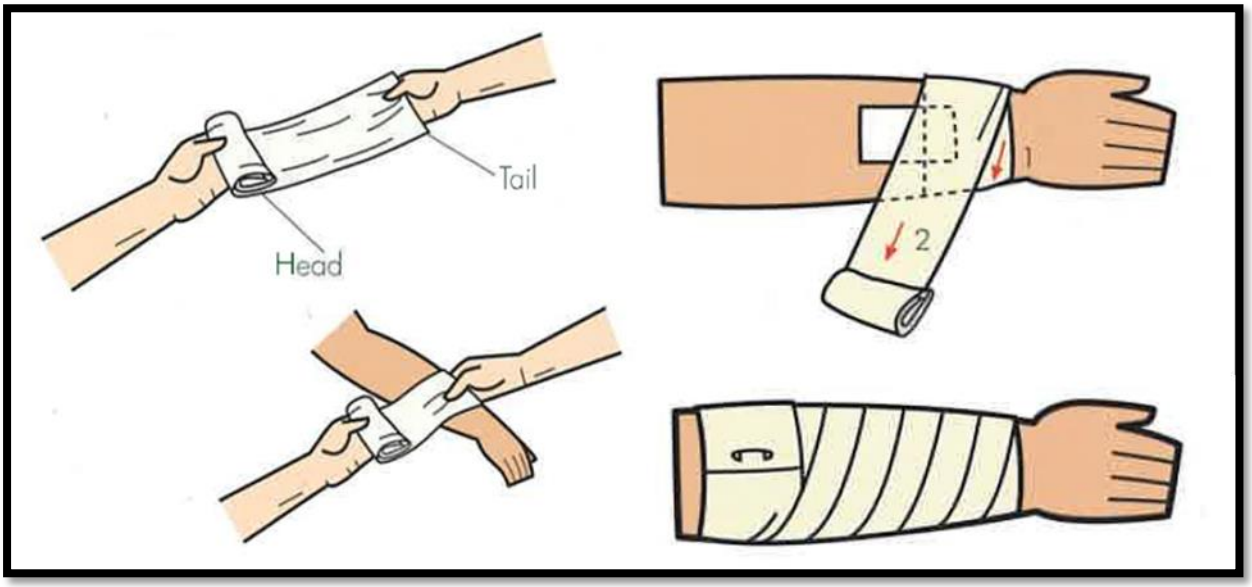


Fig. 57 – Applying a Crepe Bandage

The above method can be used on straight limbs such as arms and legs. However, if a crepe bandage is required at the joints such as the elbow, palm/wrist, knee or ankle/foot, it can be applied as shown below (see figure 58).

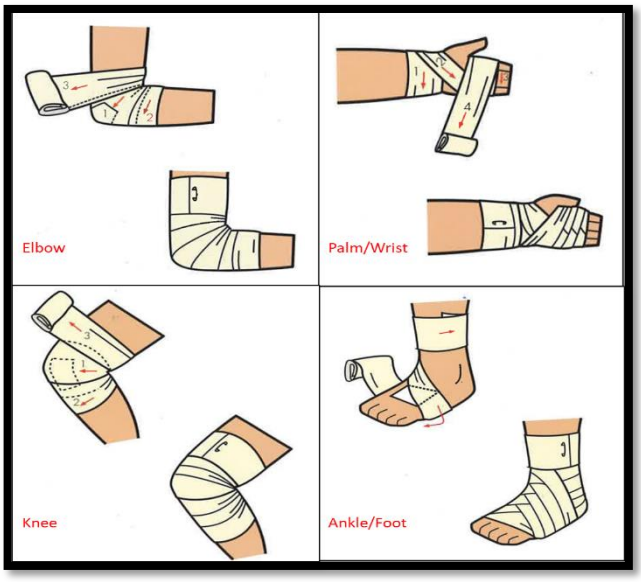


Fig. 58 – Applying a Crepe Bandage at other parts

Applying a Large Arm Sling

A large arm sling (see figure 59) is supposed to provide comfort, immobilisation or support to an injured arm. Do note that the palm should not be dangling out of the sling and should not be lower than the elbow level. Common uses for a large arm sling may include:

- ✓ Fracture of lower or upper arm

Fig. 59 – Applying a Large Arm Sling

Applying an Elevation Sling

Due to the angulation of this sling, it would be useful when some form of elevation is required at the lower arm, wrist or palm to reduce swelling or to control blood flow to those areas. Common uses include:

- ✓ Fracture or dislocation of the shoulder or collarbone
- ✓ Bleeding wounds to the lower arm, wrist or palm
- ✓ Fracture of the ribs

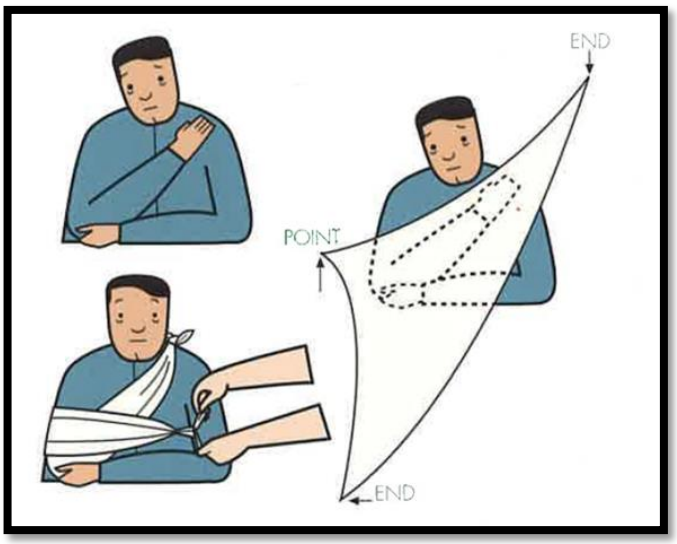


Fig. 60 – Applying an Elevation Sling

Bandaging the Scalp

Bleeding from a scalp wound can be profuse and may appear to be more serious than it is.

- ✓ Control bleeding by applying direct pressure (see figure 61).
- ✓ Apply pressure around edges of the wound with a ring pad (see figure 56 on page 66) if a skull fracture is suspected.
- ✓ Secure the dressing with a triangular bandage (see figure 62). Tie the knot at the forehead, just above the eyebrows (see figure 63).
- ✓ Lay the casualty down with the head and shoulders raised to control bleeding.
- ✓ Monitor and record the vital signs every 5 minutes.
- ✓ **DO NOT** leave the casualty unattended.

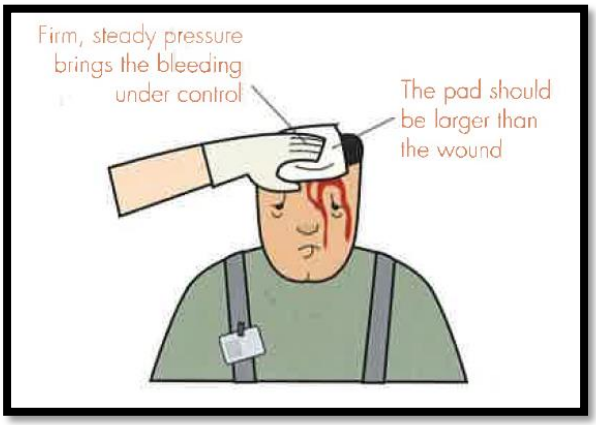


Fig. 61 – Control bleeding with direct pressure

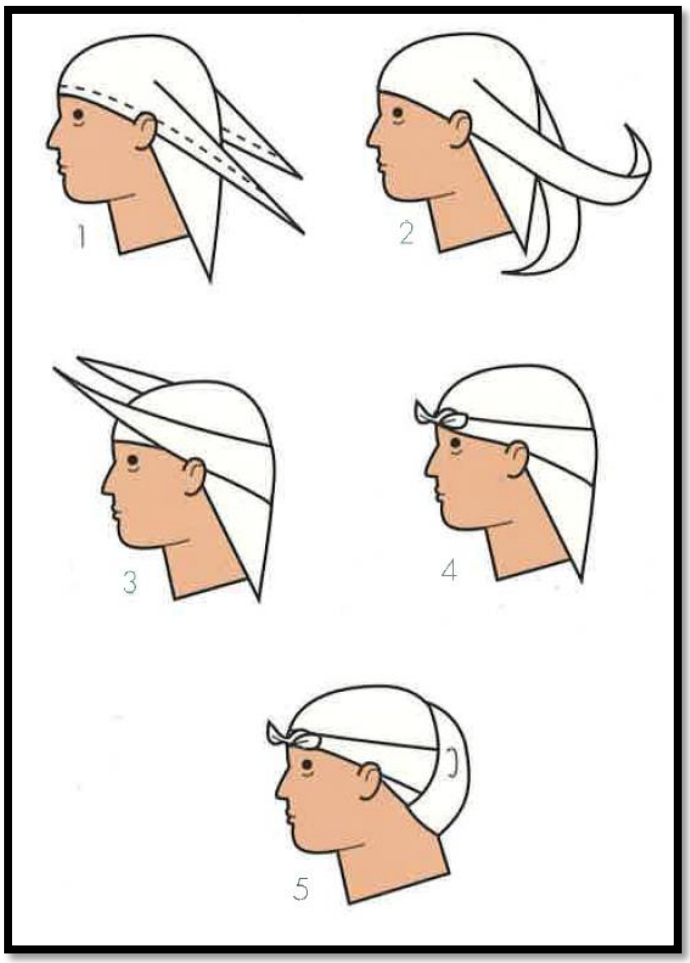


Fig. 62 – Applying a Scalp Bandage

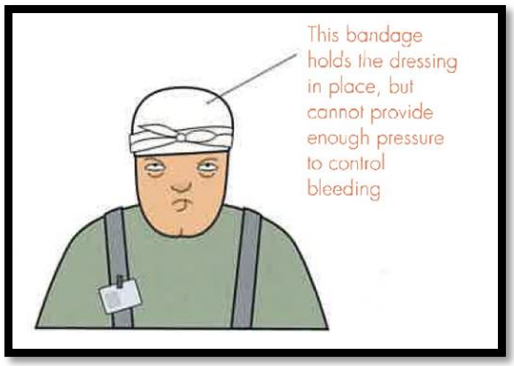


Fig. 63 – The Scalp Bandage

Applying an Eye Bandage

- ✓ Apply an eye pad over the cut eyelid to control the bleeding.
- ✓ Apply an eye shield if small foreign bodies are present in the eye.
- ✓ **DO NOT** remove any impaled object from the eye. Stabilise the object using ring pads.
- ✓ Apply the eye bandage as shown (see figure 64).

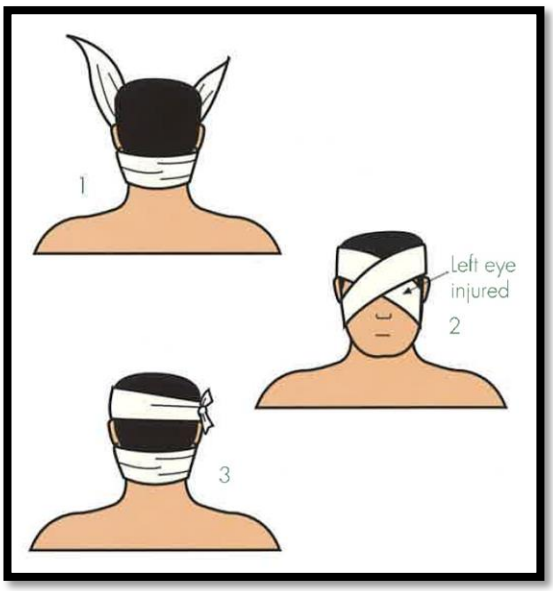


Fig. 64 – Applying an Eye Bandage

Applying a Hand Bandage

For minor cuts, burns or abrasions to the hand, a hand bandage (see figure 65) can be applied over the initial dressing using an open triangular bandage.

Alternatively, a crepe bandage may be applied over the initial dressing.

It can be supported with an elevation sling (see figure 60 on page 69).

