Medical First Responder

(Basic & Advance)

NDRF Academy, Nagpur
Edition: 2020 (First Edition)

Published by

National Disaster Response Force Academy, Nagpur, Ministry of Home Affairs,

Nagpur – 440 001

Written & compiled by

Instructors of National Disaster Response Force Academy, Nagpur

Sources/reference

Authenticated Websites, Brady reference book and PEER instructor's guide

National Disaster Response Force Academy

(Ministry of Home Affairs, Govt. of India)

Civil Line, Temple Road Nagpur– 440001

Contents

LESSON-1

Emergency Medical System & Medical First Responder

Introduction

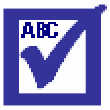
- Emergency Medical System or Ambulance system is a very effective and quick response system during emergency for transporting patients from houses, accident sites and hospitals. Before arriving EMS on incident sites
- A Medical First Responder can perform his duty effectively and save the victim's life or minimize the life threatening situation.
- Emergency Medical Services exists to fulfil the basic principles of first aid, which are to Preserve Life, Prevent Further Injury, and Promote Recovery.

Outcomes

Upon completion of this lesson, you will be able to:

- Define First aid
- The Emergency Medical Services (EMS).
- Six duties and responsibilities of the MFR
- Define Negligence
- Define Abandonment
- Implied consent and Expressed consent

Terminology



First aid: First aid is the Emergency care and medical attention that is typically administered, immediately after an injury or illness occurs. It usually consists of one time, short term treatment, such as cleaning minor/major cuts, treating minor burns, applying dressing- bandages, splinting, giving care of FBAO and CPR. The overall goals of first aid are:-

- Keep the victim alive.
- Prevent the victim's condition from worsening.
- Give first aid until Advanced Medical Emergency Service arrives.
- Ensure that the victim receives needed medical care.
- In the pre-hospital setting, the key contributors to survival and recovery from illness and injury are prompt and effective maintenance of the body's primary functions:
    - Circulation
    - Airway
    - Breathing
    - Bleeding control (life threatening)

Aims of first aid:

- To preserve life of patients/victims.
- To prevent the worsening of one's medical condition of the patients/victims.
- To promote recovery of the patient/victims.
- To help, to ensure safe transportation to the nearest health care facility.

Duty of giving care: Usually, if a Medical First Responder (MFR) comes to the aid of an injured or sick person who is a stranger, the person giving the aid owes the stranger a duty of being reasonably careful.

If a road user is involved in an accident, there is a legal requirement to stay at the scene, assist the injured and report the incident to the police.

There are also some points you can follow it…

a. Inform local police and Emergency Medical Services.
b. Take consent from patient/relative/bystander.
c. Assess the situation that what happened.
d. Make the area around the patient safe and safety for yourself, crew and others.
e. Give pre hospital treatment soon.
f. Monitor the patient and check vital sign.
g. Give emotional support.

h. Give rest and comfort to the patient.
i. Transport the patient to the EMS as soon as possible.

Medical First Responder (MFR)

The first person on the scene of an incident with Emergency Medical Care skills, typically trained to the most basic EMS level.

Or

A certified first responder (also called an Emergency Medical Responder, Medical First Responder or First Responder) is a person who has completed a course and received certification in providing pre-hospital care for Medical Emergencies.

Certified individuals should have received much more instruction than someone who is trained in Basic first aid and CPR, but they are not necessarily a substitute for more Advanced Emergency Medical Care rendered by Emergency Medical Technicians and Paramedics.

First responders typically provide basic first aid level care, like: CPR, and Automated External Defibrillator (AED) usage. The term ―certified first responder is not to be confused with ―**First Responder** which is a generic term referring to the first medically trained responder to arrive on scene (police, fire, EMS).
Many police officers and fire fighters must be at least certified first responders. But there is the required level of training to become Emergency Medical Technicians or Paramedics.

First Person

First Person on the Scene means the first person to arrive at the scene of an accident, injury or sudden illness and is to assess the situation and arrange for assistance. The first person on the scene may or may not be a First Aid Officer or person trained in first aid.

First Responders Proactive Precautions

Awareness of Danger: - Firstly first responder should be aware about potential danger. This is especially important in pre hospital treatment, as situations which are dangerous are the most likely to produce casualties who require PHT.

"One of the key dangers to a first responder is bodily fluids, such as blood, vomit, urine and feces, which pose a risk of cross contamination. Body fluids can carry infections and diseases, including, but not limited to, HIV and hepatitis".

Paramedic-

A member of the EMS system whose training includes advanced life support care, such as inserting endo tracheal tubes and starting I V lines.

Paramedics also administer medications, interpret electro cardiograms, monitor cardiac rhythms and perform cardiac defibrillation.

Basic requirement of MFR:

- Recognize the nature and seriousness of the patient‘s condition or extent of injuries to assess requirements for Emergency Medical Care.
- Administer appropriate Emergency Medical Care based on assessment findings of the patient‘s condition.
- Lift, move, position and otherwise handle the patient to minimize discomfort and prevent further injury.
- After providing initial care, preparing the patient for transport to an area hospital and continuing care enroute.
- Perform safely and effectively the expectations of the job description.

Qualities of the MFR

The MFR must possess, among others, these qualities:

- Responsible
- Sociable
- Honest
- Good sense of humour
- Pride (hygiene, uniform, personal appearance)
- Emotionally stable
- Professional demeanors
- Good physical condition
- Demonstrated ability
- Resourceful

Duties of the MFR:

- Ensure your safety and the safety of your crew, the patient, and bystanders.
- Gain access to the patient.
- Assess the patient to identify life-threatening problems.
- Alert additional EMS resources.
- Provide care based on assessment.
- Assist other EMS personnel.
- Participate in record-keeping and data collection as received.
- Act as liaison with other public safety workers.
- Perform patient preparation for movement and transportation

Legal Aspects and Protocols: Legal aspects vary country to country. The legal sanctity to MFR for giving first aid to the victim, Local legislation **(Indian Panel Code sec 92)**

Indian Penal Code Sec 92: Act done in good faith for benefit of a person without consent- nothing is an offence by reason of any harm which it may cause to person for whose benefit it is done in good faith, even without that person's consent, if the circumstances are such that it is impossible for that person to signify consent, or if that person is capable of giving consent, and has no guardian or other person in lawful charge of him from whom it is possible to obtain consent in time for the thing to be done with benefit.

Responsibilities of the MFR:

Professional responsibility refers to the legal and ethical obligation that all persons who practice any profession must be accountable before the law for any acts that cause harm as a result of carrying out that activity.

Scope of Care: Actions that are legally allowed by the MFR when providing patient care. The scope of care in Indian situation is the skills and knowledge learned in this course as it has been approved by MHA.

Duty to act: The Medical First Responder had a legal duty to provide care.

Abandonment: Discontinuing emergency medical care without making sure that another health care professional with equal or better training has taken over.

Negligence: Failure to provide the expected standard of care, aggravating injury or causing death of the patient.

Quality & duty of a good MFR

Do's	Don't
He may be able to assess the scene or situation	Never comes in abandonment and negligence-case
He may be able to know about scene size-up	Never be a careless or irresponsible
He may be able to know about scene secure	Never be a emotional person
He have to take consent when going to give emergency care to patient	Never be a physically unfit
He knows to alert EMS	Never be a mentally unstable
He having knowledge about rights of the patient	
He has to stabilize the victim in a professional manner.	
He has a good knowledge of preparing patient hand off report.	

Scope Of Work (MFR): A scope of work of a Medical First Responder is to minimize the life threatening condition with rapid assessment and giving emergency care at the basic EMS level with the consent of victim or relatives or bystanders in all worsening conditions or situations with the care of himself first, by using personal protective equipments and making Hand off report, until EMS not arrives on the scene.

Rights of the patient:

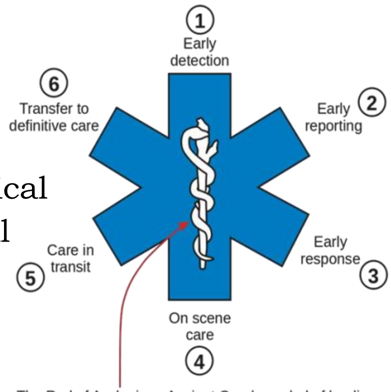
- To solicit and receive pre-hospital care.
- Confidentiality regarding personal information and condition.
- To pursue legal recourse for acts of negligence, abandonment, and/or violations of, confidentiality.
- To denounce and demand restitution for improper care and/or any violation of privacy.
- In some situations, the patient has the right to refuse care. The patient may be required to sign a refusal form in the presence of a witness.

EMS (Emergency Medical Services)

Definition: The Emergency Medical Services system is a network of resources linked together for the purpose of providing Emergency Care and transport to victims of sudden illness or injury.

Or

Emergency Medical Services, also known as **Ambulance services** or **Paramedic services** are a type of emergency service dedicated to providing out-of-hospital acute medical care, transport to definitive care, and other medical transport to patients with illnesses and injuries which prevent the patient from transporting themselves.



Purpose: the purpose of Emergency Medical Services is to fulfill the basic principles of first aid, by which can save Life, can prevent any further severe Injury, and Promote Recovery. This common theme in medicine is demonstrated by the "**star of life**". The Star of Life shown here, where each of the '**arms**' to the star represent one of the six points, are used to represent the six stages of high quality pre-hospital care, which are:

- **Early detection** – members of the public, or another agency, find the incident and understand the problem.
- **Early reporting** – the first persons on scene make a call to the Emergency Medical Services (108) and provide details to enable a response to be mounted.
- **Early response** – The first professional (EMS) rescuers are dispatched and arrive on scene as quickly as possible, enabling care to begin.

- **Good on-scene/ field care** – The Emergency medical service provides appropriate and timely interventions to treat the patient at the scene of the incident without doing further harm.
- **Care in transit** -– The Emergency medical service load the patient in to suitable transport and continue to provide appropriate medical care throughout the journey.
- **Transfer to definitive care** – The patient is handed over to an appropriate care setting, such as the emergency department at a hospital, in to the care of physicians

Countries have this kind of ambulance service at dial no.

- U.S.A Dial Number 911
- Europe Dial Number 112
- England Dial Number 999
- Bangladesh Dial Number 199
- Bhutan Dial Number 112
- India Dial Number 102/108
- China Dial Number 120
- Nepal Dial Number 102
- Pakistan Dial Number 115
- Sri lanka Dial Number 110

EMS Relation with Disaster

EMS has been designated as the lead agency for coordinating disaster medical services. EMS also facilitates the evacuation of injured disaster victims to hospitals in areas/regions not impacted by the disaster.

1- Ambulance: The term Ambulance comes from the Latin word—Ambulare as meaning to walk or move which is a reference to early medical care.

Where patients were move by lifting or wheeling. Ambulances were first used for emergency transport in 1487 by the Spanish forces (during the siege of Malaga by the Catholic Monarchs against the Emirates of Granada). Advances in technology throughout the 19th, 20thand 21stcenturies led to the modern self-powered Ambulances.

An Ambulance is a vehicle for transportation of sick of injured people to, from or between places of treatment for an illness or injury, and in some instance will also provide out of Hospital medical care to the patient.

It is of two types.

- Normal Ambulance/Basic life support Ambulance
- Advanced Ambulance

EMS system in India:

- 108 (Emergency telephone usually pronounced "one-zero-eight") is a free telephone number for emergency services to call in the India.

- The service is a public-private partnership between state governments and private EMS providers. This (108) system was introduced by Central government of India. And the system was designed by Satyam Infotech.
- The 108 Emergency Response Services is a free 24/7 emergency service for providing integrated medical, police and fire emergency services in India.

1- **Basic Life Support (BLS):** Ambulances provide transport to patients who do not require extra support or cardiac monitoring.
2- **Advanced Life Support (ALS):** Ambulances that (staffed by Paramedic) transport patients who need a higher level of care during transport, above those services provided by a BLS ambulance. Patients who typically require ALS transport include:
   - Any medical/surgical patient with a continuous IV medicine but does not need a RN (REGISTERED NURSE) per state protocols.
   - Any patient on a Cardiac Monitor
   - Obstetrical Patients
   - Patients from urgent care centers
   - Patients with potential airway compromise
   - Any patient deemed to have a potential complication during transport when report is received from the sending facility.

Trauma Emergency: There is a substantial difference between the care a patient receives at emergency departments (frequently called the emergency room) and trauma centers. Most hospitals have an emergency department; this is where patients come with emergency illnesses and injuries, some of which may be life-threatening.

Trauma Emergency relation with disaster: Both natural and human generated disasters, which are associated with destruction as well as loss of loved ones and irreplaceable belongings, often overwhelm one‘s normal coping capacity.

Medical Emergency: The purpose of any Emergency Department is to save lives. An emergency is any medical problem that could cause death or permanent injury if not treated quickly. Severe pain in some instances can also be a medical emergency, such as the pain associated with kidney stones or appendicitis.

Some examples of Medical Emergencies are:

- Chest pain accompanied by sweating, nausea, vomiting, shortness of breath, radiating pain that moves to the arm or neck, dizziness, or feeling that your heart is beating irregularly or too fast

- Choking
- Severe bleeding that doesn't stop after 15 minutes of direct pressure
- Fainting
- Broken or displaced bones
- Swallowing poison
- Burns
- Suddenly not being able to walk, speak, or move a portion of your body
- Shortness of breath or difficulty in breathing.

Gaining Consent

Consent is a legal term that means to give formal permission for something to happen.

Implied consent: Consent assumed on the part of an unconscious, confused or seriously injured patient or, for a minor patient that cannot make decisions. It is assumed that if the person is conscious, he or she would authorize care; likewise, one assumes that if a relative or the minor's guardian is present, he or she would authorize care.

Expressed consent: Permission obtained from every responsive, competent adult patient before providing emergency care. A relative or legal guardian may give expressed consent to care for an unconscious, confused or seriously injured patient or to a minor or mentally handicapped person.

Personal Protective Equipment: -
The five most common components of PPE are:

- Latex gloves
- Personal mask
- Eye protection
- Gown
- CPR mask

Disposal of waste: - Always discards contaminated items properly. Your safety and the safety of others are at risk from cross contamination.

All bodily fluids are considered infectious and you must take appropriate precautions for all patients at all times!

Unit Summary

a. What is First aid?

First aid is the Emergency care and medical attention that is typically administered, immediately after an injury or illness occurs. It usually consists of one time, short term treatment, such as cleaning minor/major cuts, treating minor burns, applying dressing- bandages, splinting, giving care of FBAO and CPR ,and using non-prescription medicines.

b. Aims of First aid?

- To preserve life of patient/victim.
- To prevent the worsening of one's medical condition of the patient/victim.
- To promote recovery of the patient/victim.
- To help to ensure safe transportation to the nearest health care facility.

c. Who is Medical First Responder?

The first person on the scene of an incident with Emergency Medical Care skills, typically trained to the most basic EMS level.

d. Emergency Medical Services (EMS)?

EMS also known as ambulance services or paramedic services, are a type of emergency service dedicated to providing out of hospital acute medical care, transport to definitive care, and other medical transport to patients with illnesses and injuries which prevent the patient from transporting themselves.

e. Responsibilities of the MFR?

Professional responsibility refers to the legal and ethical obligation that all persons who practice any profession must be accountable before the law for any acts that cause harm as a result of carrying out that activity.

f. What is Negligence?

Failure to provide the expected standard of care, aggravating injury or causing death of the patient.

g. What is Abandonment?

Discontinuing emergency medical care without making sure that another health care professional with equal or better training has taken over.

Self- Assessment

Objective Questions:

1. Ending care of a patient without his consent, or without ensuring that someone with equal or higher training will continue the care, is called:
    a. Abandonment
    b. Refusal of care
    c. Transfer of function
    d. Competence

2. All documentation should be:
    a. Perfectly handwritten, accurate, and without error
    b. Bulleted, with the diagnosis clearly indicated
    c. Legible, professional, and complete
    d. Typed, on time, and signed by the patient

3. When obtaining consent before caring for someone, which of the following you do not has to do?
    a. Have the person sign the Acceptance of Treatment form
    b. Identify yourself with your name
    c. Indicate what you think may be wrong and what you plan to do
    d. State your level of training

4. What type of consent is necessary from responsive, competant adult patients?
    a. Implied
    b. Applied
    c. Absentee
    d. Expressed

5. What type of consent is used when a patient is unresponsive?
    a. Informed
    b. Expressed
    c. Assumed
    d. Implied

6. Which one of the following is NOT true about expressed consent?
    a. It is also known as informed consent.
    b. It must always be given verbally by the patient.
    c. It can be given by parents of minors on their behalf.
    d. The patient must be informed of your intentions.

7. What is the Emergency Medical Responder's primary concern at an emergency scene?
    a. Own personal safety
    b. Patient safety
    c. Scene stabilization
    d. Patient care

8. Who is responsible for evaluating the effectiveness of the EMS services?
    a. Each state EMS system
    b. Federal EMS system
    c. Training program coordinator
    d. Dispatch operator supervisor

9. Which of the following is NOT a main patient-related duty of the Emergency Medical Responder?
    a. Always reposition the patient
    b. Determine the patient's chief complaint
    c. Be the patient's advocate
    d. Transfer the patient and his information

Descriptive Questions:

1. Explain what is meant by Abandonment, Negligence and Confidentiality?
2. Mention at least 08 Qualities of an MFR?
3. Write down the six signs and symptoms of critical incident stress
4. Mention at least 05 duties of an MFR?
5. What would you do?

Read the following scenario and answer the questions below:

While you are driving to work one morning, you see someone has fallen off his bicycle and seems to be bleeding from his leg quite severely. As you get closer, you notice that the bike is badly damaged and the person has several cuts and scrapes all over him.

a. In this situation, do you have a duty to act? If so, why? If not, why not?
b. If you do decide to act in this situation, your first concern should be to:
    - Bandage the wounds
    - Determine if there are any other injuries you can‘t see
    - Ensure your safety and the safety of any bystanders
    - Call work and tell them you will be late

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- https://en.wikipedia.org
- Www.livescience.com
- Www.merriam-webster.com
- Thefreedictionary.com
- Www.espressoenglish.net
- Www.safety.blr.com

LESSON NO –02

Infectious Disease and Precautions

Introduction

Infectious diseases are disorders caused by organisms such as bacteria, viruses, fungi or parasites. Many organisms live in and on our bodies. They're normally harmless or even beneficial, but under certain conditions, some organisms may cause disease.

Some infectious diseases can be passed from person to person. Some are transmitted by bites from insects or animals. And others are acquired by ingesting contaminated food or water or being exposed to organisms in the environment. Signs and symptoms vary depending on the organism causing the infection, but often include fever and fatigue. Mild infections may respond to rest and home remedies, while some life-threatening infections may require hospitalization. Many infectious diseases, such as measles and chickenpox, can be prevented by vaccines. Frequent and thorough hand-washing also protect you from most infectious diseases.

Outcomes

Upon completion of this lesson, you will be able to:

- Know what is an Infectious disease?
- Know causes of infectious diseases.
- Describe the two means of transmission of infectious diseases.
- Define various types of infectious diseases.
- Define Hepatitis and AIDS.
- Define BSI (Body Substance Isolation).

Terminology

Infectious Disease: Infectious diseases are caused by the transmission of pathogens, which are microorganisms such as bacteria and viruses. Pathogens can be transmitted by direct contact - horizontal and vertical transmission - and by indirect contact - vehicle-borne transmission and vector-borne transmission.

Pathogens: Pathogens are microorganisms that cause infectious disease. Pathogens are mostly bacteria but some are viruses, fungi and protozoans.

Airborne transmission: The transmission of a disease by inhaling infected droplets that becomes airborne when an infected person coughs or sneezes.

Blood-borne pathogens: Bacteria and Viruses present in human blood and body fluids that can cause disease in humans.

Endemic diseases: Diseases those are prevalent in or peculiar to a particular locality, region, or people.

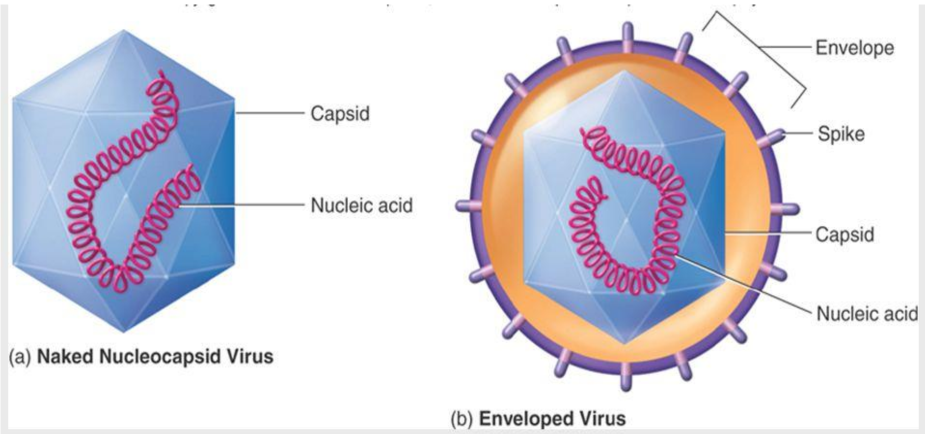
Epidemic: The occurrence of cases of a particular disease in excess of the expected. (Therefore, demanding that emergency control measures be implemented.)

Vaccine-preventable diseases: Diseases such as measles, malaria and meningitis can be prevented through vaccinations.

Bacteria: One-celled micro-organisms that may cause infections.Bacteria are living cells and, in favorable conditions, can multiply rapidly. Once inside the body they release poisons or toxins that fall us ill. Bacteria comes in many shapes and sizes but even the largest are only 10 micro meters long (10 millionths of a meter).

Virus: Viruses are many times smaller than bacteria. They are among the smallest organisms known and consist of a fragment of genetic material inside a protective protein coat.

Viruses are tiny organisms that may lead to mild to severe illnesses in humans, animals and plants. This may include flu or a cold to something more life threatening like HIV/AIDS. The virus particles are 100 times smaller than a single bacteria cell. They cannot grow or multiply on their own and need to enter a human or animal cell and take over the cell to help them multiply. These viruses may also infect bacterial cells.



Transmission of pathogens

Microorganisms can be transmitted in two main ways: direct contact and indirect contact.

Direct Contact: Direct contact means disease-causing microbe is passed from one person to another when their bodies come in contact in some way. This occurs through contact with bodily fluids, open wounds or exposed tissues or mucous membranes of the mouth, eyes or nose.

Vertical transmission occurs when microorganisms pass from mother to her unborn baby through the placenta. German measles and HIV can be passed in this way.

Horizontal transmission occurs when microorganisms pass from one person to another by touching, kissing or sexual intercourse.

Indirect Contact: Indirect contact occurs when microorganisms are carried to a person in some way instead of actual body to body contact. As airborne pathogens spread by tiny droplets during breathing, coughing or sneezing, or by way of contaminated objects such as needles.

Vehicle-borne transmission involves an object (Toys, keys etc) carrying the disease-causing microorganism.

Vector-borne transmission involves an animal such as an insect. For example, malaria is transmitted by mosquitoes, dysentery by houseflies and plague by fleas.

Diseases of Concern

As a medical first responder, you can be exposed to infectious diseases whenever you treat a patient. There are several infectious diseases to which you may be exposed to, including:

- Malaria
- Meningitis
- Diarrhea
- Influenza

- Dengue
- Hepatitis
- Measles
- Mums
- Rubella
- Sexually Transmitted Diseases (STDs)
- Common cold
- Cholera
- Typhoid
- Polio
- Plague

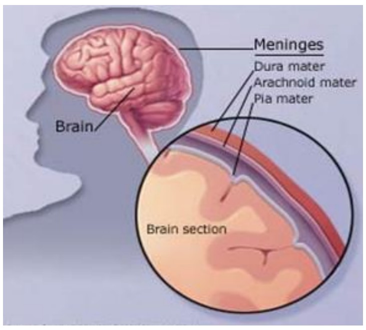
Malaria

Malaria is a life-threatening mosquito-borne infectious disease caused by a Plasmodium parasite (a group of single-celled microorganisms).It is transmitted to humans through the bite of the Anopheles mosquito. The mosquito bite introduces the parasites from the mosquito's saliva into a person's blood

The risk of disease can be reduced by preventing mosquito bites through the use of mosquito nets and insect repellents, or with mosquito control measures such as spraying insecticides and draining standing water. Several medications are available to prevent malaria in travellers to areas where the disease is common.

Meningitis

Meningitis, often known as spinal meningitis is an infection of the spinal cord. It is usually the result of a viral or bacterial infection. Meningitis is a rare infection that affects the delicate membranes called **meninges** that cover the **brain and spinal cord.**



Bacterial meningitis can be life-threatening and spreads among people in close contact with each other. Viral meningitis tends to be less severe, and most people recover completely without treatment. Fungal meningitis is a rare form of the disease. It usually occurs in people who have a weak immune system.

Fungal Diseases

Fungi are everywhere. There are approximately 1.5 million different species of fungi on Earth, but only about 300 of those are known to make people sick. Fungal diseases are often caused by fungi that are common in the environment. Fungi live outdoors in soil and on plants and trees as well as on many indoor surfaces and on human skin. Most fungi are not dangerous but few can be harmful to health. Once harmful fungi invade the body itis difficult to kill as they can survive in the environment and re-infect the person trying to get better.

Diarrhea

It often lasts for a few days and can result in dehydration due to fluid loss. Signs of dehydration often begin with loss of the normal stretchiness of the skin and irritable behavior. This can progress to decreased urination, loss of skin color, a fast heart rate, and a decrease in responsiveness as it becomes more severe.

The most common cause is an infection of the intestines due to either a virus, bacteria, or parasite - a condition also known as gastroenteritis. These infections are often acquired from food or water that has been contaminated by feces, or directly from another person who is infected. The three types of diarrhea are: short duration watery diarrhea, short duration bloody diarrhea, and persistent diarrhea (lasting more than two weeks).

Diarrhea can be prevented by improved sanitation, clean drinking water, and hand washing with soap. Breastfeeding for at least six months and vaccination against rotavirus is also recommended for infant. **Oral Rehydration Solution (ORS)** or clean water with modest amounts of salts and sugar is helpful for recovery.

Note: (Water : Salt : Sugar :: 1litre : 2.9 gram(1/2 level tea spoon) : 25.2 gram (6 level tea spoons)

Virus Infections

Influenza

The flu/influenza is a contagious respiratory illness caused by influenza viruses that infect the nose, throat, and sometimes the lungs. The influenza virus attacks the human respiratory tract, causing symptoms such as fever, headaches, fatigue, coughing, sore throat, nasal congestion, and body aches. It can cause mild to severe illness and at times can lead to death.

The influenza virus belongs to the Orthomyxo virus group and comprises of four types:

- ✓ Influenza A
- ✓ Influenza B
- ✓ Influenza C
- ✓ Influenza D

The most effective way to prevent the disease is vaccination. Safe and effective vaccines are available. Immunity from vaccination wanes over time so annual vaccination is recommended to protect against influenza. Patients are advised, to stay home in order to minimize the risk of infecting others in the community.

Dengue fever

Dengue fever is transmitted by **Aedes mosquitoes**. The disease has an **incubation period** of less than 7 days. The acute phase of the illness with fever and muscle pain lasts about one to two weeks.

Symptoms of Dengue Fever:

- severe joint pain
- muscle pain
- swollen lymph nodes
- headache
- fever
- exhaustion
- rash

The complication of dengue causes abdominal pain, hemorrhage (bleeding), and circulatory collapse (shock).

The prevention of dengue fever requires control or eradication of the mosquitoes carrying the virus that causes dengue.

Hepatitis

Hepatitis is an inflammation of the liver. The condition can be self-limiting or can progress to fibrosis (scarring), cirrhosis or liver cancer. Hepatitis viruses are the most common cause of hepatitis in the world but other infections, toxic substances (e.g. alcohol, certain drugs), and autoimmune diseases can also cause hepatitis.