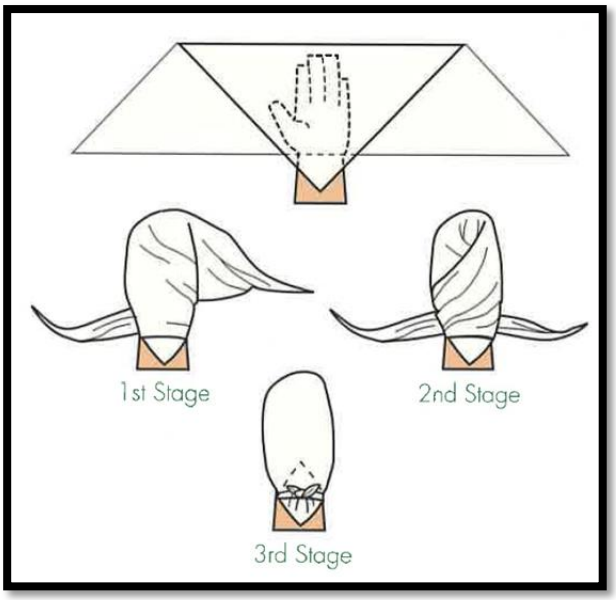


Fig. 65 – Applying a Hand Bandage using Triangular Bandage

Applying an Elbow, Knee or Foot Bandage

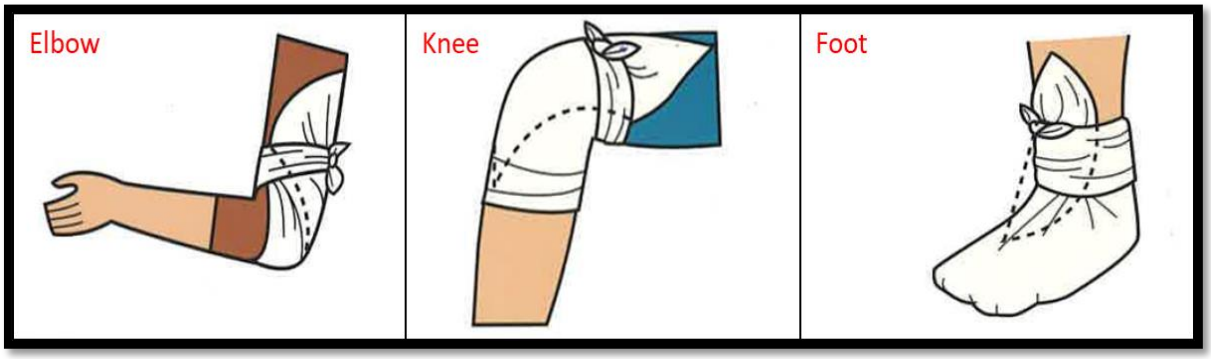


Fig. 66 – Applying Elbow, Knee and Foot Bandage

The above bandages (see figure 66) can be applied to the respective parts of the body to secure dressing for minor cuts, burns or abrasions.

Applying a Torso Bandage

This method can be used when a bandage is required to be covered over the wound (see figure 67).

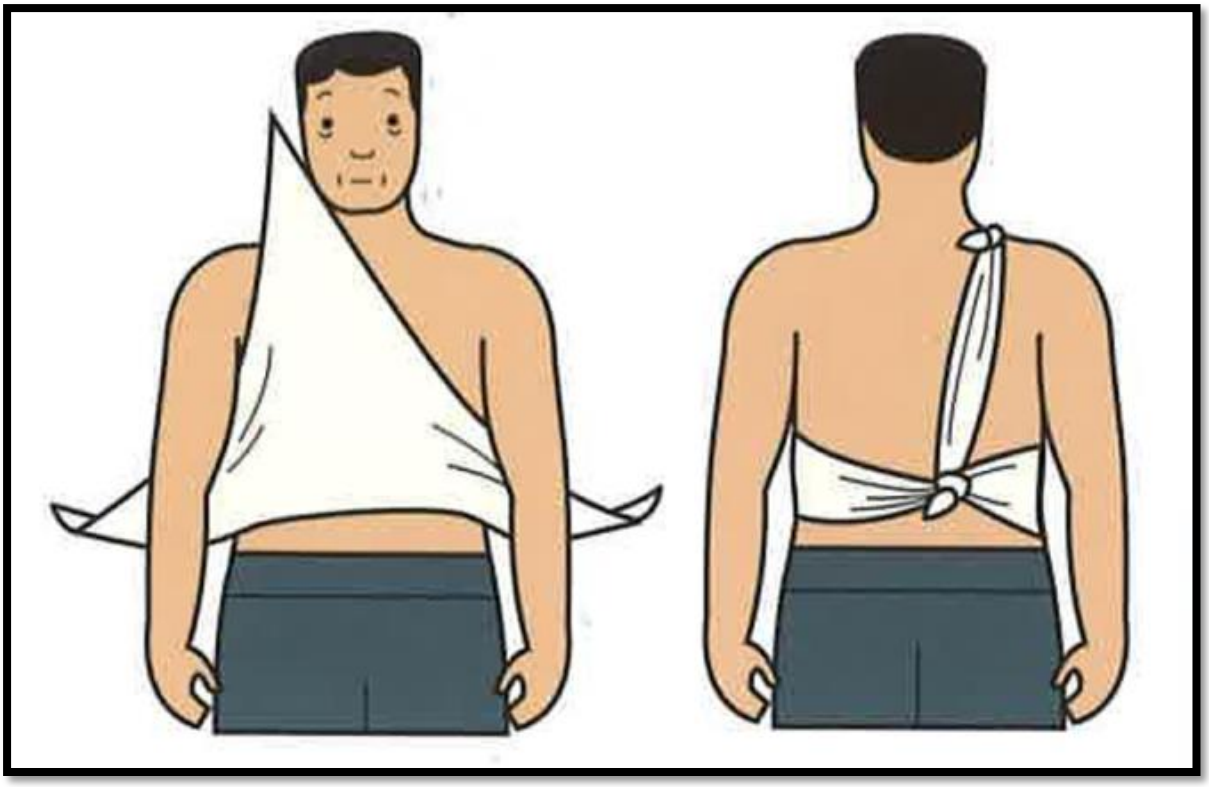


Fig. 67 – Applying a Torso Bandage

Applying a Tourniquet

Tourniquets are an effective means of arresting life-threatening external haemorrhage from limb injury. It is recommended to use tourniquets for the following situations:

- ✓ Severe external limb bleeding that could not be controlled by direct pressure
- ✓ Multiple casualties with extremity haemorrhage and lack of resources to maintain simple methods of haemorrhage control
- ✓ Extreme life-threatening limb haemorrhage, or limb amputation/mangled limb with multiple bleeding points

Important notes when applying a tourniquet:

- ✓ The version of tourniquet below is an improvised type (see figure 68).
- ✓ Direct pressure must still be applied on the wound when applying a tourniquet (see step 1 of figure 68).
- ✓ Use a broad-fold triangular bandage from the First Aid kit. Other suitable materials such as a belt, scarf or strips of clothes may also be used.
- ✓ When applying the tourniquet, place it about 5cm from the bleeding site (see step 2 of figure 68) and rotate the stick (see step 3 of figure 68) until the bleeding it completely stopped.
- ✓ **DO NOT** apply over a joint as it will be ineffective.
- ✓ Secure the stick such that it does not undo the tightening effect (see step 4 of figure 68).
- ✓ Once applied, the tourniquet can be left in place for up to 2 hours.
- ✓ Record the time of the application and inform the SCDF officer taking over the casualty.
- ✓ If the First Aid kit within your premise is equipped with more specialized tourniquets, do be familiar with its application.

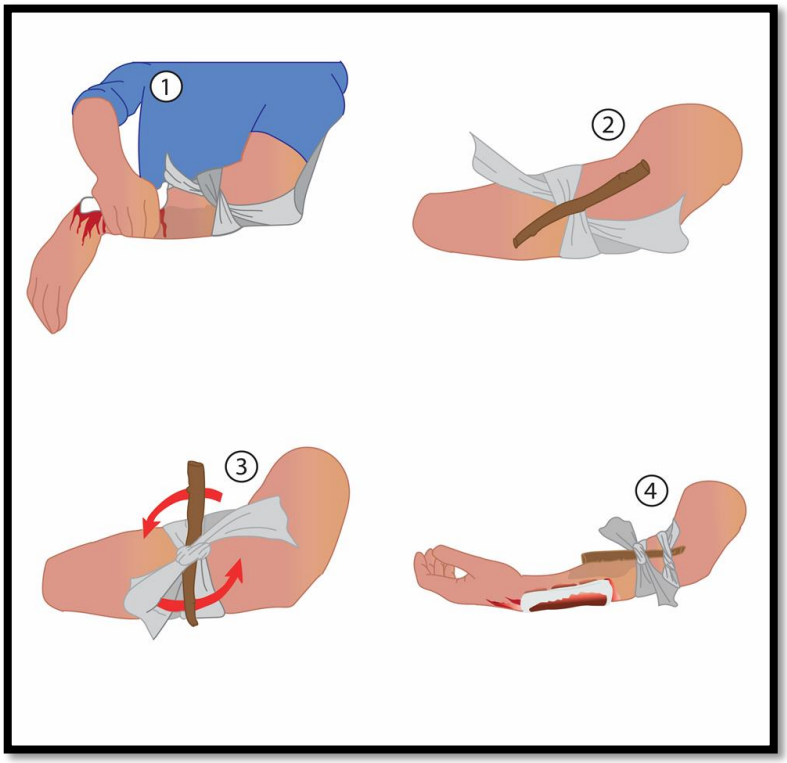


Fig. 68 – Applying a Tourniquet

Chapter 5

Musculoskeletal Injuries

1) **Fracture and Dislocation**
2) **Soft Tissue Injuries**
3) **Immobilisation/Bandaging**

The Musculoskeletal System

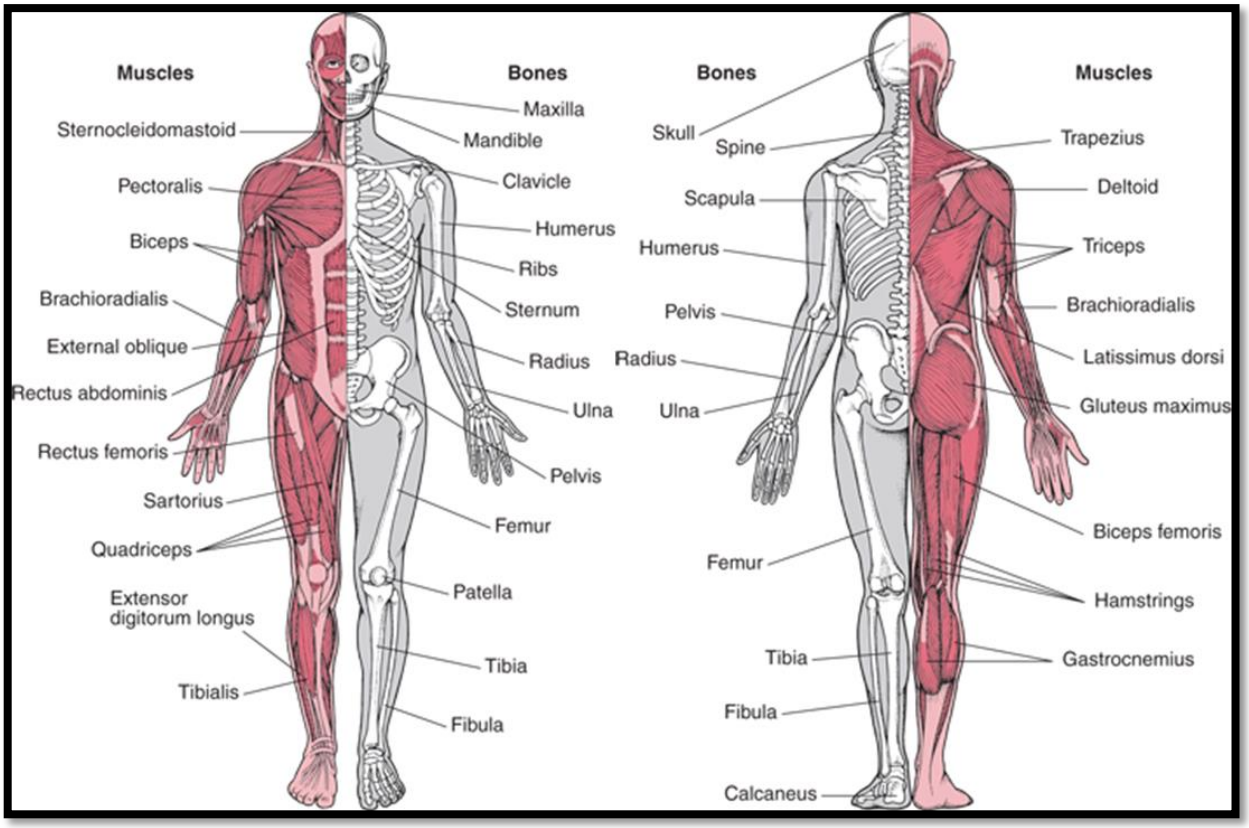


Fig. 69 – The Musculoskeletal System

The musculoskeletal system (see figure 69) provides structure, support, stability, and movement to the body. It comprises of the bones of the skeleton, muscles, tendons, cartilage, ligaments, joints, and other connective tissue that supports and binds tissues and organs together.