There are 5 main hepatitis viruses, referred as types A, B, C, D and E. These 5 types are of greatest concern because of illness and death they cause and the potential of outbreaks and epidemic spread. In particular, types B and C lead to chronic disease in hundreds of millions of people and together are the most common cause of liver cirrhosis and cancer.

- ✓ **Hepatitis A**
- ✓ **Hepatitis B**
- ✓ **Hepatitis C**
- ✓ **Hepatitis D**
- ✓ **Hepatitis E**

Acute infection may occur with limited or no symptoms, or may include symptoms such as jaundice (yellowing of the skin and eyes), dark urine, extreme fatigue, nausea, vomiting and abdominal pain.

Measles also known as rubella or morbilli is an endemic disease. Measles is a viral disease that can spread rapidly. It is an unpleasant condition but one is normally cured without treatment within 7 to 10 days. After a bout of measles, a person gains immunity for the rest of their life. They are very unlikely to cause measles a second time.

Mumps is a contagious disease caused by a virus that passes from one person to another through respiratory droplets, saliva, nasal secretions, and close personal contact. Only humans get and spread the disease. The condition primarily affects the salivary glands, also called the parotid glands. These glands are responsible for producing saliva. There are three sets of salivary glands on each side of your face, located behind and below your ears. The hallmark symptom of mumps is swelling of the salivary glands.

Initial signs and symptoms often include fever, muscle pain, headache, and feeling tired. This is then usually followed by painful swelling of one or both parotid salivary glands.

Mumps is preventable by two doses of the mumps vaccine. Most of the countries include it in their immunization programs, often in combination with measles, rubella, and varicella vaccine.

Rubella is **caused by** a virus. It is spread in the same way as any viral cold - by tiny droplets produced from the nose and mouth. It's not as contagious as a cold or the measles, but it has a long incubation period (the time between getting infected with the virus and getting sick) that varies from 12 to 23 days.

It is caused by the rubella virus (not the same virus that causes measles). Rubella spreads when people breathe in virus-infected fluid, such as the droplets sprayed into the air when a person with rubella sneezes or coughs, or share food or drink with someone who's infected.

Japanese Encephalitis (JE) is an infection of the brain caused by the Japanese Encephalitis Virus (JEV). While most infections result in little or no symptoms, occasional inflammation of the brain occurs. In these cases symptoms may include headache, vomiting, fever, confusion, and seizures. This occurs about 5 to 15 days after infection. Symptoms that develop later include swelling around the brain and coma. JE is a serious disease that may cause death.

JEV is generally spread by mosquitoes, specifically those of the Culex type. Pigs and wild birds serve as a reservoir for the virus.

Prevention is generally with the Japanese encephalitis vaccine is called **JENVAC**, which is safe and highly effective. Other measures include avoiding mosquito bites. Once infected there is no specific treatment, with care being supportive. This is generally carried out in hospital.

Rabies virus is an infectious viral disease that is always fatal following the onset of clinical symptoms. In 99% of cases, domestic dogs are responsible for rabies virus transmission to humans. Yet, rabies can be caused by both domestic and wild animals. It spreads to people through bites or scratches, usually via saliva.

Human Immunodeficiency Virus (HIV)

HIV stands for **H**uman Immunodeficiency Virus. If left untreated, HIV can lead to the disease AIDS (Acquired Immunodeficiency syndrome). HIV is a virus that attacks the immune system, the body's natural defense system. White blood cells are an important part of the immune system. HIV infects and destroys certain white blood cells called CD4+ cells. People with AIDS have a low number of CD4+ cells and get infections or cancer. But having HIV doesn't mean you have AIDS. Even without treatment, it takes a long time for HIV to progress to AIDS- usually 10 to 12 years.

When HIV is diagnosed before it becomes AIDS, medicines can slow or stop the damage to the immune system. If AIDS does develop, medicines can often help the immune system return to a healthier stage. AIDS stands for acquired immunodeficiency syndrome. AIDS is the final stage of HIV infection, and not everyone who has HIV advances to this stage. AIDS is the stage of infection that occurs when your immune system is badly damaged and you become vulnerable to opportunistic infections.

Without treatment, people who are diagnosed with AIDS typically survive about 3 years. Once someone has a dangerous opportunistic illness, life expectancy without treatment falls to about 1 year. People with AIDS need medical treatment to prevent death.

Sign and Symptoms

Each infectious disease has its own specific signs and symptoms. General signs and symptoms common to a number of infectious diseases include:

- Nausea
- Headache, chest or abdominal pain
- Coughing or shortness of breath
- Diarrhea
- Fatigue
- Muscle aches
- Rapid weight loss
- Recurring fever or profuse night sweats
- Extreme and unexplained tiredness
- Prolonged swelling of the lymph glands in the armpits, groin, or neck
- Pneumonia

- Red, brown, pink, or purplish blotches on or under the skin or inside the mouth, nose, or eyelids
- Memory loss, depression, and other neurologic disorders.

Note: Patients contaminated with an infectious disease may not present with signs or symptoms. A major source of infectious transmission is the "chronic carrier". Such a person can carry an infection for years without signs or symptoms.

Infectious Disease

Sl No	Disease	Causes	Affected Organs	Sign & Symptoms
1.	**Tuberculosis (TB)**	*Mycobacterium tuberculosis*	Lungs	Chronic cough with blood-containing sputum, fever, night sweats, and weight loss
	Preventive measures	○ TB infection can be control by the use of respirators and masks. ○ If you have TB, or you might have TB, then when you cough you should cover your mouth and nose with appropriate barrier. ○ You should not cough into your hands. After you have coughed you should wash your hands.		
2.	**Diarrhoeal disease**	***Bacteria** salmonella, shigella and Escherichia coli.* ***Rotavirus*** ***parasites** Giardia lamblia and cryptosporidium*	Gastrointestinal tract.	Loose watery stools, Abdominal cramps, Abdominal pain, Fever, Blood in the stool
	Preventive measures	○ Diarrhea can be prevented by improved sanitation, clean drinking water, and hand washing with soap. ○ Breastfeeding for at least six months and vaccination against rotavirus is also recommended for infant. ○ **Oral rehydration solution (ORS)** or clean water with modest amounts of salts and sugar is helpful for recovery. • **Note:** (Water : Salt : Sugar :: 1 litre : 2.9 gram(1/2 level tea spoon) : 25.2 gram (6 level tea spoons)		
3.	**Cholera**	*Bacteria* *Vibrio cholerae.*	Intestines	Rapid heart rate, Loss of skin elasticity, Dry mucous membranes, Low blood pressure, Thirst, Muscle cramps.
	Preventive measures	○ Drink and use safe water. ○ Drink only water that you have boiled or treated with chlorine or iodine. ○ Eat only foods that have been thoroughly cooked and are still hot, or fruit that you have peeled yourself.		
4.	**Hepatitis A**	*Hepatitis A virus (HAV)* *Contaminated food or water*		Fatigue, flu-like symptoms, dark urine,

5.	**Hepatitis B**	*Hepatitis B virus (HBV)* *Infectious body fluids, such as blood, vaginal secretions, or semen.*	Liver	pale stool, abdominal pain, unexplained weight loss, yellow skin and eyes, which may be signs of jaundice.
6.	**Hepatitis C**	*Hepatitis C virus (HCV)* *Direct contact with infected body fluids (blood borne viral infections)*		
7.	**Hepatitis D**	*Hepatitis D virus (HDV)* *Direct contact with infected blood*		
8.	**Hepatitis E**	*Hepatitis E virus (HEV)* *Waterborne disease*		
9.	**Malaria**	*Plasmodium* *(parasitic protozoan microorganism)* *mosquito-borne infectious disease* *female Anopheles mosquito*	Spleen, Liver and blood cell	Fever, fatigue, chills, vomiting, headaches, diarrhea, anemia, muscle pain, Profuse sweating, convulsions, bloody stools.
	Preventive measures	○ Bite prevention – avoid mosquito bites by covering your arms and legs, and using a mosquito net.		
10.	**Typhoid Fever**	*Salmonellae typhi bacteria* *Salmonella paratyphi bacteria* *contaminated food or water*	Spread into the bloodstream	poor appetite, headaches, diarrhea, generalized aches and pains, fever, and lethargy.
	Preventive measures	○ Wash hands frequently in hot, soapy water before eating or preparing food, as well as after using the toilet. ○ Alcohol-based sanitizer can be used in the absence of hot water. ○ Avoid drinking contaminated water by ensuring water is bottled or boiled.		
11.	**AIDS**	*Human immunodeficiency virus (HIV)*	Immune system	
	Preventive measures	○ HIV is spread by body fluids like blood, semen, pre-seminal fluids, rectal fluids, vaginal fluids, and breast milk from a person who has HIV. Please avoid these.		
12.	**Common Cold**	*Rhinovirus*	Upper Respiratory Tract Infections (URTI)	runny nose, scratchy throat, and nonstop sneezing
13.	**Bronchitis**	*Bronchitis can be caused by viruses, bacteria, and other particles that irritate the bronchial tubes*	Bronchial tubes (LUNGS) (bronchial tubes becomes inflamed)	Persistent cough, which may produce mucus, Wheezing, Low fever, Chest tightening, Sore throat, Body aches,

				Headaches, Blocked nose Breathlessness
14.	**Pneumonia**	*Pneumonia may be caused by viruses, bacteria, or fungi.* *The most common bacterial type that causes pneumonia* *is* Streptococcus *pneumoniae*	Lungs	Fever, chills, cough, shortness of breath, and fatigue
15.	**Measles** **German measles**	*Paramyxo virus* *Rubeola virus*	Brain tissue	Watery eyes, sneezing, and a dry hacking cough, fever, rashes.
16.	**Mumps**	*Mumps virus*	Swelling of the salivary glands	Fatigue, body aches, headache, loss of appetite, low-grade fever
17.	**Tetanus**	*Clostridium tetani bacteria* (found in soil, dust and animal feces)	Nervous system	Painful muscle contractions
18.	**Dengue**	*Dengue virus* *(spread by the Aedes mosquito)*	Liver and the bone marrow	Muscle and joint pain, rash, loss of appetite and swollen lymph nodes. Other symptoms of dengue are diarrhea, vomiting and mild bleeding from gums and nose.
	Preventive measures	○ The prevention of dengue fever requires control or eradication of the mosquitoes carrying the virus that causes dengue.		
19.	**Influenza**	*Influenza virus*	Respiratory tract	High fever, runny nose, sore throat, headache, coughing, muscle pains and feeling tired
	Preventive measures	○ The most effective way to prevent the disease is vaccination. ○ Annual vaccination is recommended to protect against influenza. ○ Patients are advised, to stay home in order to minimize the risk of infecting others in the community.		
20.	**Chikungunya**	*Chikungunya virus (CHIKV)* virus is spread by two types of mosquitos: Aedesalbopictus and Aedesaegypti.	Lymphoid tissues, liver, CNS, joints, and muscle	fever, joint pain, headache, muscle pain, joint swelling, and a rash.
21.	**Meningitis**	*Viral infections are the most common cause of*	Central nervous system(Brain and	fever, headache, neck stiffness , confusion or

		meningitis, followed by bacterial infections and, rarely, fungal infections.	spinal cord) (Meningitis is an infection that causes the protective membranes of the nervous system to swell)	altered consciousness, vomiting, and an inability to tolerate light or loud noises
22.	**Polio(poliomyelitis)**	*Poliovirus*	Nervous system (spinal cord)	Muscle weakness or myasthenia, Fever, headache, nausea and vomiting.
23.	**Smallpox**	*Variola virus*	Skin	High fever, skin rash, fluid filled bumps, head and body aches, general malaise and occasional vomiting.
24.	**Chickenpox**	*varicella zoster virus (VZV)*	Skin	Skin rash that forms small, itchy blisters, fever, tiredness, and headaches.

Body Substance Isolation (BSI)

Definition: A strict way of infection control based on the premise that blood and other bodily fluids are infectious.

Body substance isolation (BSI) consists of a combination of equipment and procedures that protect you from the bodily fluids of the patient. With BSI precautions, it is possible to take care of patients safely, including those with infectious diseases. BSI precautions fall under three categories.

Hand-washing: The single most important way to prevent infection (even if wearing gloves).

Cleaning equipment: Cleaning, disinfecting, and sterilizing are related terms.

Cleaning is simply washing an object with soap and water.
Disinfecting is cleaning plus using a chemical like alcohol or bleach to kill most of the pathogens.
Sterilizing *is a process in which a chemical or other process (such as* superheated steam) is used to kill all microorganisms on the object.

Using personal protective equipment (PPE): You must always use PPE to protect against infection. This will prevent you from coming into contact with blood and other bodily fluids. The five most common components of PPE are:

- Latex gloves

- Personal mask
- Eye Protection
- Gown
- CPR mask

Important:

- Always discard contaminated items properly.
- Your safety and the safety of others is at risk from cross contamination.
- All bodily fluids are considered infectious and you must take appropriate precautions for all patients at all times!!

Immunisation

The following immunizations are recommended for active duty MFR's:

- Tetanus prophylaxis (every 10 years)
- Hepatitis-A Vaccine
- Hepatitis-B Vaccine
- Influenza vaccine (every year)
- Polio
- Rubella (German measles)
- Measles
- Mumps

However in India Influenza, Polio, Rubella, Measles and Mumps vaccines are to be given only if childhood immunization is incomplete.

Reporting of Exposures

Report any suspected exposure to blood or bodily fluids to your supervisor as soon as possible. Include it in your report the date and time of the exposure, the type and the amount of bodily fluids involved, and details of the incident. All agencies should have a written policy in place to handle exposures to infectious body substances.

Health Education

Health education is not limited to the problem of infectious diseases. However, infectious diseases are a useful starting point for initiating health education in a disaster situation. The risks involved in infectious diseases must be well understood by the affected community, and the need for their participation in controlling them.

Health education should take into consideration other components that influence behavior. An important key to diminish adverse health effects due to natural disasters is a multidisciplinary approach with a wide range of proficiency which is useful in prevention and also immediate treatment of communicable diseases.