Infants are born with about 300 bones, almost a third of which eventually fuse to form the adult skeleton with 206 bones.

- The skull, spine and ribcage protect the vital body organs
- The pelvis supports the abdominal organs
- The bones and joints of the arms and legs enable the body to move

5.1 – Fracture and Dislocation

Fractures are breaks or disruptions in bone tissue. These can be complete or partial breaks in the bone.

Dislocation is the displacement of a bone at a joint, caused by a strong force wrenching the bone out of its joint, or by a violent muscle contraction. There may be associated tearing of the ligaments. The joints most commonly dislocated are the shoulder, fingers and jaw.

In many cases, it can be difficult to distinguish a dislocation from a closed fracture. If in any doubt, treat the injury as a fracture. A severe dislocation of any joint may also fracture the bones involved.

Types of Fracture

- Closed fracture – a bone is broken but the skin is intact. Bruising and swelling often occur around the fracture side.
- Open fracture – a wound accompanies the fracture and the overlying skin is broken. The bone may be exposed through the wound.
- Complicated fracture – a fracture is complicated by injury to adjoining muscles, blood vessels, nerves and organs. E.g. a fractured rib damaging the lung causing bleeding.

Causes

Direct force – a bone may break at a point where a heavy blow is received (see figure 70). For example, the forearm bone may be broken by the impact of a piece of wood falling on it.

Indirect force – a force my travel from the point of impact through the body to break bones elsewhere (see figure 70). A common example is falling on an outstretched hand which in an adult, results in a fracture of the collar bone; a fracture of the wrist in the elderly; and an elbow fracture in a child.

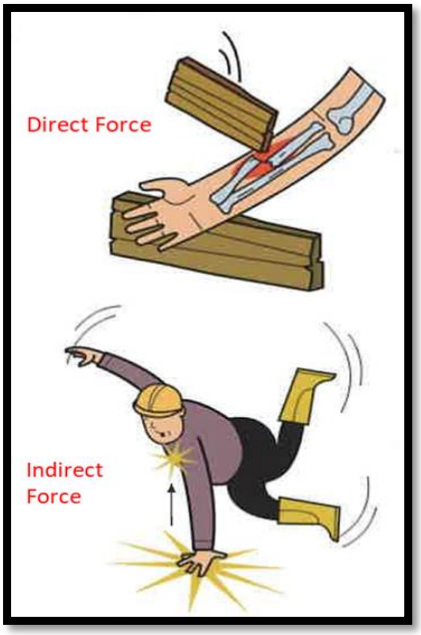


Fig. 70 – Direct and Indirect Forces

Recognition

Fracture

- Deformity or shortening of the affected limb
- Open injuries or internal bleeding, (manifested as shock if severe)
- Pain and tenderness at the injury site
- Swelling and bruising – from internal bleeding
- Loss of function of the limb

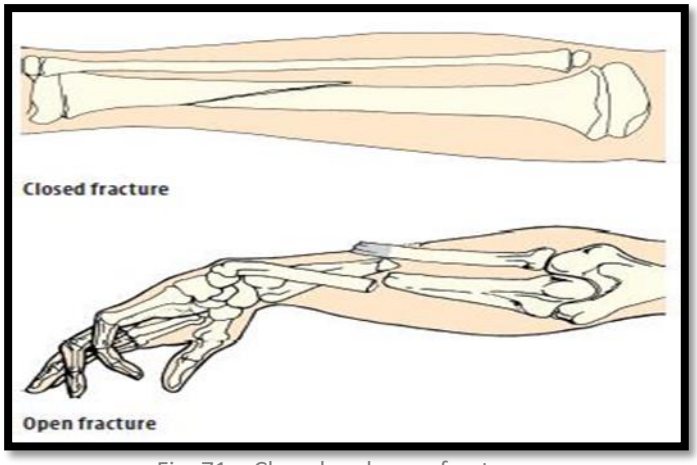


Fig. 71 – Closed and open fractures

Dislocation

- Intense pain
- Joint instability
- Deformity of the joint area
- Reduced muscle strength
- Bruising or redness of joint area
- Difficulty moving joint
- Stiffness

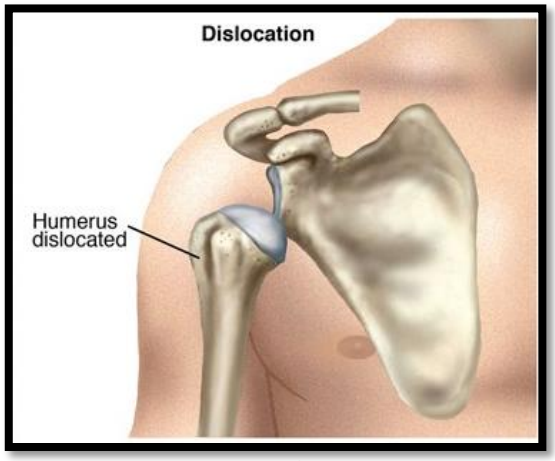


Fig. 72 – Dislocation

Actions to Take

Open Fracture:

- ✓ Cover the wound with a clean pad and apply pressure around it to control bleeding with a bandage.
- ✓ Move the uninjured part of the body and secure to the injured part of the body.
- ✓ Call 995 for SCDF.
- ✓ Check the circulation beyond the bandaging every 10 minutes.

- ✓ **DO NOT** press down directly on a protruding bone. Use ring pads around the protruding bone to hold it in place.
- ✓ **DO NOT** move the casualty until the injured part is secured and supported.
- ✓ **DO NOT** let the casualty eat or drink anything.

Closed Fracture:

- ✓ Lay the casualty down and minimize movement.
- ✓ Support the injured part until it is immobilized.
- ✓ Move the uninjured part of the body and secure to the injured part of the body.
- ✓ Call 995 for SCDF.
- ✓ Check the circulation beyond the bandaging every 10 minutes.
- ✓ **DO NOT** let the casualty eat or drink anything.
- ✓ **DO NOT** move the casualty until the injured part is secured and supported.

Dislocation:

- ✓ Support the injured part until it is immobilized.
- ✓ Secure the injured part to an uninjured part of the body.
- ✓ Call 995 for SCDF.
- ✓ Elevate the injured limb if possible.
- ✓ Check the circulation beyond the bandaging every 10 minutes
- ✓ **DO NOT** let the casualty eat or drink anything.
- ✓ **DO NOT** move the casualty until the injured part is secured and supported.
- ✓ **DO NOT** force the dislocated joint back into its "original" position.

Use of Splints

A splint is a device used for support or immobilization of a limb or the spine and can be made from many different materials. Splinting of the injured part should be applied in the position it was found without straightening or causing more pain/discomfort.

Fig. 73 – SAM splint

Some examples of splints are:

- Improvised splint: folded newspaper, magazines, cardboard, or wooden sticks
- Commercial splint: SAM splint (mouldable splint) (see figure 73 on page 78), air splint
- Body splint: the injured part is tied to an uninjured body part (e.g. an injured finger to an adjacent finger; an injured arm tied to the chest).

Important Notes:

- ✓ Find a splint of suitable material and length.
- ✓ Pad the splint if needed.
- ✓ Pad the natural spaces between the splint and limb.
- ✓ Secure the splint at the joints above and below the fractured site for the limb fracture.
- ✓ Secure the splint above and below the fractured joint for a joint fracture.

Specific Bone Injuries

Skull Fracture

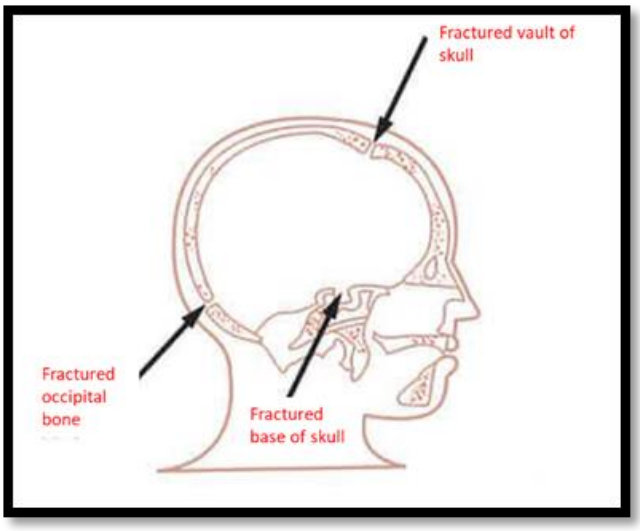


Fig. 74 – Skull Fracture

A skull fracture is any break in the cranial bone, also known as the skull (see chapter 2). There are many types of skull fractures, but only one major cause: an impact or a blow to the head that's strong enough to break the bone. An injury to the brain can also accompany the fracture, but that may not always be the case.

Recognition

- A wound or bruise on the head.
- Progressive deterioration in the level of consciousness.
- Clear fluid (cerebro-spinal fluid) or watery blood coming out from the nose or ear.
- Bleeding into the whites of the eyes.

Actions to Take

- ✓ Call 995 for SCDF.
- ✓ Immobilise the head & neck.
- ✓ Perform CPR if casualty is not breathing.
- ✓ Casualty may not be fully conscious, do not feed the casualty anything.
- ✓ If there is discharge (blood or fluid) from the ear or nose, position the casualty such that the affected ear or nose is lower than the unaffected one.
- ✓ Monitor and record vital signs and level of consciousness regularly.
- ✓ Stay with the casualty.

Jaw Fracture/Dislocation

A broken jaw is a break (fracture) in the jaw bone. A dislocated jaw means the lower part of the jaw has moved out of its normal position at one or both joints where the jaw bone connects to the skull (temporomandibular joints).

Recognition

- Pain when moving the jaw and swallowing
- Distortion of the teeth and dribbling
- Swelling, tenderness and bruising
- A wound or bruising within the mouth

Actions to Take

- ✓ Call 995 for SCDF.
- ✓ Sit the casualty up with his/her head well forward, to allow any fluid to drain away.
- ✓ Ask the casualty to hold a soft pad firmly in place to support the jaw.

Collar Bone Fracture

The collar bone (clavicle) forms a strut between the breastbone and the shoulder blade, giving support to the arm. It is usually broken by indirect force, transmitted from a fall onto the outstretched hand.

Recognition

- ➢ The casualty supports the arm and inclines the head to the injured side
- ➢ Inability to raise the arm
- ➢ Sharp pain and deformity at the injury site
- ➢ Casualty's head may be tilted towards the injured side to minimise movement

Fig. 75 – Collar Bone Fracture

Action to Take

- ✓ Call 995 for SCDF.
- ✓ Ask the casualty to sit down and gently place the affected arm across the chest at a comfortable angle.
- ✓ Apply an elevation sling to the affected arm (see figure 60 on page 69).
- ✓ Insert soft padding between the arm and the chest on the affected side if needed.
- ✓ A broad bandage can be applied across the arm and chest to stabilise the injury (see figure 84 on page 93).

Shoulder Dislocation

A fall onto the shoulder or a wrenching force may cause the head of the arm bone (humerus) to come out of the shoulder joint socket. This form of dislocation caused acute pain and any movement of the shoulder would be intolerable.

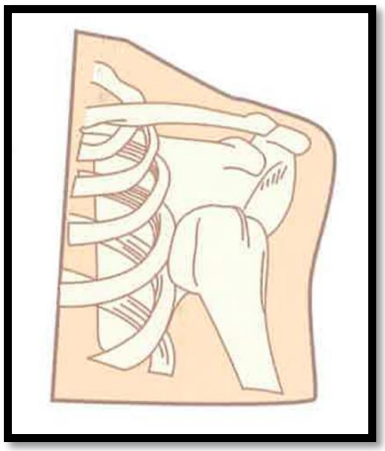


Fig. 76 – Shoulder Dislocation

Recognition

- Pain, swelling and loss of rounded contour of the shoulder
- The casualty supports the arm and inclines the head to the injured side
- Inability to raise the arm

Actions to take

- ✓ Call 995 for SCDF.
- ✓ **DO NOT** attempt to replace the bone into its socket.
- ✓ **DO NOT** allow the casualty to eat or drink.
- ✓ Ask the casualty to sit down and gently place the affected arm across the chest at a comfortable angle.
- ✓ Apply an elevation sling or large arm sling to the affected arm (see figure 60 on page 69 and figure 59 on page 68 respectively).
- ✓ Insert soft padding between the arm and the chest on the affected side.
- ✓ A broad bandage can be applied across the arm and chest to stabilise the injury (see figure 85 and 86 on page 94).