The establishment, implementation, and continuous monitoring of minimum standards for water safety security, sanitation, shelter, and personal hygiene is critical for health promotion after disasters. Awareness of the emergence of water and food born disease is of importance to the health of the victims. Furthermore by establishment of a surveillance system and monitoring the trend of disease carefully, the threat of outbreaks will be assessed. In addition, some strategic guidelines for controlling outbreaks are needed.

This approach needs extensive continuous preparation, planning, education and also policy development. The ultimate goal is better awareness and response for natural disaster or other complex emergency circumstances to minimize the morbidity and mortality of such ominous events.

Summary

Infectious Disease: Infectious diseases are caused by the transmission of pathogens, which are microorganisms such as bacteria and viruses. Pathogens can be transmitted by direct contact and indirect contact.

Pathogens: Pathogens are microorganisms that cause infectious disease. Pathogens are mostly bacteria but some are viruses, fungi and protectants.

Transmission of Pathogens/Infectious Disease

Microorganisms can be transmitted in two main ways: direct contact and indirect contact.

- ✓ Direct Contact:
- ✓ Indirect Contact

Diseases of Concern

As a medical first responder, you can be exposed to infectious diseases whenever you treat a patient. There are several other infectious to which you may be exposed to, including

- Malaria
- Meningitis
- Diarrhea
- Influenza
- Dengue
- Hepatitis
- Measles
- Mums
- Rubella
- Sexually transmitted diseases (STDs)
- Common cold
- Cholera

- Typhoid
- Polio

Body Substance Isolation (BSI)

Body substance isolation (BSI) consists of a combination of equipment and procedures that protect you from the bodily fluids of the patient. With BSI precautions, it is possible to take care of patients safely, including those with infectious diseases.

Immunization

The following immunizations are recommended for active duty MFR's:

- Tetanus prophylaxis (every 10 years)
- Hepatitis-A Vaccine
- Hepatitis-B Vaccine
- Influenza vaccine (every year)
- Polio
- Rubella (German measles)
- Measles
- Mumps

However in India Influenza, Polio, Rubella, Measles and Mumps vaccines are to be given only if childhood immunization is incomplete.

Self- Assessment

Objective Questions

1. What is the full form of HIV?
   a. Human Indigenous Virus
   b. Heart Infected Virus
   c. Human Immune Virus
   d. None of These
2. People who are infected with, likely to live their whole life.
   a. Acquired Immune Deficiency Syndrome (AIDS)
   b. HIV

c. lungs cancer
d. All of above

3. Variola virus has been known to cause__________
   a. Malaria
   b. Measles
   c. Smallpox
   d. Chickenpox
4. A sudden increase in number of people having disease is called as
   a. Pandemic
   b. Prodemic
   c. Endemic
   d. Epidemic
5. Bacteria are known to cause
   a. Cholera
   b. Acquired Immune Deficiency Syndrome (HIV/AIDS)
   c. Malaria
   d. Measles
6. Bacteria are.
   a. Non-living
   b. Unicellular organisms
   c. Multicellular organisms
   d. Complex organisms
7. Polio can lead to.
   a. Paralysis
   b. Nervous system distracted
   c. Both a and b
   d. Eye diseases
8. Transfusion of infected blood is main reason for spread of diseases like.
   a. AIDS
   b. Hepatitis B
   c. Both a and b
   d. Polio
9. Viruses are made up of.
   a. DNA
   b. RNA
   c. Protein coat
   d. All of them
10. Diseases which are caused by micro-organisms are called.
   a. Contagious

b. Venereal
c. Infectious
d. Incurable

Descriptive Question

1. Define Body Substance Isolation (BSI) method.

2. Write the name of virus infected disease.

3. What is infectious disease and method of transmission of infectious disease?

4. What is difference between bacteria and virus?

5. What is hepatitis and its various types?

Reference:

- Peer instructor's guide for medical first responder course
- Bready: first responder book 8th edition
- https://en.wikipedia.org
- www.livestrong.com › Health
- firstaidcprhamilton.ca › Minor Medical Emergencies
- www.livestrong.com › Diseases and Conditions

LESSON-3

The Incident

Introduction

There are so much ambiguity and confusion in definition of an incident and accident. These confusions come when we define these two terms in simple (routine) life and disaster situation simultaneously. But for more clarity and to understand in simple way we should define an accident and incident separately for disaster and routine life. In the context of disaster (as we all are rescuer) both deals with negative aspects only as damage or loss of life and property occur in both. But the major difference in this perspective is accident comes with narrow impact and on the other hand incident deals with broader impact.

Outcomes

Upon completion of this lesson, you will be able to know:

- The five items of information to obtain when receiving a call for assistance.
- The five factors to consider when responding to a call.
- The three steps for scene size-up, in proper order.
- The six items of information that should be included in the initial report when arriving at the scene.
- The three priorities when securing the scene.
- The five basic tools used to gain access to a patient trapped in a vehicle.
- The two ways to gain access to a patient trapped in a vehicle.

Terminology

Definition: In disaster context an incident is an event caused by a natural phenomenon or human activity that requires the intervention of emergency service personnel to prevent or mitigate loss of life and damage to property and the environment.

Information to Obtain

Obtain the following five items of information when receiving a call for assistance:

- Address/location of the incident.
- Identify the origin of the call (telephone, radio, in-person, etc.)
- Incident type (what is happening)
- Victims (quantity and condition).
- Actions taken.

Response: When responding to a call, you should consider, among others, the following factors:

- Day of the week (traffic, etc.)
- Time of day (school, business hours, people at home, etc.)
- Weather (rain, wind, storms, etc.)
- Social disturbances, riots
- Topography (winding roads, etc.)
- Hazardous materials (fuel leaks, radiation, etc.)
- Access routes (freeways, crossings, bridges, height, width, road maintenance, land mines, etc.)
- Power lines
- Proper vehicle placement

Types of Incident

- Motor vehicle collision
- Structural fire
- Natural phenomenon
- Water rescue
- Medical emergency
- Hazardous materials
- Structural collapse
- Electrical
- Aircraft accident etc

Difference between Accident and Incident:

Incident:

An incident in general can refer to any event – big or small (minor or catastrophic), good or bad, intentional or un-intentional. A bank robbery, a funny or controversial situation and an argument between celebrities are example of routine life incidents and structural collapse, earthquake, flood, train accident (any manmade or natural disaster) etc. all can be described as incidents. It can involves few to large number of equipments and manpower.

Accident:

We generally define accident is an event which is unpleasant and unfortunate and caused by error, carelessness or by ignorance. Accidents are always unintentional, and they usually result in some damage or injury. A car crash is one example of an accident. When accident occurs at large scale like rail accident then accident treated as incident in general.

All accidents can also be described as incidents – but NOT all incidents are accidents.

Critical Incident Stress

Any emergency that involves a severe injury or death is a critical incident. The stress that these incidents cause may overwhelm a first responder and shut down their ability to cope, that is known as **Critical Incident Stress (CIS).** This condition may have a great impact on the first responder suffering from it, and if left un-treated, may lead a serious condition known as **Post-Traumatic Stress Syndrome.**

Signs of CIS (Critical Incident Stress)

- May not perform well at their job.
- May seem pre-occupied.
- Confusion
- Poor concentration
- Denial
- Guilt
- Anger
- Change in appetite
- Unusual behavior

Treatment: CIS requires professional help to avoid Post-Traumatic Stress Syndrome. However, there are supplements to professional treatment that will help such as:

- Relaxation techniques
- Avoiding drugs and alcohol
- Eating a balanced diet
- Getting enough rest
- Talking with peers

What is Scene?

The place where an incident occurred related to loss of man and material like: road accident, train accident, plane crash, drowning case etc. is called Scene.

Assessment Plan is completed in Six Phases:

The Assessment Plan begins with information received by control room.

- Scene size up
- Initial assessment
- Physical exam
- Patient history
- Ongoing assessment
- Hand off report

1. Scene Size-Up

The evaluation of factors that are used in the decision-making process to establish the strategy and tactics to be used in a particular incident. Ongoing evaluation of the incident begins when the call is received and continues until the incident is successfully mitigated.

2. Initial Assessment

The process used to identify and treat life-threatening problems, concentrating on Level of Consciousness, Cervical Spinal Stabilization, Circulation, Airway, Breathing and forming a General Impression of the patient to determine the priority of care based on your immediate assessment and determining if the patient is a medical or trauma patient.

3. Physical Exam

The physical exam is a thorough survey of the patient's entire body. The physical exam proceeds in a logical order, usually from head to toe, but may vary from patient to patient. The main purpose of the physical exam is to reveal any injury or medical problem that could be a threat to patient survival if left untreated.

4. Patient History

Patient history is gathered mostly by conversation with patient, if patient is unresponsive, gather facts by observing scene M.O.I. (Mechanism of Injury), looking for identification tags, speaking to family members and bystanders. Remember the differences between medical and trauma patients. In case of trauma, perform physical exam first and for medical patient take a history first.

5. Ongoing Assessment

A patient may be in stable or unstable condition. The assessment process must be ongoing until your patient is turned over to the next level of care. Complete the following every 5 minutes for unstable patients and every 15 minutes for stable patients.

6. Hand-Off Report

When you handover your patient to higher-level care provider. Be prepared to give appropriate information about your patient. This is called hand-off report also known as patient transfer information.

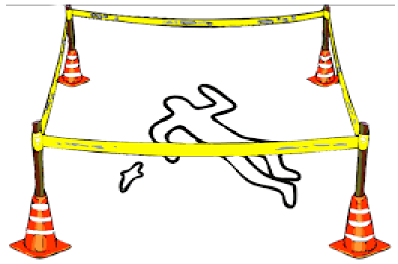
REPORTING:

What is a local protocol?

The official procedure or system of rules followed in a particular locality, area or state, taking in view of issues like culture, tradition, health and environment etc**.**

The following information should be included in the initial report:

- Address/location
- Type of incident
- Environmental conditions
- Current situation
- Number of victims
- Resources needed



Secure the scene:

There are three priorities for securing the scene:

1. **Place your vehicle properly:** On arrival, if no hazards are present, and other units are on the scene, park 20 meter away from the scene. If your unit is first, block the scene with your vehicle 20 meters before, until other units arrive.
2. **Isolate and mark the scene:** Use flares, tapes, or other warning devices.
3. **Mitigate Risks*:***
   - Disconnect the car battery (negative terminal), shut off the gas, extinguish fire, manage traffic hazards, secure electrical, stabilize vehicle, etc. Entry with specialized equipment; it simply shows how to gain access through the natural entrances of a structure vehicle using basic tools.
   - The MFR should always analyze the need for personal protection such as helmet, eye protection, mask, self-contained breathing apparatus, gloves, etc. before attempting to gain access to a patient.
   - In case the incident occurs in water, cliffs, etc. the MFR should request assistance from specially trained personnel.

Basic Tools:

- ✓ Pliers
- ✓ Pry bar
- ✓ Screwdriver
- ✓ Vise grip
- ✓ Tin snips
- ✓ Axe
- ✓ Hammer
- ✓ Hacksaw
- ✓ Knife
- ✓ Rubber mallet

- ✓ Rope
- ✓ Automatic centre punch
- ✓ Kelly tool
- ✓ Personal protective equipment

Gaining access to buildings:

- Remind participants that personal safety is paramount.
- Always look for alternate means of entry.
- Consider the easiest route for entry and exit based on the situation and the patient 's needs.

Doors

With padlock: Insert the tip of the Kelly tool in the eye of the padlock bolt and use it as a lever to open the padlock.

Solid door: Before using force, notice whether the door opens in or out. If it opens out, it may be possible to remove the hinges.

Windows

- A glass window should only be forced as a last resort.
- If you need to break a window, protect yourself properly and use a pointed tool.

Gaining Access to Vehicles Using Basic Tools

Generally, and if possible, medical treatment should begin before the patient is extricated. The patient should be removed in such a way as to minimize further injury. Access may be simple (not requiring tools) or complex (requiring tools and special training). Take only those steps you are trained to take. Call for additional resources.

You may find a vehicle in several positions:

- Upright
- On its side
- On its roof

Doors:

- Try before you pry.
- Ask the patient to assist in opening the door, either by unlocking or rolling down the window.
- Do the doors require forced entry? If so, use a pry bar or hydraulic tools.

Windows:

- Make sure patient is protected from glass particles.
- Use a screwdriver or other pointed tool. Strike tool against lower corner of window and continue to strike in the same spot until the window shatters. If you must break a window, choose the one that is farthest from the patient.

- Rear and side window are made of tempered glass, which shatters into small granules. The windscreen is laminated and can be removed in one piece.

Unit Summary

Incident: An incident can be referred as any event, big or small, good or bad, intentional or unintentional, a bank robbery, a funny or controversial situation, an argument between celebrities, etc.- all can be described as an incident.

Types of Incidents

- Motor vehicle collision
- Structural fire
- Natural phenomenon
- Water rescue
- Medical emergency
- Hazardous materials
- Structural collapse
- Electrical
- Aircraft accident etc.

Accident: An accident is a bad event caused by error or by chance. Accidents are always unintentional, and they usually result in some damage or injury. A car crash is one example of an accident. If some equipment malfunctions in a factory and injures the workers, that is also an accident.

Scene size up

1. **General procedure on arrival on the Scene**
2. **Identify Yourself**
3. **Sources of Information**

Assessment plan is completed in six phases:

The Assessment Plan begins with information received on dispatch.