Rib Fracture

Rib fractures may be caused by a direct or indirect force. If the fracture is complicated by a penetrating wound or a fracture at two or more locations of the ribcage (also known as flail chest), breathing may be severely impaired.

Recognition

- Pain at the fracture site
- Pain on taking deep breaths or coughing
- Shallow breathing
- An open wound over the fracture through which you might hear air being "sucked" into the chest cavity
- Presence of shock in the casualty

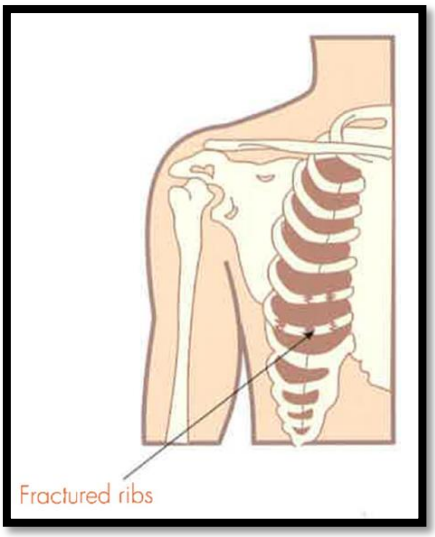


Fig. 77 – Rib Fracture

Actions to Take

For a fractured rib:

- ✓ Call 995 for SCDF.
- ✓ Reassure the casualty.
- ✓ Place soft padding between the injured side of the chest and arm.
- ✓ Support the limb on the injured side in an elevated arm sling (see figure 60 on page 69).
- ✓ Tie a broad-fold bandage across the chest (see figure 85 on page 94).

For open (puncture) chest wound or multiple rib fractures:

- ✓ Call 995 for SCDF.
- ✓ If there is puncture wound to the chest and lung, leave the entry wound open and apply direct pressure over the exit wound (if any) with sterile dressings.
- ✓ **DO NOT** seal up or cover the entry wound.
- ✓ Lay the casualty down in a half sitting position.
- ✓ Apply an elevation sling to the limb on the injured side (see figure 60 on page 69).
- ✓ Tie a broad bandage across the sling (see figure 85 on page 94).
- ✓ If the casualty is unconscious with no suspected spinal injury, place him/her in the recovery position with the injured side down. This allows the lung on the uninjured side to work at its full capacity while immobilising the injured side.

Upper Arm Fracture

The long bone of the upper arm (humerus) may be fractured across its shaft by a direct blow, but it is more common for the neck of the humerus at the shoulder to break following a fall.

Recognition

- Pain and tenderness at the fracture site
- Swelling and bruising
- Difficulty in raising the arm

Actions to Take

- ✓ Sit the casualty down. Place the injured arm across his/her chest in a position that is most comfortable. Get him/her to support the arm if possible.
- ✓ Support the injured arm in a large arm sling (see figure 60 on page 68); place soft padding between the arm and chest.
- ✓ Tie a broad-fold bandage around the chest over the sling (see figure 86 on page 94). Tie the knot on the uninjured side.
- ✓ Call 995 for SCDF.

Elbow Fracture

Fractures around the elbow are rather common, often resulting from a fall.

Recognition

- Pain and tenderness at the fracture site
- Swelling and bruising

Actions to Take

For an elbow that can be bent:

- ✓ Call 995 for SCDF.
- ✓ Treat as for a fracture of the upper arm (see page 84).

For an elbow that cannot be bent:

- ✓ Call 995 for SCDF.
- ✓ **DO NOT** attempt to forcibly bend or straighten the elbow.
- ✓ Lay the casualty down and place the injured limb on the trunk.
- ✓ Place soft padding between the injured limb and the body to ensure that bandaging will not displace the broken bones.
- ✓ Bandage the injured limb to the trunk, first at the wrist and hips, then above the elbow (see figure 87 on page 95).

Forearm and Wrist Fracture

The bones of the forearm (the radius and ulna) may be fractured across their shafts by a violent blow.

In the elderly, the bones at the wrist may be broken in a fall. This is called the Colles' fracture.

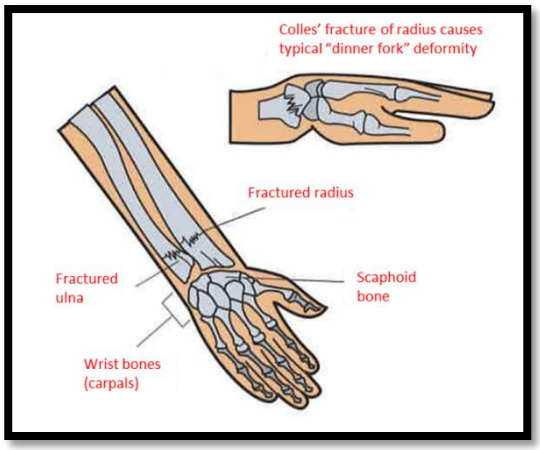


Fig. 78 – Forearm or Wrist Fracture

Recognition

- ➢ History of a fall onto an outstretched hand or history of a direct blow on the arm
- ➢ Pain, bruising and swelling
- ➢ "Dinner fork" deformity (see figure 79)

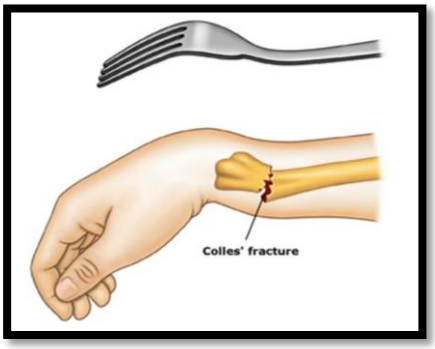


Fig. 79 – "Dinner fork" deformity

Actions to take

- ✓ Call 995 for SCDF.
- ✓ Have the casualty seated. Gently steady and support the injured forearm across his chest.
- ✓ Expose and treat any open wounds.
- ✓ Gently place soft padding around the forearm.
- ✓ Support the arm in an arm sling (see figure 59 on page 68).
- ✓ Secure the arm to the chest with a broad-fold bandage tied over the sling, close to the elbow (see figure 86 on page 94). Tie the knot of the broad bandage in front on the uninjured side.

Hand and Fingers Fracture

The hand consists of many small bones, any of which may be injured by direct or indirect force. Multiple fractures of these bones are frequently caused by crushing injuries, severe bleeding and swelling may occur.

Recognition

- ➢ Pain and tenderness at the fracture site
- ➢ Swelling and bruising
- ➢ Deformity

Actions to Take

- ✓ Call 995 for SCDF.
- ✓ Protect the injured hand by placing soft padding around the hand.
- ✓ Gently support the injured arm in an elevation sling (see figure 60 on page 69).
- ✓ Secure the arm to the chest by applying a broad-fold bandage over the sling (see figure 85 on page 94). Tie the knot in front on the uninjured side.

Thigh Fracture

A fracture of the shaft of the thigh bone may be caused by a direct blow. It may result in severe blood loss into the tissues. Shock may develop.

Recognition

- Severe pain, pallor and sweatiness
- Bruising and swelling of fracture area
- An outward turning of the knee and foot
- Shortening of the leg
- Inability to stand
- Signs of shock

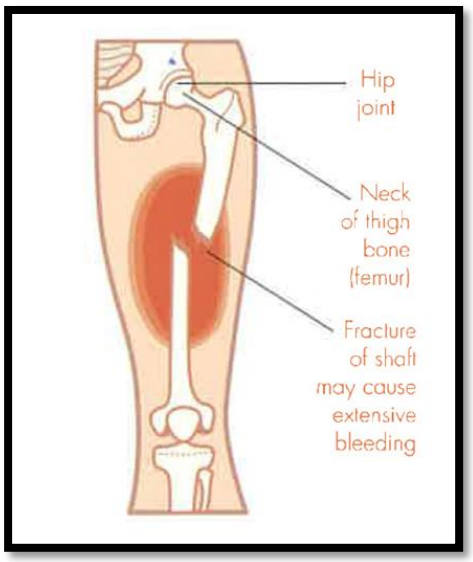


Fig. 80 – Thigh Bone Fracture

Actions to Take

- ✓ Call 995 for SCDF.
- ✓ Lay the casualty down.
- ✓ Bring the sound leg alongside the injured leg and immobilise with the injured leg.
- ✓ Slide one bandage under the knee and another under the ankle.
- ✓ Slide two more bandages under the knees, one above and one below the fracture.
- ✓ Place soft padding between the thighs, knees and ankles to cushion the bony parts.
- ✓ Tie a narrow-fold figure-of-eight around the ankles first (see figure 88 on page 95).
- ✓ Tie a broad-fold bandage around the knees (see figure 89 on page 96).
- ✓ Then tie one broad-fold bandage above and one broad-fold bandage below the fracture (see figure 89 on page 96).
- ✓ Tie the knots on the uninjured side (see figure 89 on page 96).

Lower Leg and Ankle Fracture

The shin bone (tibia) of the lower leg usually requires a direct force to break it, e.g. a hit by a vehicle or heavy objects. The thinner splint bone (fibula) may be broken by a twisting force or a direct force.

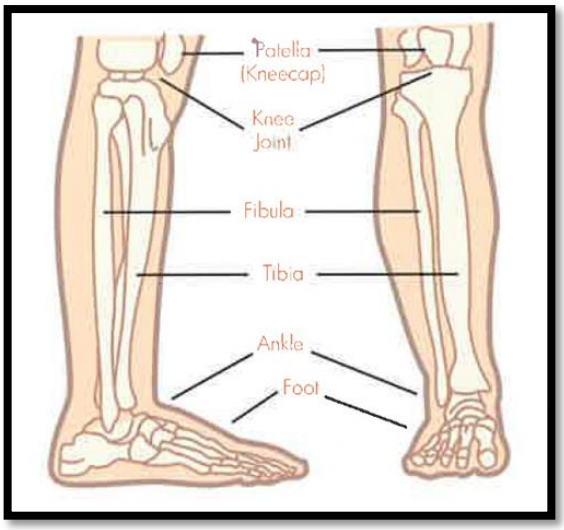


Fig. 81 – Parts of the Lower leg and Ankle

Recognition

- Deformity and shortening of the limb
- Possibility of an open injury
- Pain and tenderness at the fracture site
- Swelling and bruising

Actions to Take

- ✓ Call 995 for SCDF.
- ✓ Lay the casualty down. Carefully steady and support the injured leg
- ✓ Gently expose and treat any open wounds.
- ✓ Bring the sound leg alongside the injured leg and immobilise with the injured leg.
- ✓ Maintain support at the ankles.
- ✓ Slide one bandage under the knees and another bandage under the ankles.
- ✓ Slide two more bandages under the knees, one above and one below the fracture site.
- ✓ Place soft padding between the calves, knees and ankles.
- ✓ Tie a narrow-fold figure-of-eight around the ankles first (see figure 88 on page 95).
- ✓ Tie a broad-fold bandage around the knees (see figure 89 on page 96).
- ✓ Then tie one broad-fold bandage above and one broad-fold bandage below the fracture (see figure 89 on page 96).
- ✓ Tie the knot on the uninjured side (see figure 89 on page 96).

Foot Fracture

Fractures affecting the numerous small bones of the foot are typically caused by crushing injuries. Hospital treatment is required for these fractures

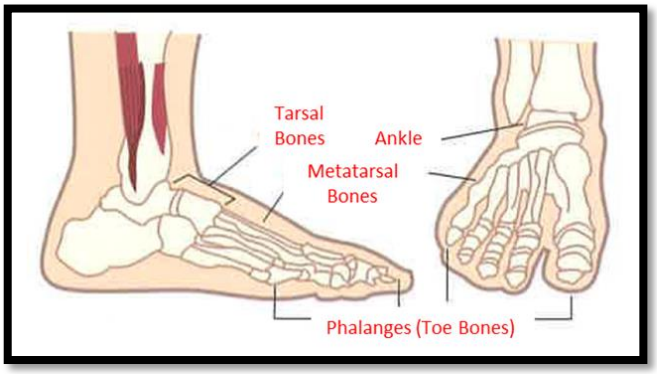


Fig. 82 – Parts of the Foot

Recognition

- Deformity of the foot
- An open injury may be present
- Pain and tenderness at the fracture site
- Bruising and swelling

Actions to Take

- ✓ Call 995 for SCDF.
- ✓ Sit the casualty down.
- ✓ Elevate and support the foot to minimize swelling.
- ✓ Cold compress may be used to reduce the pain and swelling.