- Scene size up
- Initial assessment
- Physical exam
- Patient history
- Ongoing assessment
- Hand off report

Self- Assessment

Objective Questions:

1. How many phases of Assessment Plan?
   a. 5
   b. 3
   c. 6
   d. 4

2. What is the current situation comes in.....
   a. Scene secure
   b. Scene size up
   c. Scene size up criteria
   d. None of above

3. Place your vehicle properly comes in .....
   a. Scene size up
   b. Scene size up criteria
   c. Securing the scene
   d. None of above

4. How many priorities for securing the scene?
   a. One
   b. Two
   c. Three
   d. Five

5. In gaining access to buildings comes first....
   a. Doors
   b. Windows
   c. Both
   d. None of above

6. “Try before you pry” comes in ....
   a. Gaining access to vehicles
   b. Gaining access to buildings
   c. Both of above
   d. None of above

7. When receiving a call for assistance how many steps of information you will gather?
   a. 3
   b. 5

c. 7
d. 6

8. The place where an incident in real life or fiction occurs or occurred known as.....
    a. Scene
    b. Scene size-up criteria
    c. Scene size-up
    d. None of above

9. Avoiding drugs and alcohol and eating a balanced diet are a treatment of ....
    a. Incident
    b. Accident
    c. Critical incident stress
    d. None of above

10. Ongoing evaluation of the incident begins when the call is received and continues until the incident is successfully mitigated comes in ....
    a. Securing the scene
    b. Scene size- up
    c. Mitigate risks
    d. None of above

Descriptive Questions:

1. Define an Incident and Accident? Mentions at least four points of difference between Incident and Accident?
2. Write the name of six tools?
3. Write the five items of information to obtain when receiving a call for assistance.
4. Write the five factors to consider when responding to a call.
5. Write the three steps to scene size-up, in proper order.

Reference:

- Peer instructor's guide for medical first responder course
- Bready: first responder book 8th edition
- https://en.wikipedia.org
- www.livescience.com

LESSON NO – 04

Anatomical References

Introduction

Medical first responder must be able to identify human body regions in order to provide pre hospital treatments and scope of care correctly. Anatomical references facilitate first responder to know about anatomical positions, body planes, body systems and their functions and human body regions.

Outcomes

Upon completion of this lesson, you will be able to:

- Identify and describe the three anatomical planes.
- The five regions of the human body.
- The five body cavities and the organs they contain.
- The location of a wound on a patient using anatomical references.
- Name the four abdominal quadrants.
- Identify and label the main internal organs located in each abdominal quadrant.
- Body systems and their function.

Terminology

Central Nervous System: The central nervous system consists of the brain and the spinal cord, which serve as the main control centers for the body and process all incoming and outgoing messages.

Peripheral Nervous System: The peripheral nervous system includes all the nerves in your body that bring messages to the central nervous system and from CNS to muscles.

Cerebrospinal Fluid: Cerebrospinal fluid (CSF) is a clear, colorless body fluid found in the brain and spinal cord. It is produced in the choroid plexuses (choroid plexuses is a plexuses/net of cell that produces the CSF in the ventricles of the brain).

Vital organ: Vital organ is a bodily organ that is essential for life.

GI Tract: The Gastrointestinal Tract (Digestive Tract, Digestion Tract, GI Tract or GIT, Gut, or Alimentary Canal) is an organ system within humans and other animals which takes in food, digests it to extract and absorb energy and nutrients, and expels the remaining waste as feces. The mouth, esophagus, stomach, and intestines are part of the gastrointestinal tract.

The blood: The blood is a thick viscid liquid of bright red or scarlet colour when it flows from the heart to the arteries and takes a dark red or purple hue when it comes back to the heart via the veins. It has a saline taste.

Anatomical position

Anatomical position is the description of any region or part of the body in a specific stance. In the anatomical position, the body is upright, directly facing the observer, feet flat and directed forward. The upper limbs are at the body's sides with the palms facing forward. Anatomical position used as a reference in describing the relation of body parts to one another.

Anatomical Planes

The anatomical planes refer to imaginary planes that divide the body in two halves, in different orientations.

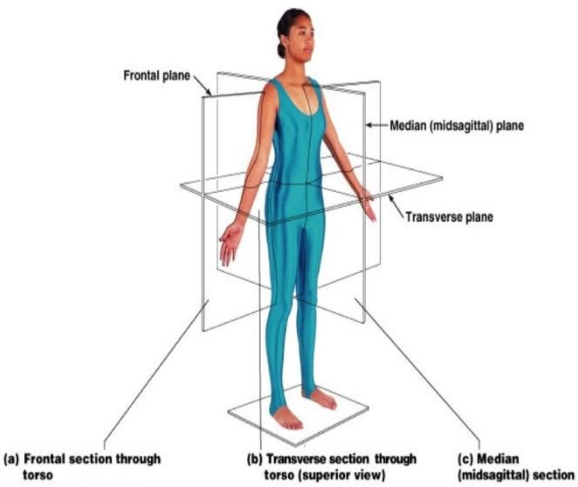
- Transverse plane
- Median/Medial plane
- Frontal plane

Transverse Plane: The transverse plane is horizontal and divides the body into a top half and a bottom half.

- Body parts above other parts are called **Superior.**
- Body parts below other body parts are called **Inferior.**

Two other terms related to this plane also refer to direction.

- **Cranial** refers to body parts toward the head.
- **Caudal** refers to body parts toward the lower end of the spine or feet.



Median Plane: The Median plane is also known as the midline plane. The median plane is vertical and divides the body into equal right and left halves.

- Body parts toward median plane are called **Medial.**
- Body parts away from median plane are called **Lateral.**

Frontal Plane: The frontal plane is also known as the coronal plane. The frontal plane is vertical. It divides the body into front and back sections.

- Body parts toward the front section are called ventral, or **Anterior.**
- Body parts toward the back section are called dorsal, or **posterior.**

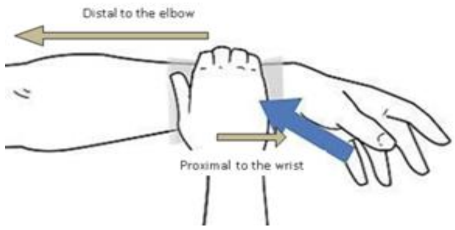
Extremities and Subdivisions

The point of reference for extremities is usually the torso.

Proximal: Means close, or closer to the point of reference given.

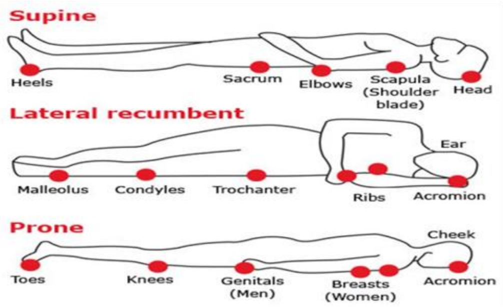
Distal: Means distant, or farther away from the point of reference given.

Used mainly for extremities. The reference may be a joint or the torso. Example: a wound on the forearm could be distal to the elbow or proximal to the wrist.



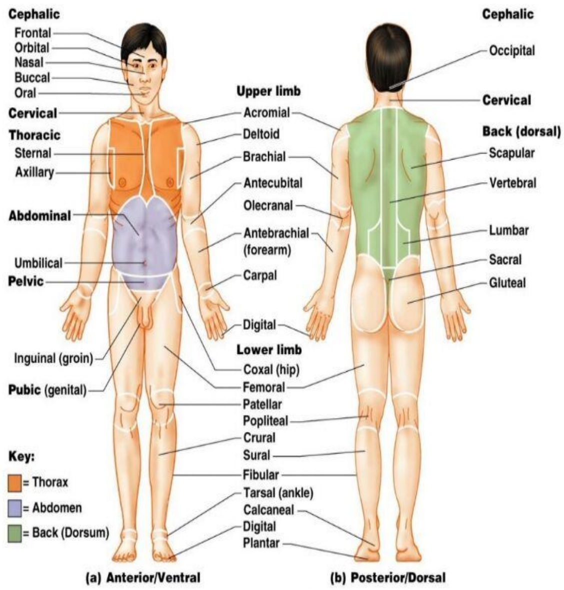
Positional Terms

- **Prone:** Lying face down, on the stomach.
- **Supine:** Lying face up, on the back.
- **Lateral recumbent or –recovery:** Lying on one side of the body



Body Region

The anatomical/body regions (shown) compartmentalize the human body. Just like on a map, a region refers to a certain area. There are five major region of human body.



Head: Cranial (skull), Frontal (forehead), Nasal (nose), Occipital (base of skull), Oral (mouth), Orbital/ocular (eyes)

Neck: Cervical (neck)

Trunk:

Thorax: Axillary (armpit), Costal (ribs), Deltoid (shoulder), Mammary (breast), Pectoral (chest), Scapular (shoulder blade), Sternal (breastbone), Vertebral (backbone)

Abdomen: Abdominal (abdomen), Gluteal (buttocks), Inguinal (bend of hip), Lumbar (lower back), Sacral (end of vertebral column)

Pelvis: Pelvic (area between hipbones), Perineal (area between anus and external genitalia), Pubic (genitals)

Upper extremity: Antebrachial (forearm), Antecubital (inner elbow), Brachial (upper arm), Carpal (wrist), Cubital (elbow), Digital (fingers/ toes), Manual (hand), Palmar (palm).

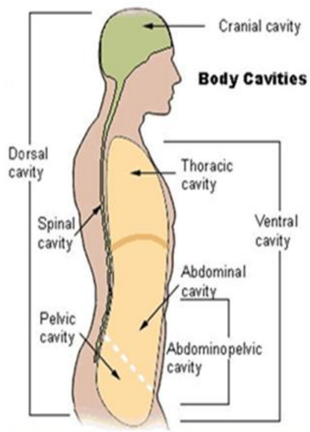
Lower extremity: Crural (shin, front of lower leg), Femoral (thigh), Patellar (front of knee), Pedal (foot), Plantar (arch of foot), Popliteal (back of knee), Sural (calf, back of lower leg), Tarsal (ankle).

Body Cavities

Body cavities are spaces within the body that contain vital organs.

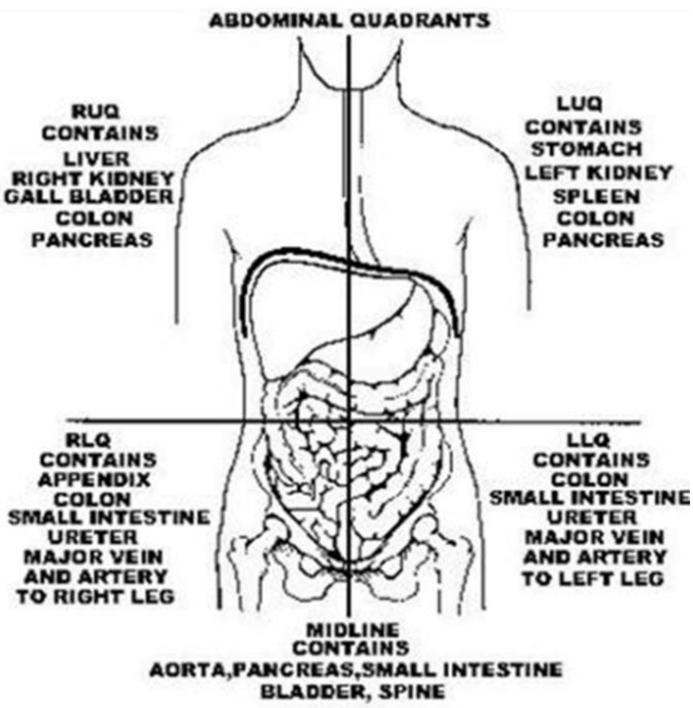
The two major cavities in the body are the dorsal and ventral cavities.

- The **Dorsal Cavity** is a long, continuous cavity located on the back of the body. The dorsal cavity is divided into two sections:
- The **Cranial Cavity** contains the brain and made of immovable joint.
- The **Spinal Cavity** contains the spinal cord.
- The **Ventral Cavity** is located on the front side of the body. The ventral cavity is divided into three sections:
- The **Thoracic Cavity** contains the trachea, esophagus, bronchi, lungs, heart, and major blood vessels. It is also known as the chest cavity and separated from the abdomen by the diaphragm.



- The **Abdominal Cavity** is **least protected cavity** and contains the stomach, small intestine, most of the large intestine, liver, gallbladder, pancreas, and spleen.
- The **Pelvic Cavity** contains the reproductive organs, urinary bladder, pelvic colon, rectum and consists of the ilium, pubis and ischium. Iliac crests form the wings of the pelvis.
- The retroperitoneal space/cavity (retro-peritoneum) is the anatomical space in the abdominal cavity behind (retro) the peritoneum.
- The retroperitoneal cavity consists of following organs.
  - P: pancreas (except tail)
  - U: ureters.
  - C: colon (ascending and descending)
  - K: kidneys.
  - E: (o) esophagus.
  - R: rectum.

Abdominal Quadrant and Organs



Since the abdomen has few reference points, it is divided into quadrants for locating internal organs, or describing the location of an injury or pain. A vertical and horizontal plane whose intersection points is the navel, divides the abdomen in to four quadrants.

- **Right Upper Quadrant:** it contains the liver, colon, pancreas and gallbladder
- **Left Upper Quadrant:** it contains the liver, spleen, stomach, colon and pancreas.
- **Right Lower Quadrant:** it contains the colon, small intestines, major artery and vein to the right leg, the ureter and appendix.
- **Left Lower Quadrant:** it contains the colon, small intestines, major artery and vein to the left leg and the ureter.

In the **Middle Area** are located the aorta, pancreas, small intestines, bladder and spine.

Hollow abdominal organs: stomach, gallbladder, the large and small intestines, and the urinary bladder and the uterus.