5.2 – Soft Tissue Injuries

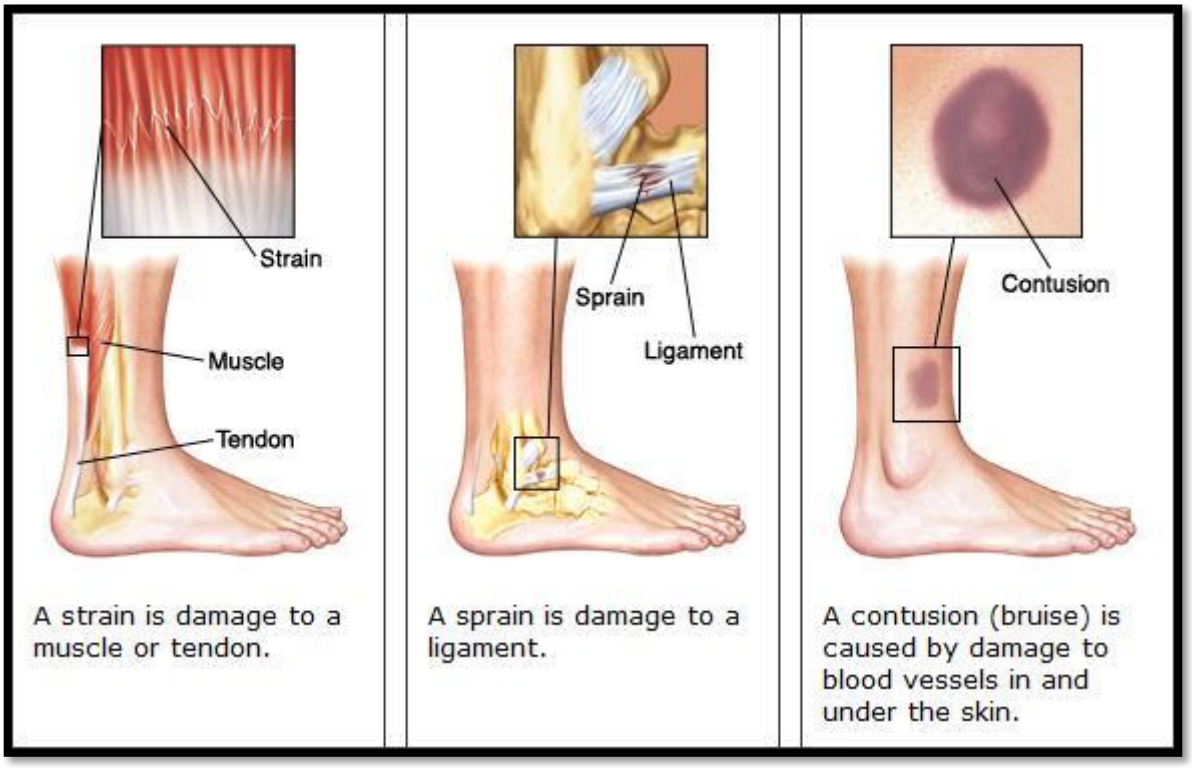


Fig. 83 – Strain, Sprain and Contusion

Strain

A strain is the result of overstretching a muscle resulting in a partial tear e.g. in the calf muscle.

Muscle Contusion

Muscle contusion (bruise) result from a blow to the muscles.

Muscle Cramp

Overuse of a muscle, dehydration, muscle strain or simply holding a position for a prolonged period can cause a muscle cramp.

Sprain

A sprain is the partial or complete stretching or tearing of the ligaments connected with a joint. The ankle is the most commonly sprained joint.

Recognition

Strain

- A sudden sharp or severe pain
- Tenderness when the area is touched

Muscle Contusion

- Swelling of the affected muscle
- Pain and tenderness
- A bruise may appear

Muscle Cramp

- Pain and uncontrollable spasm
- Restricted movement

Sprain

- Acute pain and tenderness at the joint
- Swelling around the joint
- Limited movement

Actions to take

Strain and Muscle Contusion

- ✓ Apply the RICE treatment (see below).

Muscle Cramp

- ✓ Get the casualty to gently stretch the affected muscles;
  or
- ✓ Relax the muscles by applying steady pressure to them.

Sprain

- ✓ Remove the footwear gently to check and treat the injury.
- ✓ Apply the RICE procedure (see below).
- ✓ If a fracture cannot be excluded, immobilize the joint and call 995 for SCDF.

RICE Treatment

The acronym **RICE** is used for contusions (bruises), strains, sprains, dislocations and fractures (see figure 84 on page 93).

R- Rest:

- ✓ Rest, steady and support the injured part in the most comfortable position for the casualty.

I – Ice:

- ✓ Using cold compress will reduce swelling, bruising and pain.
- ✓ Apply a cold compress for 10-15 minutes or stop when the casualty starts to shiver or feels numb at the site.
- ✓ **DO NOT** apply a cold compress longer than 20 minutes at a time as frostbite and/or nerve damage can result.

C – Compression:

- ✓ Apply gentle, even pressure to the injured part by surrounding the area with a thick layer of soft padding, such as cotton wool or plastic foam, and secure with a crepe bandage.
- ✓ **DO NOT** apply the bandage too tightly as this would restrict circulation. Expose the fingers and toes to observe for possible colour change.

E – Elevation:

- ✓ Raise and support the injured limb to reduce swelling.
- ✓ **DO NOT** elevate a suspected fracture until it has been stabilized with a splint. Note that some fractures should not be elevated e.g. a spinal fracture.

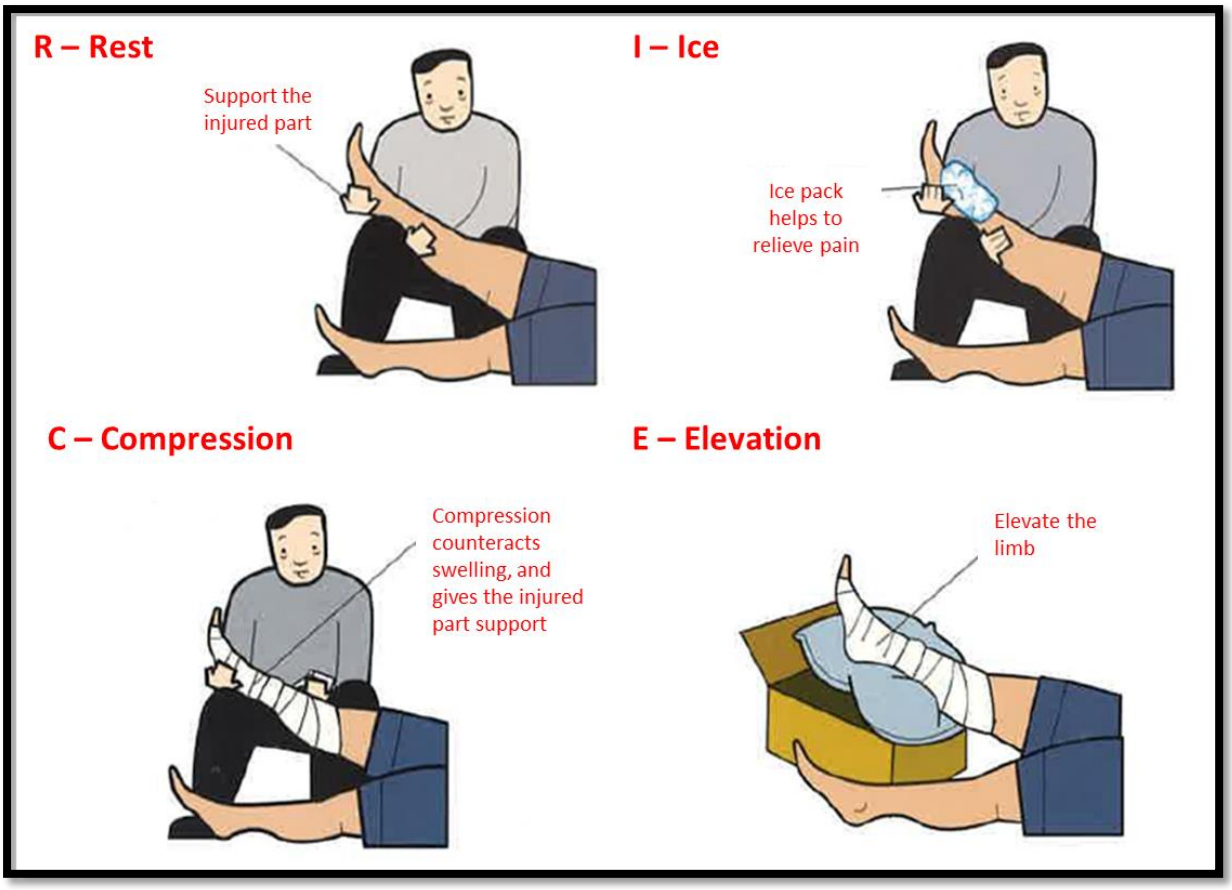


Fig. 84 – RICE Treatment.

5.3 – Immobilisation/Bandaging

Immobilisation

Immobilisation requires movement of the injured part to be minimised in order to reduce pain and prevent further injury. This can be done with the use of splints (see page 78) along with bandaging techniques covered in chapter 4.

Immobilisation should consider the casualty's level of comfort (and cooperation). Straightening of the angulated fracture should not be performed by the First Aider and should be referred to professionals with specific training.

Immobilisation of the Upper Body

Apply an elevation sling with a broad-fold bandage across the sling and chest (see figure 85):

- ✓ Dislocated shoulder
- ✓ Fractured collar bone
- ✓ Fracture of the ribs (soft padding to be placed between chest and arm)

Fig. 85 – Elevation Sling with Broad-Fold Bandage across

Apply a large arm sling with a broad-fold bandage across the sling and chest (see figure 86):

- ✓ Lower arm fracture (with splint along the lower arm)
- ✓ Upper arm fracture (with splint along the upper arm)
- ✓ Wrist or hand fracture (with splint along the wrist and hand)
- ✓ Elbow fracture (if the arm can be kept at an angle suited for a large arm sling)

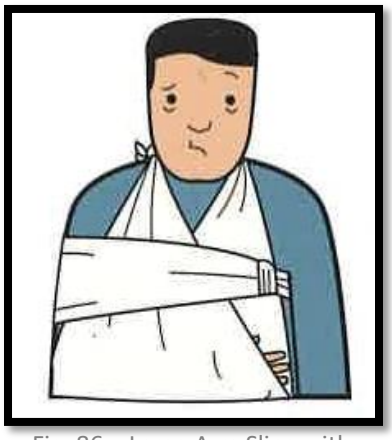


Fig. 86 – Large Arm Sling with Broad-Fold Bandage across

For elbow fracture where the elbow cannot be bent (see figure 87):

Fig. 87 – Immobilisation for elbow fracture that cannot be bent

Immobilisation of the Lower Body

When immobilising parts of the lower body, it is important to start with the feet or ankles as they are the most distant point from the torso and any movement will cause pain or discomfort. This should include splinting of the lower limb with available splints or using the uninjured side as a splint.

The following picture shows a figure-of-eight bandage (see figure 88) used to secure the feet to prevent outward rotation of the legs, leading to further aggravation of the leg or pelvic fracture. Other alternatives include tying the laces of both shoes together and using crepe or triangular bandage to secure the feet together. After the immobilizing the feet, other bandages can be applied to deal with the specific lower body fractures.

Fig. 88 – Figure-of-Eight bandage at the feet for immobilisation

- ✓ Triangular bandages can be prepared into broad of narrow folds and inserted under the natural spaces under the knees, ankles or the lower back.
- ✓ Gently slide the folded bandages under the body into place to be tied.

- ✓ Padding should be placed between both legs to provide some comfort.
- ✓ Knots are usually tied on the uninjured side.