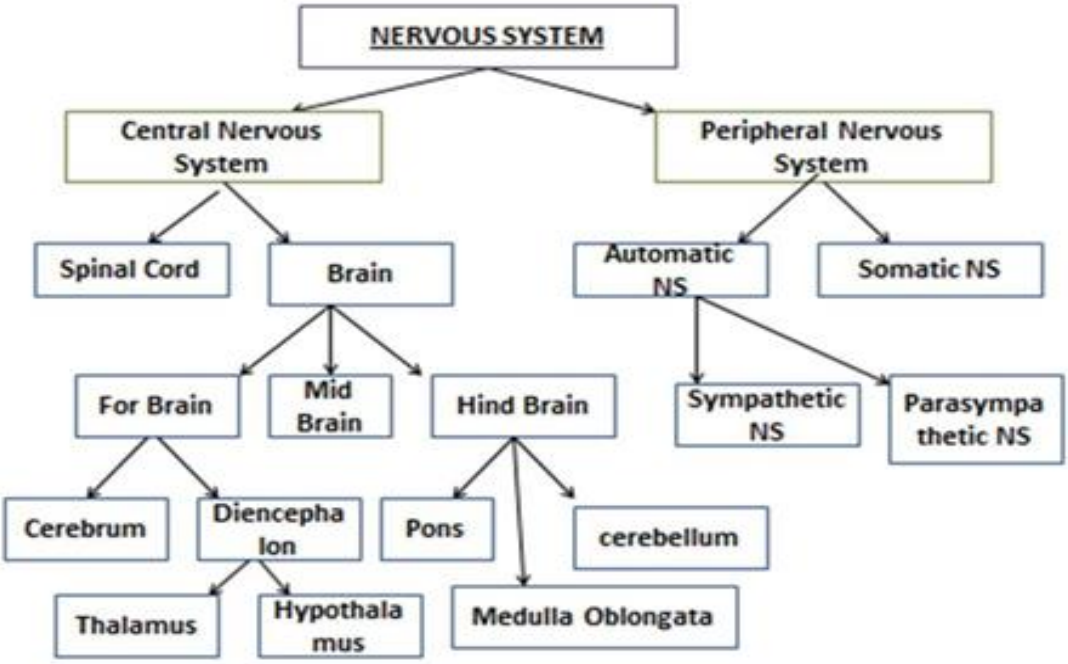
Solid abdominal organs: liver, spleen and pancreas.

Body Systems

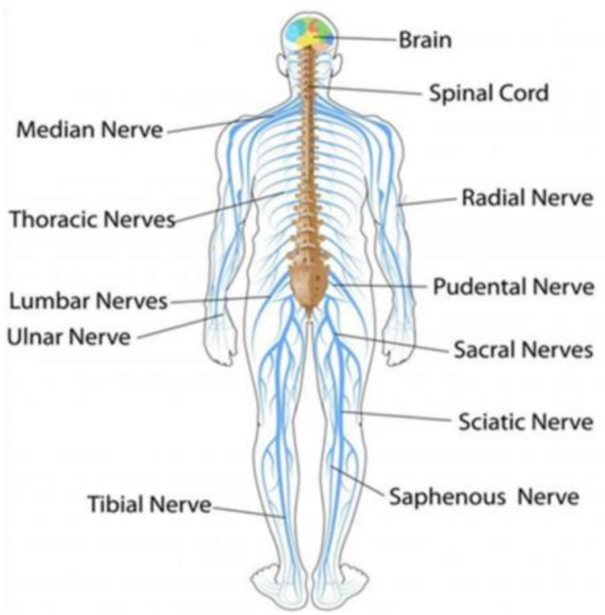
Body systems are groups of organs and tissues that work together to perform important jobs for the body. Some organs may be part of more than one body system, if they serve more than one function. All body systems are necessary for life to be sustained. There are 10 major organ systems in the human body.

Nervous System

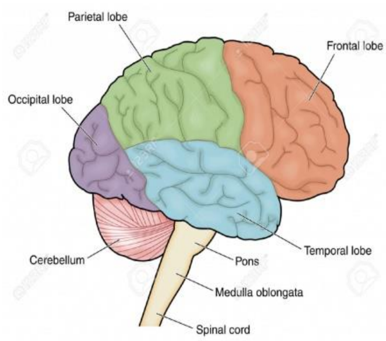
The **nervous system** controls all functions of the body, the sensory, integrative and motor for something as complex as our **body to function** well, there must be a command center that controls all movements, needs, feelings and problems.



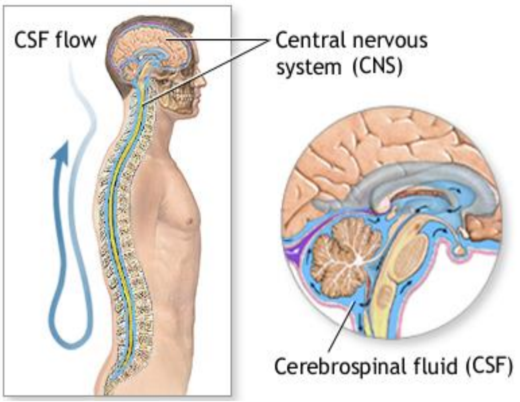
The Nervous System consists of brain, spinal cord, sensory organs, and all of the nerves that connect these organs with the rest of the body. Together, these organs are responsible for the control of the body and communication among its parts. The brain and spinal cord form the control center known as the **Central Nervous System** (CNS), where information is evaluated and decisions made. The sensory nerves and sense organs of the **Peripheral Nervous System** (PNS) monitor conditions inside and outside of the body and send this information to the CNS. Efferent nerves in the PNS carry signals from the control center to the muscles, glands, and organs to regulate their functions.



Brain: The brain, a soft, wrinkled organ that weighs about 3 pounds, is located inside the cranial cavity, where the bones of the skull surround and protect it. Approximately 100 billion neurons of the brain form the main control center of the body. The brain, the seat of higher mental functions such as consciousness, memory, planning, and voluntary actions, also controls lower body functions such as the maintenance of respiration, heart rate, blood pressure, and digestion.



Cerebrospinal Fluid: The space surrounding the organs of the CNS is filled with a clear fluid known as cerebrospinal fluid (CSF). CSF is formed from blood plasma by special structures called net of cells or choroid plexuses. The choroid plexuses contain many capillaries lined with epithelial tissue that filters blood plasma and allows the filtered fluid to enter the space around the brain.



Functions of the nervous system

The nervous system has **3 main** functions:

- Sensory
- Integration
- Motor.

Sensory: The sensory function of the nervous system involves collecting information from sensory receptors that monitor the body‘s internal and external conditions.

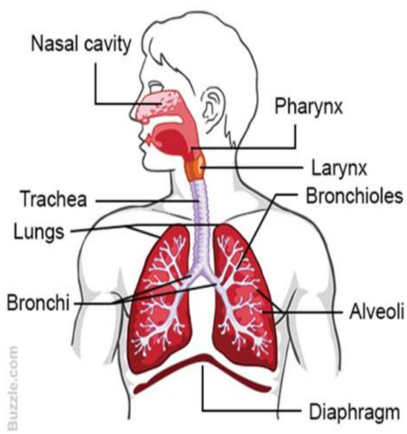
Integration: The process of integration is the processing of the many sensory signals that are passed into the CNS at any given time. These signals are evaluated, compared, used for decision making, discarded or committed to memory as deemed appropriate.

Motor: Once the networks of interneuron‘s in the CNS evaluate sensory information and decide on an action, they stimulate efferent neurons. Efferent neurons (also called motor neurons) carry signals from the gray matter of the CNS through the nerves of the peripheral nervous system to effectors cells. The effectors may be smooth, cardiac, or skeletal muscle tissue or glandular tissue.

Respiratory System

The Respiratory System moves air in and out of the body using oxygen and eliminating carbon dioxide, a gas produced when cells use oxygen. The respiratory system includes the nose, mouth, trachea, bronchi, diaphragm and lungs.

When you breathe in Oxygen from the air passes through the walls of the alveoli into capillaries while carbon dioxide is passed out.



The alveoli are surrounded by the capillaries. The brain sends nerve signals to muscles in the thorax and diaphragm, causing us to breathe. With each inhalation, air is carried through the airways to the alveoli in the lungs, where oxygen and carbon dioxide are exchanged. The main function of the respiratory system is to provide oxygen for the body's cells and remove the carbon dioxide they produce. Oxygen is the most important energy source for the cells.

1. **Function**
   a. Deliver oxygen to the body.
   b. Remove carbon dioxide from the body.
2. **Components/anatomy**
   a. Nose and mouth
   b. Pharynx: Oropharynx and Nasopharynx
   c. Epiglottis - a leaf-shaped structure that prevents food and liquid from entering the trachea during swallowing.
   d. Windpipe (trachea)
   e. Voice box (larynx)
   f. Lungs
   g. Diaphragm
3. **Physiology**
   a. Diaphragm moves down, chest moves out, drawing air into the lungs (**Inhalation**)
   b. Exchange of oxygen and carbon dioxide in the lungs
   c. Diaphragm moves up causing air to exit the lungs (**Exhalation**)
4. **Infant and child anatomy and physiology considerations**
   a. All structures are smaller and more easily obstructed than in adults.
   b. Infants' and children's tongues take up proportionally more space in the mouth than adults.
   c. The trachea is more flexible in infants and children.
   d. The primary cause of cardiac arrest in infants and children is an uncorrected respiratory problem.

Circulatory System

The **Circulatory System also called the cardiovascular system or the vascular system** is responsible for transporting materials throughout the entire body. It transports nutrients, water, and oxygen to your billions of body cells and carries away wastes such as carbon dioxide that body cells produce. It is an amazing highway that travels through your entire body connecting all your body cells.

The circulatory System is divided into three major parts:

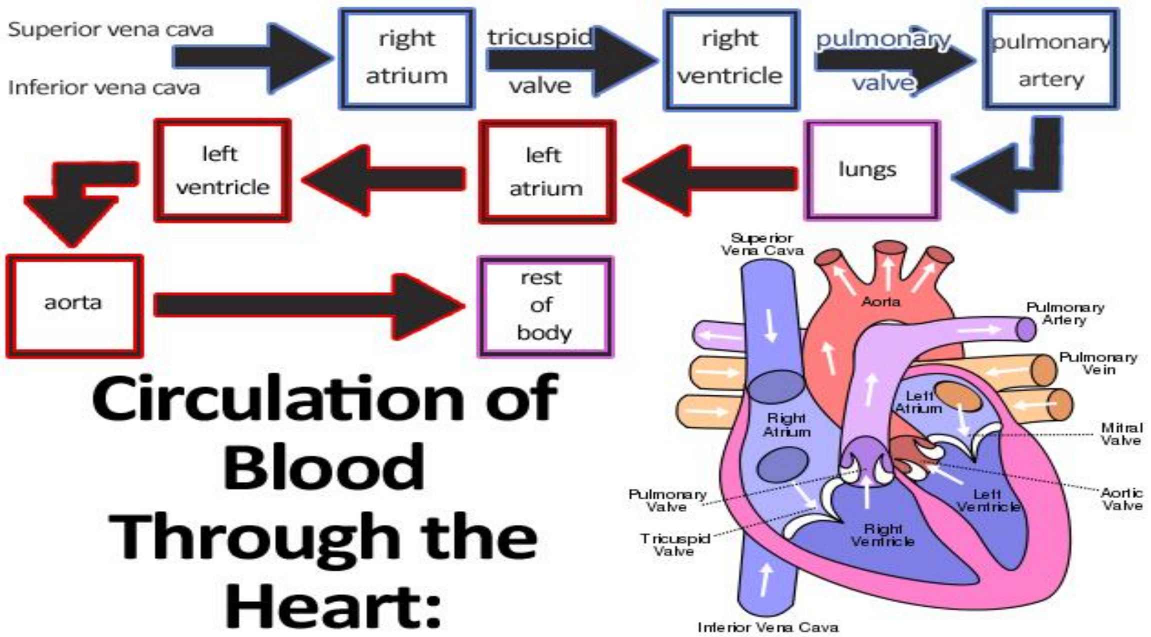
- The Heart
- The Blood
- The Blood Vessels

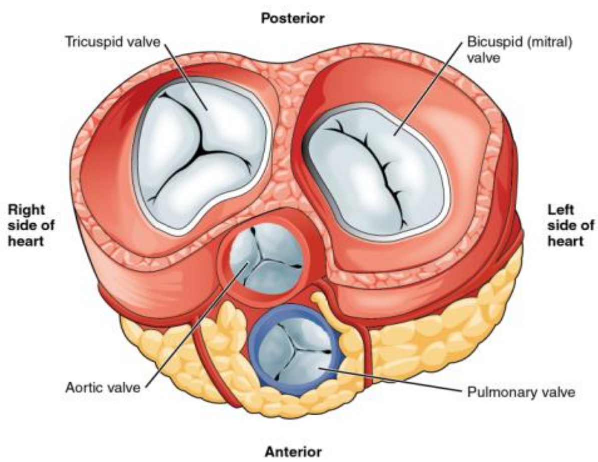
Heart

The heart is a muscular organ about the size of a closed fist that functions as the body's circulatory pump. It takes in deoxygenated blood through the veins and delivers it to the lungs for oxygenation before pumping it into the various arteries.

The heart is located in the thoracic cavity medial to the lungs and posterior to the sternum. On its superior end, the base of the heart is attached to the aorta pulmonary arteries and veins, and the vena cava. The inferior tip of the heart, known as the apex, rests just superior to the diaphragm. The base of the heart is located along the body's midline with the apex pointing toward the left side. Because the heart points to the left, about 2/3 of the heart's mass is found on the left side of the body and the other 1/3 is on the right.

Blood Flow through the Heart





Deoxygenated blood returning from the body first enters the heart from the superior and inferior vena cava. The blood enters the right atrium and is pumped through the tricuspid valve into the right ventricle. From the right ventricle, the blood is pumped through the pulmonary semi-lunar valve into the pulmonary artery.

The pulmonary artery carries blood to the lungs where it releases carbon dioxide and absorbs oxygen. The blood in the lungs returns to the heart through the pulmonary veins. From the pulmonary veins, blood enters the heart again in the left atrium.

The left atrium contracts to pump blood through the bicuspid (mitral) valve into the left ventricle. The left ventricle pumps blood through the aortic semilunar valve into the aorta. From the aorta, blood enters into systemic circulation throughout the body tissues until it returns to the heart via the vena cava and the cycle repeats.