Immobilisation for Thigh (Femur) or Lower Leg (Tibia/Fibula) Fractures

- ✓ Find appropriate splint and pad between the legs.
- ✓ Figure-of-eight bandage at the ankles.
- ✓ 1 broad-fold triangular bandage at the knees.
- ✓ 1 narrow-fold bandage **above** the fracture site.
- ✓ 1 narrow-fold bandage **below** the fracture site.
- ✓ All knots to end off on the uninjured side.

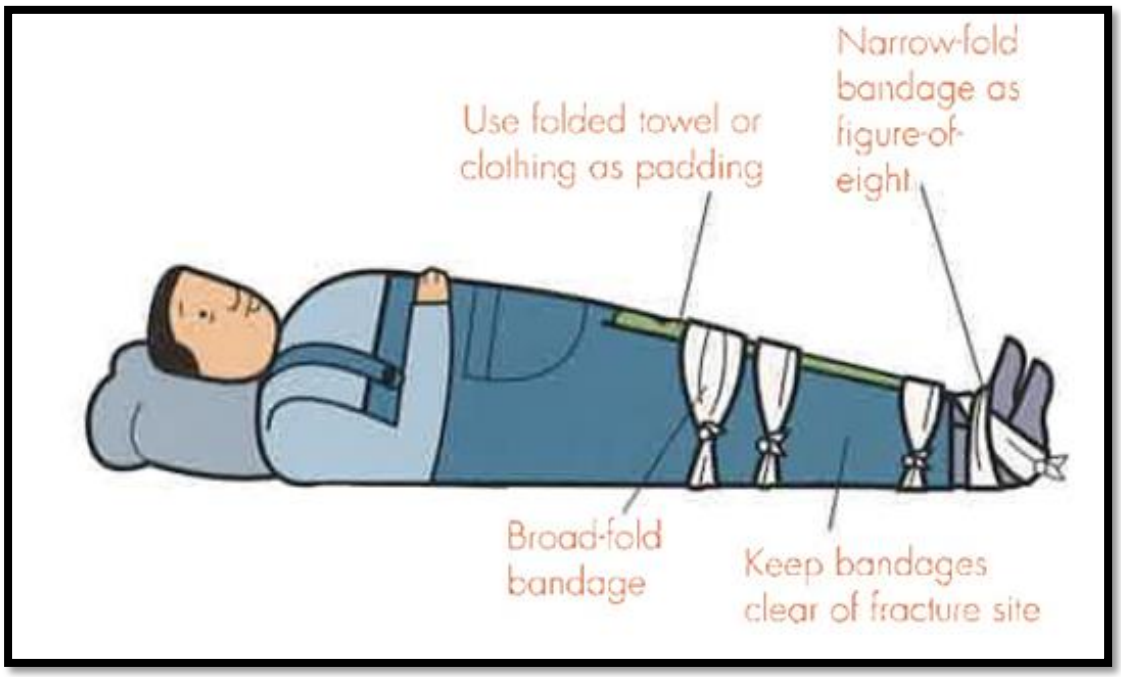


Fig. 89 – Immobilisation of the lower legs. Example shown here is for Lower Leg fracture.

Chapter 6

Burn Injuries

1) Burns Depth and Severity of Burns
2) Classification and Treatment of Burns

The Skin Structure

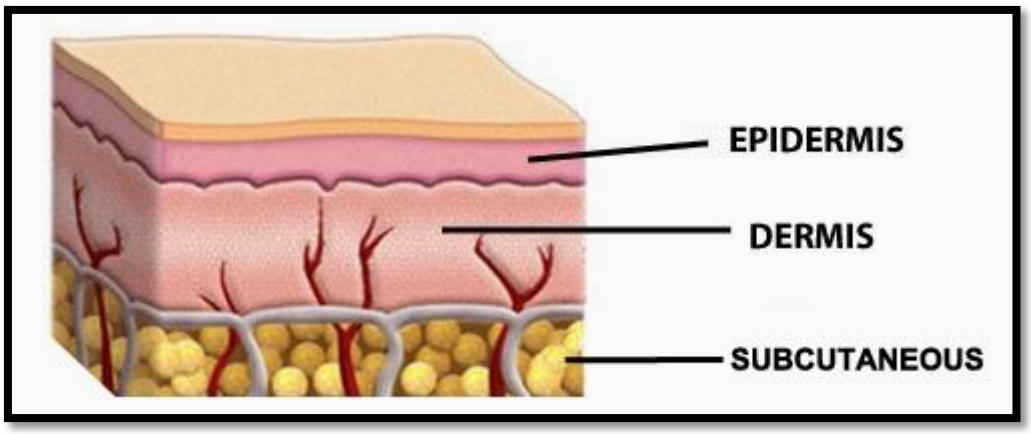


Fig. 90 – The Skin Structure

Epidermis – The outer layer

Dermis – The layer with sebaceous glands, blood vessels and nerve endings

Subcutaneous tissue – The layer with sweat glands, hair follicles, blood vessels and fat

Function

- Protects from injury
- Protects from infections
- Regulates body temperature

Important Notes

- Establish own safety before attempting to treat the casualty.
- Stop the burning, by means of rapid cooling using water for 5 – 10 minutes, in order to prevent further damage to the tissues, to reduce swelling, minimize shock, and alleviate pain.
- Cover the injury to protect it from infection.
- Except in cases of very minor burns, obtain appropriate medical aid.

6.1 – Burns Depth and Severity of Burns

Burns and scalds are damage to the skin usually caused by heat. Both are treated in the same way.

A burn is caused by dry heat – by an iron or fire, for example. A scald is caused by something wet, such as hot water or steam.

The amount of pain experienced by the casualty is not always related to the severity of the burn. Even a very serious burn may be relatively painless.

Recognition

Burns Depth

Superficial Burn (1st Degree)

- Injury involves only the outer layer of the skin
- Redness, swelling, tenderness and pain are present

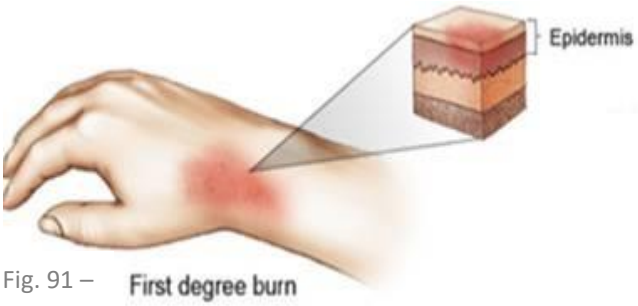


Fig. 91 – First degree burn

Partial Thickness Burn (2nd Degree)

- Injury affects the deeper layers of the epidermis
- Formation of blisters
- Pain is present

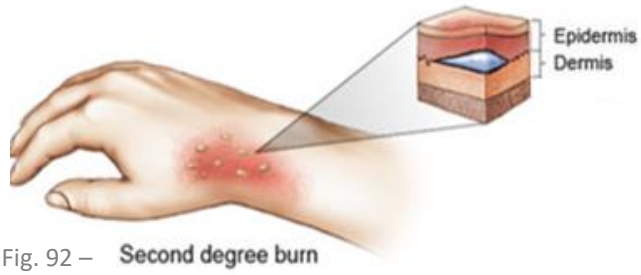


Fig. 92 – Second degree burn

Full Thickness Burn (3rd Degree)

- Injury involves all layers of the skin; damage may extend to nerve, muscle and fat
- The skin appears pale, waxy or charred
- Relatively pain free

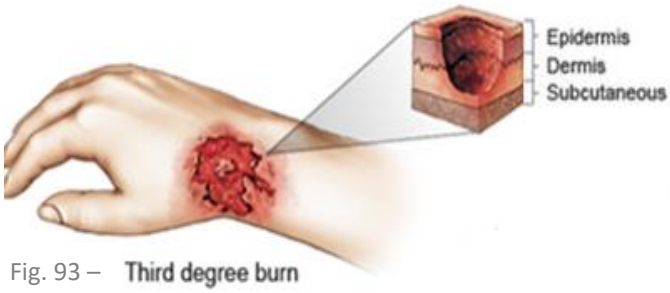


Fig. 93 – Third degree burn

Severity of Burns

The extent of a burn is expressed in terms of a percentage of the Body Surface Area (BSA).

The "**Rule-of-Nines**", which divides the surface area of the body into areas of approximately 9%, is used to calculate extent and to decide what level of medical attention should be sought.

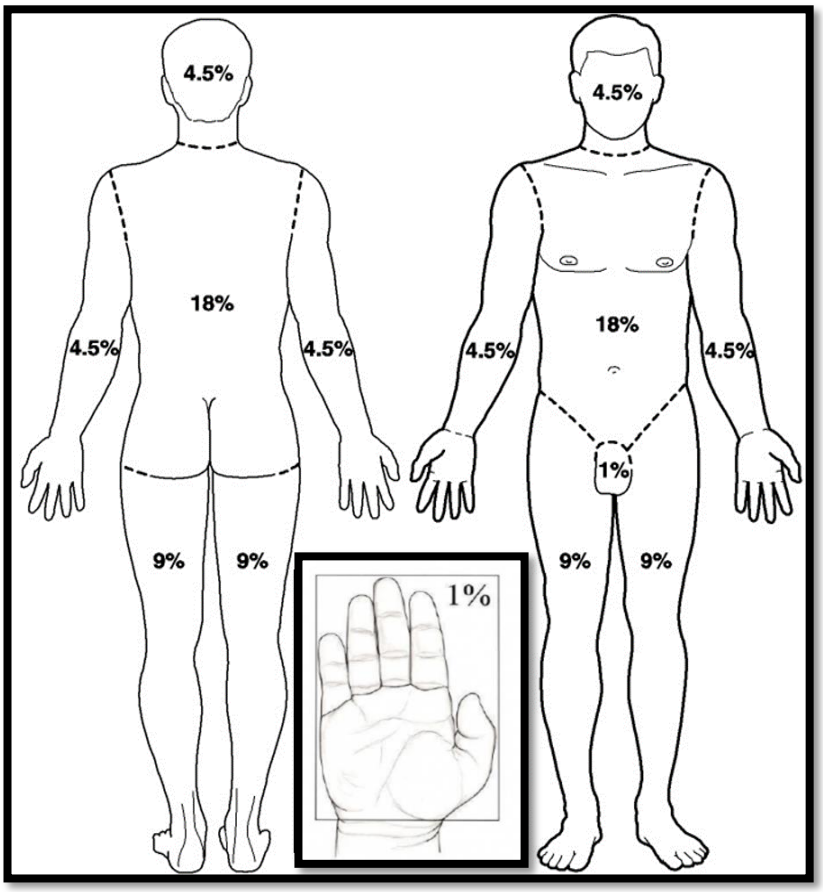


Fig. 94 – "Rule-of-Nines" and Palmar Method

The **Palmar Method** is used for estimating the percentage of body surface area on a casualty by using the casualty's palm to estimate 1% of their Body Surface Area (BSA). This method may be useful in estimating burn areas smaller than a full extremity.

For a normal adult:

- ✓ Any partial-thickness burn (2nd degree) of 1% or more (covering an area approximating to that of the casualty's palm) must be seen by a doctor.
- ✓ A partial-thickness burn (2nd degree) of 9% or more may lead to shock; the casualty needs hospital treatment.
- ✓ A full-thickness burn (3rd degree) of any size requires immediate hospital treatment.

6.2 – Classification and Treatment of Burns

Classification of Burns Injuries

- Thermal burns – caused by hot surfaces and fires
- Scalding – caused by steam, hot liquids, hot oil
- Chemical burns – caused by acids and alkalis
- Electrical burns – caused by electricity and lightning strikes
- Radiation burns – caused by exposure to the sun or radioactive substances

Actions to Take

Superficial Burn (1st Degree) and Partial Thickness Burn (2nd Degree)

- ✓ Remove jewellery, belts and other restrictive items, especially from burned areas around the neck as burned areas may swell rapidly.
- ✓ Flush the burnt area with tap water for at least 10 minutes, blot dry and cover with a sterile dressing or any clean cloth.
- ✓ Treat the casualty for shock if present.
- ✓ Seek medical attention.
- ✓ **DO NOT** break blisters.
- ✓ **DO NOT** use adhesive dressings.
- ✓ **DO NOT** apply ice.
- ✓ **DO NOT** remove anything stuck to the burn as further damage and infection may result.
- ✓ **DO NOT** use antiseptic preparation, ointment sprays, lotions or creams to the injury.