Blood

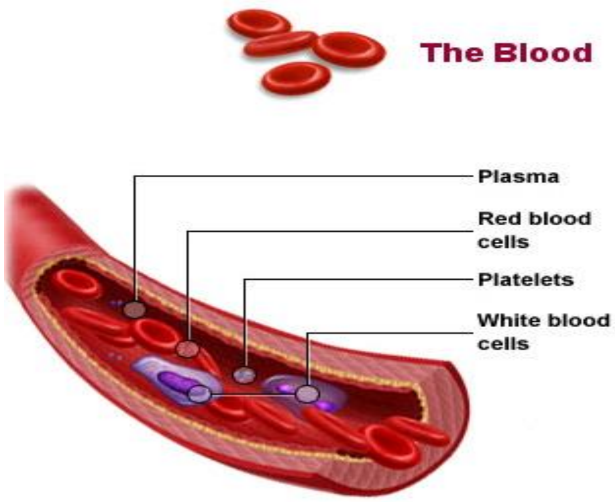
The fluid that circulates in the heart, arteries, capillaries, and veins of a vertebrate animal carrying nourishment and oxygen to and bringing away waste products from all parts of the body.

- The blood is pumped by your heart.
- The blood travels through thousands of miles of blood vessels right within your own body.
- The blood carries nutrients, water, oxygen and waste products to and from your body cells.
- A young person has about 4-5 liters of blood.
- The blood is not just a red liquid but rather is made up of liquids, solids and small amounts of oxygen and carbon dioxide.

Blood has many functions including transportation of nutrients round the body, maintaining homeostasis and the immune system. It is made up of plasma, red blood cells, white blood cells and platelets.

Red Blood Cells (Erythrocytes): RBC is responsible for carrying oxygen and carbon dioxide. RBC picks up oxygen in the lungs and transports it to all the body cells. After delivering the oxygen to the cells it gathers up the carbon dioxide (a waste gas produced as our cells are working) and transports carbon dioxide back to the lungs where it is removed from the body when we exhale (breath out).

White Blood Cells (Leucocytes): WBC helps the body to fight with germs. WBC attack and destroy germs when they enter the body. When you have an infection, your body will produce more WBC to help fight an infection.



Platelets (Thrombocytes): Platelets are blood cells that help to stop bleeding. When we cut ourselves, we have broken a blood vessel and the blood leaks out. As the platelets stick to the opening of the damaged vessel they attract more platelets, fibers and other blood cells to help form a plug to seal the broken blood vessel. When the platelet plug is completely formed, the wound stops bleeding.

Plasma: Plasma is the liquid part of the blood. Approximately half of your blood is made of plasma. The plasma carries the blood cells and other components throughout the body. Plasma is made in the liver.

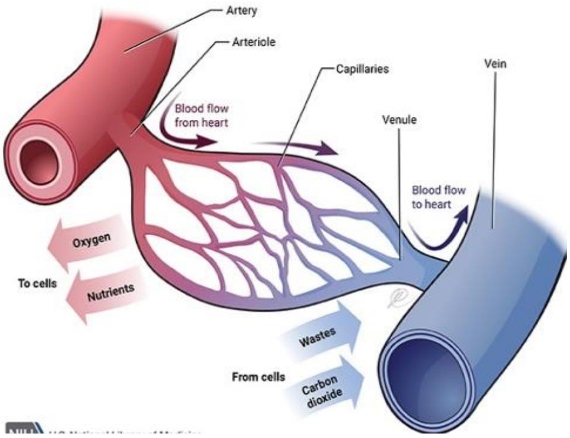
The Red Blood Cells, White Blood Cells and Platelets are made by the bone marrow. Bone marrow is a soft tissue inside of our bones that produces blood cells.

Blood Vessels

The blood vessels are the part of the circulatory system and microcirculation that transports blood throughout the human body.

There are three major types of blood vessels:

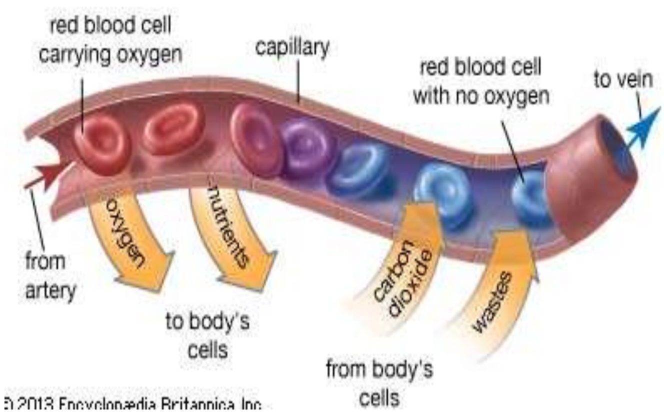
- Arteries
- Capillaries
- Veins



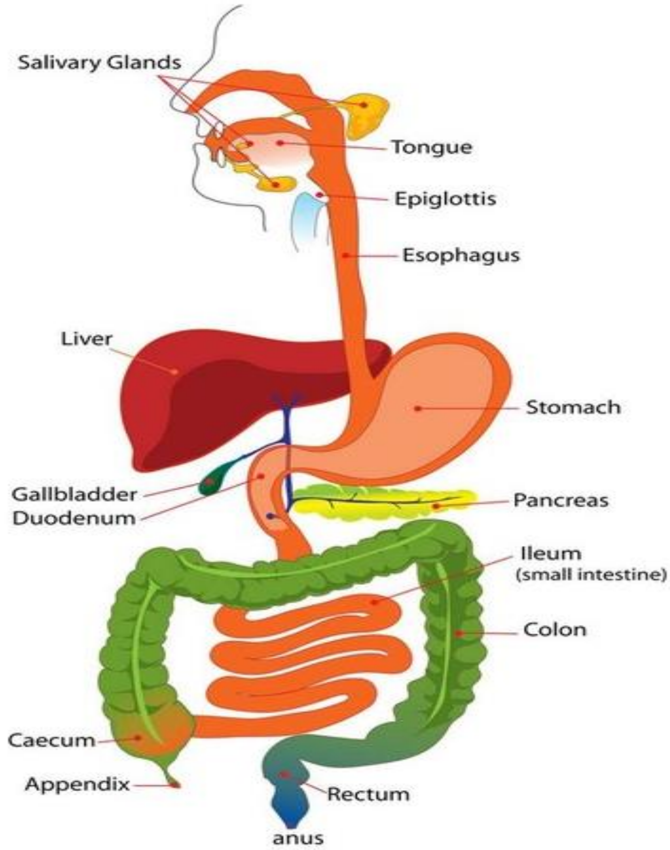
Arteries: Artery, in human physiology, any of the vessels that, with one exception, carry oxygenated blood and nourishment from the heart to the tissues of the body. The exception, the pulmonary artery, carries oxygen-depleted blood to the lungs for oxygenation and removal of excess carbon dioxide and very small branches of arteries are called arterioles.

Veins: Vein, in human physiology, any of the vessels that, with one exception, carry oxygen-depleted blood to the right upper chamber (atrium) of the heart. The one exception, the pulmonary veins, transport oxygenated blood from the lungs to the left upper chamber of the heart and very small branches of veins are called venules.

Capillary: Capillary, in human physiology, any of the minute blood vessels that form networks throughout the bodily tissues; it is through the capillaries that oxygen, nutrients, and wastes are exchanged between the blood and the tissues. The capillary networks are the ultimate destination of arterial blood from the heart and are the starting point for flow of venous blood back to the heart.



Digestive System



The digestive system is a group of organs working together to convert food into energy and basic nutrients to feed the entire body. Food passes through a long tube inside the body known as the alimentary canal or the gastrointestinal tract (GI tract). The alimentary canal is made up of the oral cavity, pharynx, esophagus, stomach, small intestines, and large intestines. In addition to the alimentary canal, there are several important accessory organs that help your body to digest food. But do not have food pass through them. Accessory organs of the digestive system include the teeth, tongue, salivary glands, liver, gallbladder, and pancreas. To achieve the goal of providing energy and nutrients to the body, **six major functions** take place in the digestive system:

Ingestion: taking food into the mouth.
Secretion: cells in the GI tract and accessory glandular organs secrete water, enzymes, acids, buffers, and salts.
Mixing and Movement: physically cut, tear and grind food into smaller pieces; stomach churns and mixes ingested food.
Digestion: chemical breakdown of food into small organic molecules suitable for absorption in GI tract. Ex. Starch-Simple sugars, Protein-Amino Acids.

Absorption: Movement of micronutrients, including water and vitamins, into blood or lymph vessels for distribution to cells.
Excretion: Removal of waste products and elimination of indigestible substances from the GI tract.

Mouth: Food begins its journey through the digestive system in the mouth, also known as the oral cavity. Inside the mouth are many accessory organs that aid in the digestion of food—the tongue, teeth, and salivary glands. Teeth chop food into small pieces, which are moistened by saliva before the tongue and other muscles push the food into the pharynx.

Esophagus: The esophagus is a muscular tube connecting the pharynx to the stomach that is part of the upper gastrointestinal tract. It carries swallowed masses of chewed food along its length. At the inferior end of the esophagus is a muscular ring called the lower esophageal sphincter or cardiac sphincter. The function of this sphincter is too close of the end of the esophagus and trap food in the stomach.

Stomach: The stomach is a muscular sac that is located on the left side of the abdominal cavity, just inferior to the diaphragm. The stomach is a hollow organ, or "container," that holds food while it is being mixed with enzymes that continue the process of breaking down food into a usable form. Cells in the lining of the stomach secrete strong acid and powerful enzymes that are responsible for the breakdown process. When the contents of the stomach are sufficiently processed, they are released into the small intestine.

Small intestine: The small intestine is a long, thin tube about 1 inch in diameter of the lower GI tract. It made up of three segments — The **Duodenum**, **Jejunum**, and **Ileum** — the small intestine is a 22-foot-long muscular tube that breaks down food using enzymes released by the pancreas and bile from the liver. Peristalsis also is at work in this organ, moving food through and mixing it with digestive secretions from the pancreas and liver. The duodenum is largely responsible for the continuous breaking-down process, with the jejunum and ileum mainly responsible for absorption of nutrients into the bloodstream.

Pancreas: The pancreas secretes digestive enzymes into the duodenum, the first segment of the small intestine. These enzymes break down protein, fats, and carbohydrates. The pancreas also makes insulin, secreting it directly into the bloodstream. Insulin is the chief hormone for metabolizing sugar.

Liver: The liver has multiple functions, but its main function within the digestive system is to process the nutrients absorbed from the small intestine. Bile from the liver secreted into the small intestine also plays an important role in digesting fat. In addition, the liver is the body's "Chemical Factory." It takes the raw materials absorbed by the intestine and makes all the various chemicals the body needs to function. The liver also detoxifies potentially harmful chemicals. It breaks down and secretes many drugs.

Gallbladder: The gallbladder stores and concentrates bile, and then releases it into the duodenum to help absorb and digest fats.

Colon (Large Intestine): The large intestine is a long, thick tube about 2.5 inches in diameter and about 5 feet long. It is located just inferior to the stomach and wraps around the superior and lateral border of the small intestine. The large intestine absorbs water and contains many symbiotic bacteria that aid in the breaking down of wastes to extract some small amounts of nutrients. Feces in the large intestine exit the body through the anal canal.

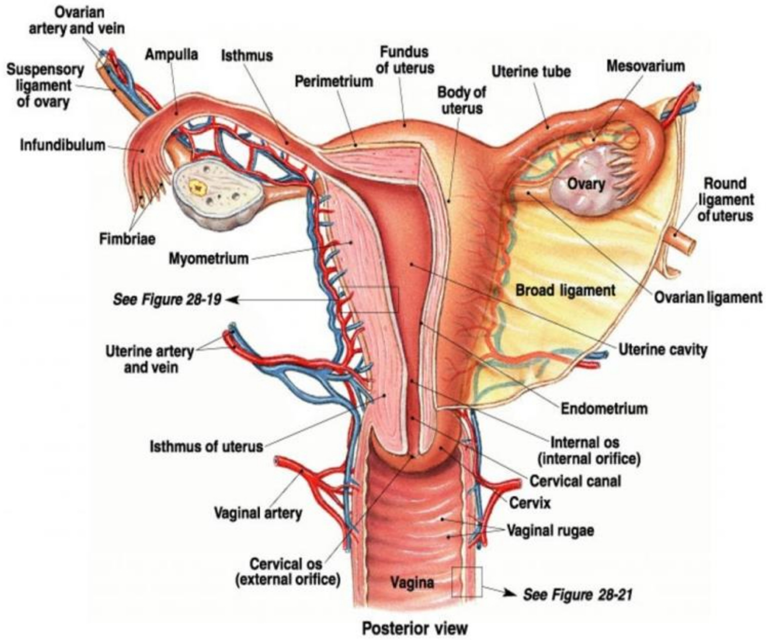
Rectum: The rectum is the final segment of the large intestine that connects the colon to the anus. It stores fecal matter produced in the colon until the body is ready to eliminate the waste through the process of defecation.

Anus: The anus, or anal canal, is the final segment of the gastrointestinal tract. It acts as the orifice that feces pass through during defecation.

Reproductive System

Female Reproductive System

The female reproductive system includes the ovaries, fallopian tubes, uterus, vagina, vulva, mammary glands and breasts. These organs are involved in the production and transportation of gametes and the production of sex hormones. The female reproductive system also facilitates the fertilization of ova by sperm and supports the development of offspring during pregnancy and infancy.



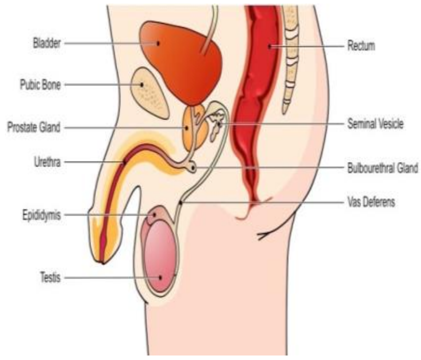
Ovaries: The ovaries are a pair of small glands about the size and shape of almonds, located on the left and right sides of the pelvic body cavity lateral to the superior portion of the uterus. Ovaries produce female sex hormones such as estrogen and progesterone as well as ova (commonly called "eggs"), the female gametes. Ova are produced from oocyte cells that slowly develop throughout a woman's early life and reach maturity after puberty. Each month during ovulation, a mature ovum is released. The ovum travels from the ovary to the fallopian tube, where it may be fertilized before reaching the uterus.