Full Thickness Burn (3rd Degree)

- ✓ Cover the area with a sterile dressing or any clean cloth.
- ✓ Treat the casualty for shock if present.
- ✓ Watch for breathing difficulty involving burns on the face and neck.
- ✓ Call 995 for SCDF.
- ✓ **DO NOT** apply ice.

- ✓ **DO NOT** remove anything stuck to the burn as further damage and infection may result.
- ✓ **DO NOT** immerse large burnt areas into water as it can cause loss of body heat.
- ✓ **DO NOT** use antiseptic preparation, ointment sprays, lotions or creams to the injury.

Burns in Special Areas

Burns to the face and within the mouth or throat by inhalation or heated fumes are extremely dangerous as they cause rapid swelling and inflammation of the air passages. Signs of burning will usually be evident. There may also be hoarseness of voice in the casualty.

For extreme cases, there is no specific first aid treatment. As swelling quickly blocks the airway, suffocation may result. Urgent and highly specialized medical aid is required.

- ✓ Call 995 for an SCDF. Inform dispatch that the casualty may have airway burns.
- ✓ Take any steps possible to facilitate the casualty's breathing; e.g. loosen clothing around the neck.
- ✓ If the casualty becomes unconscious, be prepared to provide chest compressions and use the AED.

Thermal Burns and Scalding

Thermal burns are caused by an external heat source that raises the temperature of the skin and tissues beneath the skin, destroying cells. Scalding is also considered a form of thermal burns and occurs when hot liquid or steam comes into contact with the skin. Superficial or Partial thickness burns may result.

- ✓ Remove the source of heat. Remove hot clothing if possible.
- ✓ Cool the injured area with water for at least 10 minutes or until the pain is relieved.
- ✓ Remove any constricting objects (jewellery, watches, belts or clothing) from the injured area before the swelling begins.
- ✓ Use a sterile dressing or a clean, non-fluffy pad to bandage loosely and consult a doctor for further treatment.

- ✓ **DO NOT** break blisters.
- ✓ **DO NOT** use adhesive dressings.
- ✓ **DO NOT** apply ice.
- ✓ **DO NOT** remove anything stuck to the burn as further damage and infection may result.
- ✓ **DO NOT** use antiseptic preparation, ointment sprays, lotions or creams to the injury.

Chemical Burn

This occurs when caustic or corrosive substances come into contact with the skin.

- ✓ Flush the area immediately with large amounts of water for 15 – 20 minutes or longer. Some chemicals require specific treatment, always refer to the chemical's Safety Data Sheet (SDS) for more information (see figure 95).
- ✓ Wear gloves, apron and eye protection if available. Remove the casualty's contaminated clothing whilst flushing.
- ✓ Cover the burned area with a dry clean dressing.
- ✓ Call 995 for SCDF. Inform the dispatch that chemicals are involved.

Gasoline
Version 1.0
Effective Date 10.03.2014

Safety Data Sheet

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

Material Name	:	Gasoline
Other Names / Synonyms	:	MOGAS, ULG 95, 88 RON, 90 RON, 91 RON, 92 RON, 93 RON, 95 RON, 97 UNLD, 91 UNLD
Recommended Use / Restrictions of Use	:	Fuel for spark ignition engines designed to run on unleaded fuel.
Supplier	:	Shell Eastern Trading (PTE) Ltd 9 North Buona Vista Drive, #07-01, Tower 1, The Metropolis Singapore 138588 Singapore
Telephone	:	+65-6384 8000
Emergency Telephone Number	:	+44 (0) 151 350 4595

2. HAZARDS IDENTIFICATION

GHS Classification	:	Flammable liquids, Category 1 Skin corrosion/irritation, Category 2 Aspiration hazard, Category 1 Toxic to reproduction, Category 2 Germ cell mutagenicity, Category 1B Carcinogenicity, Category 1B Specific target organ toxicity - single exposure, Category 3, Inhalation, Narcotic effects. Acute hazards to the aquatic environment, Category 2 Hazardous to the aquatic environment - Long-term Hazard, Category 2
GHS Label Elements Symbol(s)	:	
Signal Words	:	Danger
Hazard Statement	:	PHYSICAL HAZARDS:

1/22

Print Date 16.04.2014 000000034041 MSDS_SG

Fig. 95 – Example of a Safety Data Sheet

Electrical Burn

An electrical burn is caused by electricity entering the body at the point of contact. Most of the damage occurs inside the body although the burn appears small and is seen only on the outside. The electricity normally exits where the body is in contact with a surface or the ground.

- ✓ Ensure that the area is safe. Unplug, disconnect, or turn off the power.
- ✓ Check for fractures and spinal injury.
- ✓ Treat the casualty for shock by raising the legs and prevent heat loss by covering him with a cot or blanket.
- ✓ Cover entry and exit burns.
- ✓ Call 995 for SCDF.
- ✓ Sudden Cardiac Arrest may occur. Perform Chest Compressions and use the AED if casualty's breathing stops.

Radiation Burn

The most common type of radiation burn is sun burn caused by Ultra Violet (UV) radiation.

- ✓ Remove the casualty from the sun or source of heat. Move to a cool and sheltered area or cover the affected parts with light clothing.
- ✓ Encourage the casualty to stay hydrated in small amounts at a time and cool the affected skin by dabbing with water.
- ✓ If signs of heat disorders are also present, treat the casualty accordingly (refer to Chapter 2) and call 995 for SCDF.

Chapter 7

Other First Aid Knowledge

1) Eye Injuries
2) Epistaxis (Nose Bleeding)
3) Poisoning
4) Transportation of Casualty

The Eye

Structure of the Eye

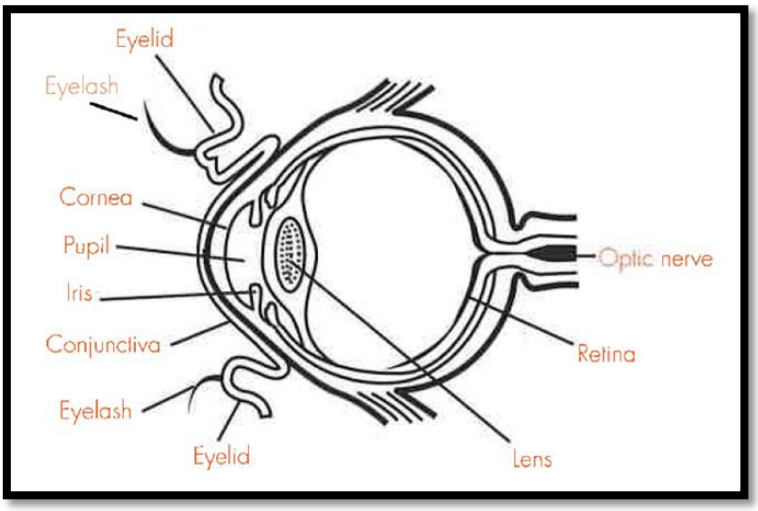


Fig. 96 – Structure of the Eye

The eyeball is situated in the eye socket and its movement is controlled by six eye muscles. The front of the eye is covered by the cornea, which is transparent. Beneath the cornea is the iris and the central opening in the iris is called the pupil. The eye is protected by the upper and lower eyelids.

Function

The eye is protected from injury by the quick movement of the eyelids. Secretions from the eye in response to irritation and chemicals help to wash the eye.

Important Notes

- Whenever possible, cover both the casualty's eyes with cold, wet pads.
- Always seek medical attention – call 995 for SCDF.

7.1 – Eye Injuries

Eye injuries occur due to damage caused by a direct blow to the eye. The trauma may affect not only the eye, but the surrounding area, including adjacent tissue and bone structure.

Other forms of eye injuries can be caused by foreign bodies or chemicals and may have a high risk of long-term damage to the eyes.

Common causes of eye injuries:

- Penetration by a foreign body
- Chemicals
- Foreign bodies
- Blunt force trauma
- Cuts to the eye and eyelid

Recognition

Penetrating Eye Injury

- Eyeball may be collapsed due to leakage of vitreous fluid
- Penetrating object might be visible in the eye
- Movement of uninjured eye will cause pain in the injured eye

Chemicals

Chemical burns to the eye can occur at the workplace, at home or in schools and may not even involve industrial chemicals. Common soap, detergent, hand sanitiser or shampoo may get into the eye and cause varying levels of discomfort.

- Redness and swelling
- Sharp or burning pain
- Unable to open eyes
- Tearing

Foreign Bodies

- Pain or discomfort
- Blurred vision
- Redness and tearing
- Eyelid may be tightly closed
- Sand, wood, dust or fragments of an object may be visible

Blunt Force Trauma

- Being hit by a blunt instrument or a fist
- "Black eye" – caused by bleeding into the eyelid and surrounding tissues

Cuts to the Eye and Eyelid

- Being hit by a sharp or blunt instrument
- Laceration of the eyelid or conjunctiva

Actions to Take

Penetrating Eye Injury

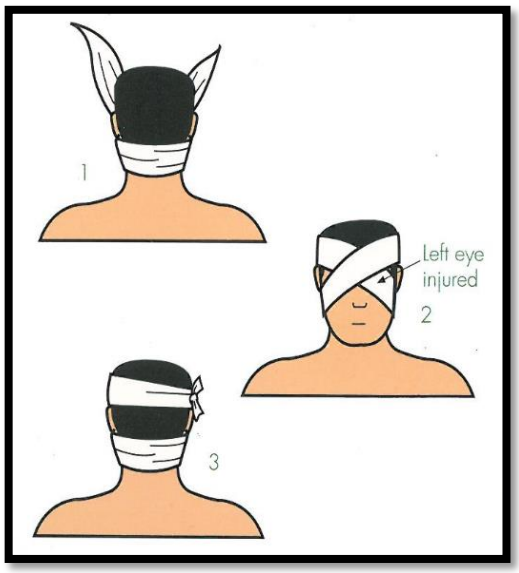


Fig. 97 – Eye Bandage

- ✓ Protect the injured eye with an eye pad or eye shield.
- ✓ Cover the uninjured eye with a patch to stop movement of the uninjured eye.
- ✓ Call 995 for SCDF.
- ✓ If object is too large to be covered by an eye pad or eye shield, apply techniques for dealing with penetrating objects (see page 59).
- **DO NOT** remove any object stuck in the eye.
- **DO NOT** apply too much pressure to the injured eye (vitreous fluid might be lost).

Chemicals

- ✓ Place the casualty's head under a tap and rinse the eye with clean water for at least 15 to 20 minutes.
- ✓ Irrigate from the nose side of the eye outwards to avoid flushing the chemical into the other eye.
- ✓ Encourage the casualty to roll his or her eyeball so that the water can flush out the chemical from all parts of the eye.
- ✓ Place and eye pad to the affected eyes and bandage both eyes.
- ✓ Call 995 for SCDF.

Foreign Bodies

- ✓ Protect the injured eye with an eye pad or eye shield to prevent object from being driven deeper into the eye.
- ✓ Cover the uninjured eye with a patch to stop movement of the uninjured eye.
- ✓ Call 995 for SCDF.
- ✓ **DO NOT** allow the casualty to rub the eye.
- ✓ **DO NOT** attempt to remove any embedded object.
- ✓ **DO NOT** use dry cotton (cotton balls or cotton-tipped swabs) or instruments such as tweezers on the eye.

Blunt Force Trauma

- ✓ Apply a cold compress for about 15 minutes to reduce pain and swelling.
- ✓ Consult a doctor immediately in case of pain, reduced vision or discolouration (black eye).

Cuts to the Eye and Eyelid

- ➢ Loosely bandage both eyes.
- ➢ Call 995 for SCDF.
- ➢ **DO NOT** flush the eye with water.
- ➢ **DO NOT** apply too much pressure to the injured eye (vitreous fluid might be lost).

7.2 – Epistaxis (Nose Bleeding)

Nosebleeds are common in children but may occur in adults as well. Other causes may also be due to injury to the nose, picking of nose dry climate, frequent nose blowing. The bleeding is usually minor in most cases. A nosebleed after a head injury should be taken seriously and medical attention should be sought, as it may suggest a possible skull fracture.

Actions to Take

- ✓ Sit the casualty down with his/her head slightly forward. Allow a small bowl for the child to spit in if necessary.
- ✓ Help the casualty pinch the fleshy part of the nose for 10 minutes, asking him/her to breathe through his open mouth.
- ✓ If the bleeding continues, reapply the pressure for another 10 minutes. Most nosebleeds should stop within 20 to 30 minutes. If it persists for more than half an hour, you should seek medical attention.
- ✓ After the bleeding has stopped, advise the casualty to rest for a few hours.

7.3 – Poisoning

Poisoning is a process or condition when a casualty becomes harmed (poisoned) by a toxic substance. Poisoning can be acute (sudden or over a very short period of time) or chronic (over a prolonged period of time). Depending on the length of exposure and dose, effects may range from temporary to irreversible damage or death.

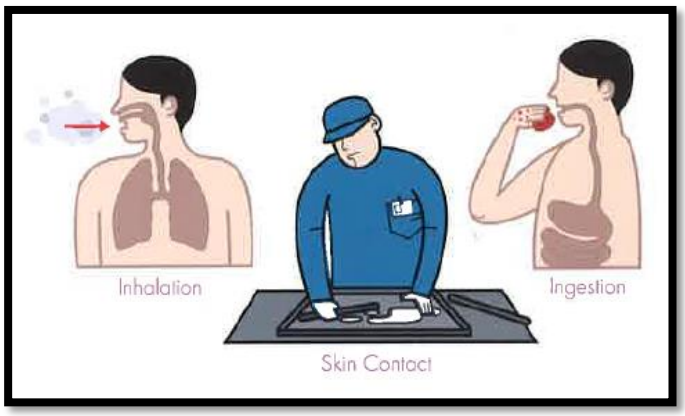


Fig. 98 – Routes of Poisoning

Poison may enter the body through breathing (inhalation), skin contact (absorption/injection) or by mouth (ingestion) (see figure 98).

Recognition

Depending on the substance, dose and exposure, the signs and symptoms may vary and may include the following (but not limited to):

- Altered levels of consciousness and may lead to unconsciousness
- Breathing difficulty
- Corrosive burns around the mouth if substance was ingested
- Vomiting and/or diarrhoea
- Presence of poisonous substances nearby
- Corrosive burn marks if the substance was absorbed through the skin
- History of substance abuse (eg. puncture marks on skin)
- Headache, nausea or giddiness

Actions to Take

- ✓ Perform the Primary Survey. If casualty is unresponsive and not breathing, start chest compressions and apply an AED (see Chapter 8).

- ✓ For poisoning cases in a workplace involving substances used during the work process, refer to the instructions on the Safety Data Sheet (SDS) and follow the emergency procedures established for such incidents. If such procedures are not in place or you are unsure, call 995 for SCDF and inform them that chemicals (type and amount if known) are involved. Keep the casualty calm and minimise the casualty's movements.
- ✓ For poisoning cases in a domestic or household setting, keep the casualty calm and minimise the casualty's movements. Call 995 for SCDF.
- ✓ **DO NOT** leave the casualty unattended at any time. Monitor the casualty and record the vital signs at regular intervals. If casualty is conscious and alert, get a detailed history.
- ✓ Ensure personal safety when handling the substance (eg. chemical, pesticide, detergent, syringe with needles, bottles, etc). Inform SCDF of the suspected substance and bring the substance's container along to the hospital.
- ✓ **DO NOT** force the casualty to vomit unless it is a natural body reaction.
- ✓ **DO NOT** force the casualty to drink more water unless advised by SCDF or a Doctor.

7.4 – Transportation of Casualty

Important factors when considering **BEFORE** moving the casualty:

- It is always ideal to wait for the arrival of the Ambulance crew and take instructions from them.
- **DO NOT** move the casualty unnecessarily unless there is immediate danger or casualty is exposed to harsh weather elements.
- **DO NOT** leave the casualty alone. Send someone else to get help.
- If the casualty is seriously injured or has multiple injuries, it may be better to attend to him where he is, because movement may cause further injuries.
- Consider the terrain or environment when moving the casualty.
- Communicate with other First Aiders of the transport/evacuation plan.
- Always ensure the safety of both the casualty and other First Aiders or assistants during the transportation process.
- Plan for a short stop every few minutes to check on the casualty and allow a change of hands if needed.

To move the casualty, the following methods may be used:

- Support by a single rescuer
- Handseats and the “kitchen chair” carry
- Blanket lift
- Stretcher
- Wheeled transport (e.g. wheelchair)

Principles of Lifting

- Know your capabilities. Do not try to handle too heavy a load – seek help.
- Keep your back straight. Tighten the muscles of the buttocks and abdomen.
- Apply a safe grip. Use as much of the palms as possible.
- Position your feet shoulder width apart for balance, with one foot in front of the other.
- When lifting, do not twist your back; pivot with your feet.
- While lifting and carrying, do so in a slow motion and smooth motion, in unison with other rescuers.

- Before moving a casualty, inform him/her about what you are going to do.

One Rescuer Methods

The following methods should only be used by a First Aider when a casualty cannot be lifted, or is incapable of standing up, but needs to be moved from danger promptly. Avoid using any of these methods if you suspect that the casualty has sustained neck or head injuries.

Shoulder Drag

- ✓ Used for short distances over a rough surface
- ✓ Stabilize the casualty's head with your forearms
- ✓ Crouch behind the casualty, help him/her to sit up, and cross his/her arms over his/her chest
- ✓ Pass your arms under the casualty's armpits and grasp his/her wrists
- ✓ Carefully pull casualty backwards.
- ✓ **DO NOT** use this method if there are shoulder, head or neck injuries.

Fig. 99 – Shoulder Drag

Human Crutch

- ✓ If one of the casualty's legs is injured, help him/her to walk on the good leg while you support the injured side.
- ✓ Stand at his/her injured side, except when there is an injury to an upper limb.
- ✓ Assist the casualty by putting your arm round his/her waist, grasp the clothing at the hip, and place his/her arm round your neck, holding his/her hand with your free hand.

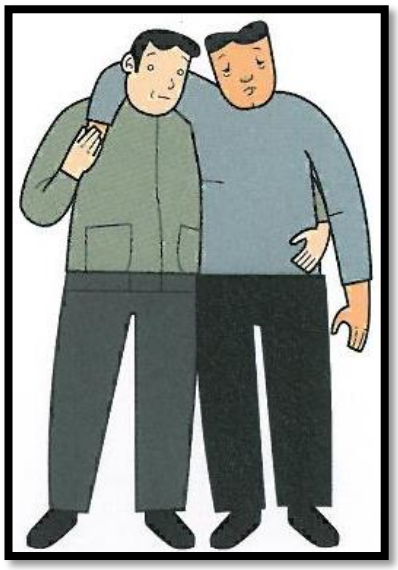


Fig. 100 – Human Crutch

- ✓ Move off with your inside foot. Take small steps and walk at the casualty's pace.
- ✓ Reassure the casualty as you move.
- ✓ If his/her upper limbs are uninjured and the other hand is free, the casualty may obtain additional help from a second supporter, or by using a walking stick.

Cradle Carry

- Used when lightweight casualties are unable to walk.
- Lift the casualty by passing one of your arms beneath both the knees, with the casualty's neck resting on the bend of the elbow of your other arm.

Fig. 101 – Cradle Carry

Fireman's Carry

- ✓ If the casualty's injuries permit, longer distances can be travelled with the casualty carried over your shoulder.
- ✓ Help the casualty to stand.
- ✓ Grasp casualty's right/left wrist with your left/right hand.
- ✓ Squat down with your head under his/her extended right/left arm so that your right/left shoulder is level with the lower part of casualty's abdomen; and place your right/left arm between or around his/her legs.
- ✓ Taking the weight on your right/left shoulder, rise to a standing position.
- ✓ Pull the casualty across both shoulders and transfer his/her right/left wrist to your right/left hand, leaving your other hand free.
- ✓ **DO NOT** use this method if the casualty is heavier/bigger than you.

Fig. 102 – Fireman's Carry

Pick-a-Back Carry

- ✓ When injuries make the fireman's carry unsafe, this method is used
- ✓ Crouch in front of the conscious casualty, with your back to him
- ✓ Ask the casualty to put his arms over your shoulders and clasp his hands in front of you
- ✓ Grasp the casualty's thighs and rise slowly, keeping your back straight.

Fig. 103 – Pick-a-Back Carry

Two Rescuers Methods

Two-handed Seat Carry

- ✓ This method is mostly used to carry a casualty who is unable to assist first aiders with his/her arms.
- ✓ Two first aiders face each other and stoop at each side of the casualty
- ✓ Each first aider passes his forearm nearest the casualty's body behind his back just below the shoulders, taking hold of his clothing
- ✓ They slightly raise the casualty's back and pass their other forearm under the middle of his thighs, clasping their hands together with the hook-grip.

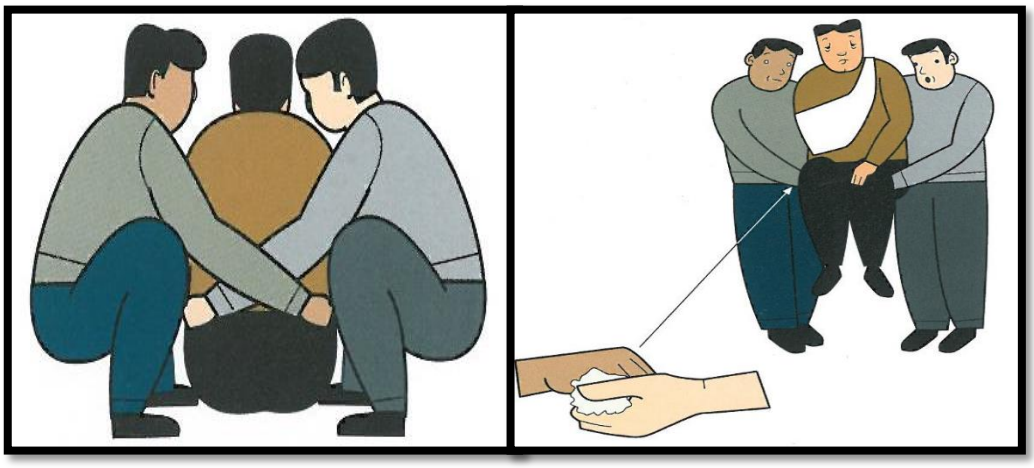


Fig. 104 – Two-Handed Seat Carry

- ✓ To clasp their hands together, the first aider on the left of the casualty faces his palm upwards whilst the first aider on the right faces his palm downwards
- ✓ To prevent their fingernails from hurting each other's hand, a folded handkerchief can be used as a buffer
- ✓ The first aiders then rise together and step off, the one on the right side with his right foot and the one on the left side with his/her left foot.

Four-handed Seat Carry

Fig. 105 – Four-Handed Seat Carry

- ✓ This is the easiest method for two persons to carry a casualty when no equipment is available.
- ✓ The casualty cannot walk but is able to assist by using one or both arms to hang onto the first aiders.
- ✓ With two First Aiders facing each other positioned behind the casualty, their left hands grasp each other's right wrists, and their right hands grasp their own left wrists.
- ✓ With both First Aiders stooping down, the casualty is then instructed to place one arm around the neck of each first aider, so as to raise him/her to sit on their hands and steady himself/herself during transportation.
- ✓ The First Aiders then rise together and step off with their outer feet, walking at an ordinary pace.

Fore-and-Aft Carry

- ✓ One First Aider carries the casualty below the armpits, holding onto the linked forearms of the casualty.
- ✓ The second First Aider carries the casualty at the knees.

Fig. 106 – Fore-and-Aft Carry

Improvised Methods

Chair Carry

- ✓ A useful method when a conscious casualty without any serious injuries, is to be transported along narrow passageways or up/down the stairs.
- ✓ A kitchen/dinning chair that is strong enough to take the casualty's weight should be used.
- ✓ The casualty should be seated on the chair and supported by First Aiders at the front and rear.
- ✓ The casualty and the chair are then slowly tilted backwards at a slight angle (about 30 degrees) and lifted.
- ✓ One First Aider should support the back of the chair with the casualty on it; the other should hold the chair by the front legs and move carefully down the stairs.
- ✓ If the staircase or passageway is wide enough, the First Aiders can stand at the sides of the chair, each supporting a back and front leg.

Fig. 107 – Chair Carry

Blanket/Sheet Pull

- ✓ Roll the casualty onto a blanket/sheet and pull it from behind casualty's head.
- ✓ **DO NOT** use this method over rough or bumpy surfaces.

Fig. 108 – Blanket/Sheet Pull

Other materials or methods can be considered for use if time, resources and casualty's condition allow for it.

- ➢ Wheeled chair
- ➢ Make-shift stretcher
- ➢ Wheel barrow/Trolley cart
- ➢ Three rescuers carry

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