Fallopian tubes: The Fallopian tubes, also known as the uterine tubes, are a pair of 4-inch (10 cm) long narrow tubes connecting the ovaries to the uterus. Ova (egg cells) are carried to the uterus through the fallopian tubes following ovulation. The ova may also be fertilized while in the Fallopian tubes if sperm is present following sexual intercourse.

Uterus: The uterus, also commonly known as the womb, is a hollow muscular organ of the female reproductive system that is responsible for the development of the embryo and fetus during pregnancy. An incredibly distensible organ, the uterus can expand during pregnancy from around the size of a closed fist to become large enough to hold a full-term baby. It is also an incredibly strong organ, able to contract forcefully to propel a full-term baby out of the body during childbirth

Vagina: The vagina is an elastic, muscular tube that connects the cervix of the uterus to the exterior of the body. It is located inferior to the uterus and posterior to the urinary bladder. The vagina functions as the receptacle for the penis during sexual intercourse and carries sperm to the uterus and fallopian tubes. It also serves as the birth canal by stretching to allow delivery of the fetus during childbirth. During menstruation, the menstrual flow exits the body via the vagina.

Male Reproductive System



The male reproductive system includes the scrotum, testes, spermatic ducts, sex glands, and penis. These organs work together to produce sperm, the male gamete, and the other components of semen. These organs also work together to deliver semen out of the body and into the vagina where it can fertilize egg cells to produce offspring.

Testes: The testes (singular: testis), commonly known as the testicles, are a pair of ovoid glandular organs that are central to the function of the male reproductive system. The testes are responsible for the production of sperm cells and the male sex hormone testosterone. The testes produce as many as 12 trillion sperm in a male's lifetime, about 400 million of which are released in a single ejaculation.

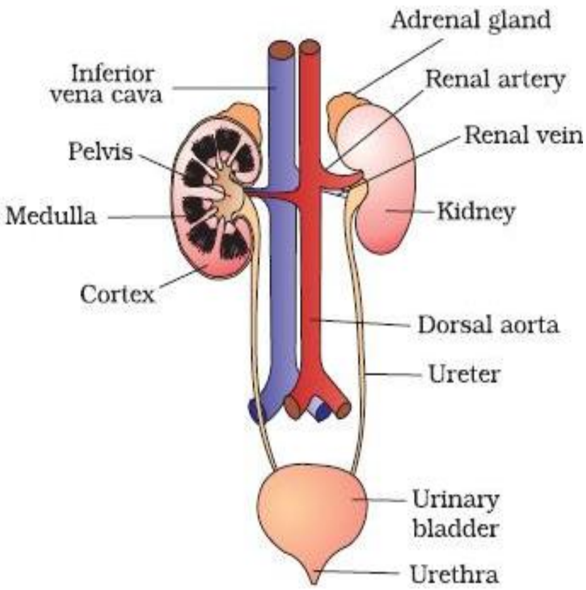
Urethra: Semen passes from the ejaculatory duct to the exterior of the body via the urethra, an 8-10 inch long muscular tube. The urethra passes through the prostate and ends at the external urethral orifice located at the tip of the penis. Urine exiting the body from the urinary bladder also passes through the urethra.

Prostate: The prostate is a walnut-sized exocrine gland that borders the inferior end of the urinary bladder and surrounds the urethra. The prostate produces a large portion of the fluid that makes up semen. This fluid is milky white in color and contains enzymes, proteins, and other chemicals to support and protect sperm during ejaculation. The prostate also contains smooth muscle tissue that can constrict to prevent the flow of urine or semen.

Penis: The penis is the male external sexual organ located superior to the scrotum and inferior to the umbilicus. The erection of the penis causes it to increase in size and become turgid. The function of the penis is to deliver semen into the vagina during sexual intercourse. In addition to its reproductive function, the penis also allows for the excretion of urine through the urethra to the exterior of the body.

Semen: Semen contains sperm, the male reproductive gametes, along with a number of chemicals suspended in a liquid medium. The chemical composition of semen gives it a thick, sticky consistency and a slightly alkaline pH. In healthy adult males, semen contains around 100 million sperm cells per milliliter. These sperm cells fertilize oocytes inside the female fallopian tubes.

Urinary System



The urinary system consists of the kidneys, ureters, urinary bladder, and urethra. The kidneys filter the blood to remove wastes and produce urine. The ureters, urinary bladder, and urethra together form the urinary tract, which acts as a plumbing system to drain urine from the kidneys, store it, and then release it during urination. Besides filtering and eliminating wastes from the body, the urinary system also maintains the homeostasis of water, ions, pH, blood pressure, calcium.

How do the kidneys remove wastes from the blood?

Each kidney contains millions of nephrons, which filter the blood that passes through them. In the nephron, capillaries pass through the glomerulus. Slits in the glomerulus prevent blood cells and larger molecules from passing out. The acidity and concentrations of various substances in the blood are maintained by diffusion and active transport of excess amounts into urine collecting tubules. The urine is composed of water (about 95%), potassium, bicarbonate, sodium, glucose, amino acids, and the waste products urea and uric acid.

What is the urinary tract and how does it work?

The urinary tract is the body's drainage system for removing urine, which is composed of wastes and extra fluid. In order for normal urination to occur, all body parts in the urinary tract need to work together in the correct order.

Kidneys: The kidneys are the waste filtering and disposal system of the body. The kidneys are two bean-shaped organs, each about the size of a fist. They are located just below the rib cage, one on each side of the spine. Every day, the kidneys filter about 120 to 150 quarts of blood to produce about 1 to 2 quarts of urine. While a person could live with only one functioning kidney, our kidneys are vital organs

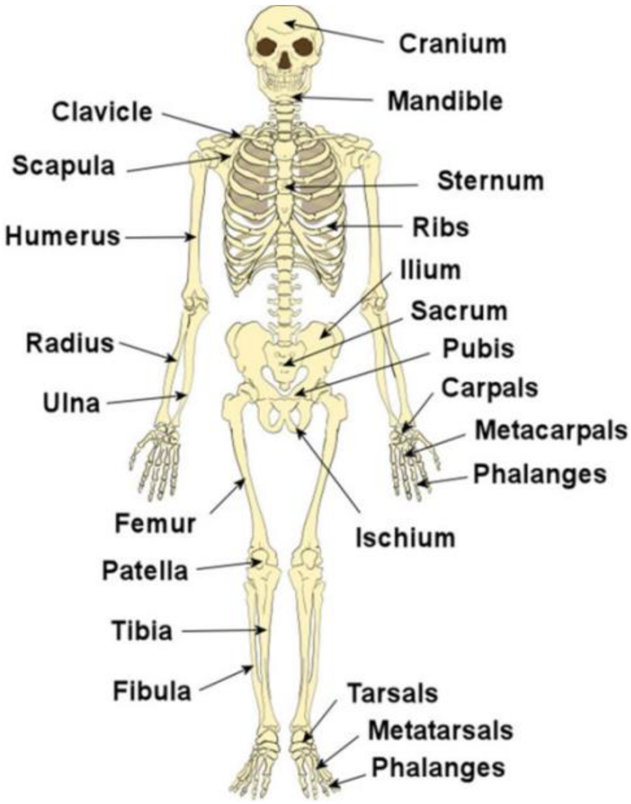
Ureters: The ureters are a pair of small tubes that connect the kidneys to the urinary bladder. They form a vital link in the urinary tract by allowing urine to drain from the kidneys to be stored in the bladder.

Bladder: The bladder, located in the pelvis between the pelvic bones, is a hollow, muscular, balloon-shaped organ that expands as it fills with urine. The urinary bladder is functions as the body's urine storage tank. Urine produced by the kidneys flows through the ureters to the urinary bladder, where is it stored before passing into the urethra and exiting the body. The urinary bladder plays an important role in delaying and controlling urination so that the average person only has to urinate several times each day instead of constantly leaking small amounts of urine.

Skeleton System

The skeleton is the framework of the body. It supports the softer tissues and provides points of attachment for most skeletal muscle.

The skeletal system supports and protects the body while giving it shape and form. This system is composed of connective tissues including bone, cartilage, tendons, and ligaments. Nutrients are provided to this system through blood vessels that are contained within canals in bone. The skeletal system stores minerals, fats, and produces blood cells.



Axial Skeleton:- The axial skeleton consists of 80 bones, including:

- Skull
- Thorax
- Vertebral (spinal) column

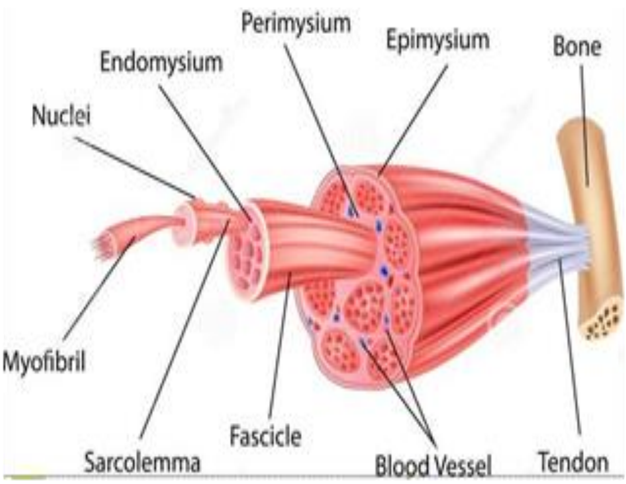
Appendicular Skeleton: - The appendicular skeleton consists of 126 bones which include:

- Shoulder: clavicle and scapula
- Upper extremities: arms, hands, fingers
- Pelvis (hips)
- Lower extremities: legs, feet, toes

- **Bone** - A type of mineralized connective tissue that contains collagen and calcium phosphate, a mineral crystal. Calcium phosphate gives bone its firmness. Bone tissue may be compact or spongy. Bones provide support and protection for body organs.
- **Cartilage** - Cartilage is a resilient and smooth elastic tissue, rubber-like padding that covers and protects the ends of long bones at the joints, and is a structural component of the rib cage, the ear, the nose, the bronchial tubes, the intervertebral discs, and many other body components.

- **Tendon** - A fibrous band of connective tissue that is bonded to bone and connects bone to muscle.
- **Ligament** - A fibrous band of connective tissue that joins bones and other connective tissues together at joints.
- **Joint** - A site where two or more bones or other skeletal components are joined together.

Muscular System



The muscular system is responsible for the movement of the human body. Attached to the bones of the skeletal system are about 700 named muscles that make up roughly half of a person's body weight. Each of these muscles is a discrete organ constructed of skeletal muscle tissue, blood vessels, tendons, and nerves. Muscle tissue is also found inside of the heart, digestive organs, and blood vessels. In these organs, muscles serve to move substances throughout the body.

There are **three** types of muscle:

Skeletal muscles: There are nearly **650 skeletal muscles** in the human body!

- Skeletal muscles are **attached to the skeleton**
- They work in **pairs:** one muscle moves the bone in one direction and the other moves it back again
- Skeletal muscles are **voluntary** muscles - in other words we think about what movements we want to make (at least, usually!) and send messages via our **nervous system** to tell the appropriate muscle(s) to contract.
- Muscle contractions can be **short, single** contractions or **longer ones**.

Smooth muscle

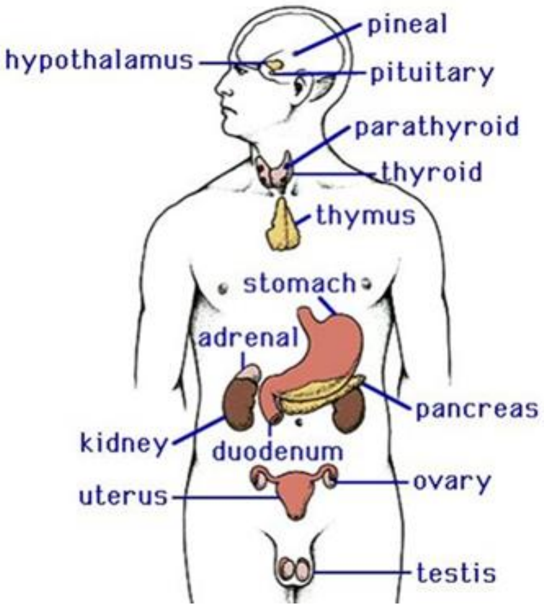
- Smooth muscle is found in our **internal organs:** in our digestive system, our blood vessels, our bladder, our respiratory organs and in a female, the uterus.
- Smooth muscle can **stretch** and **maintain tension** over extended periods.
- Smooth muscles are **involuntary** muscles - in other words we do **not** have to think about contracting them because they are **controlled automatically** by the **nervous system**.
- It would be pretty inconvenient if we had to think about digesting our food.

Cardiac muscles

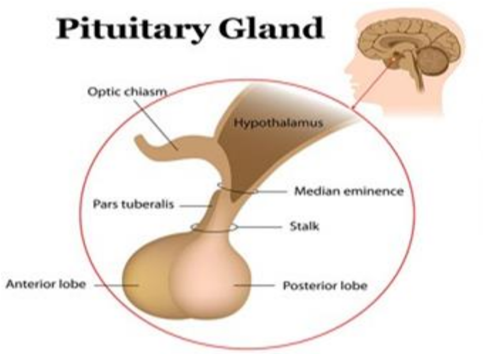
- As the name should tell you, cardiac muscle is found only in the heart.

- It can **stretch**, just like smooth muscle, and **contract** like skeletal muscle.
- It is a **twitch** muscle - it only does short single contractions
- Like smooth muscle, cardiac muscle is **involuntary**. It'd be rather dangerous if it were voluntary - we could stop our heart beating any time we wanted.

Endocrine System



The endocrine system includes all of the glands of the body and the hormones produced by those glands. The glands are controlled directly by stimulation from the nervous system as well as by chemical receptors in the blood and hormones produced by other glands. By regulating the functions of organs in the body, these glands help to maintain the body's homeostasis. Cellular metabolism, reproduction, sexual development, sugar and mineral homeostasis, heart rate, and digestion are among the many processes regulated by the actions of hormones.



Pituitary Gland: The pituitary gland, also known as the hypophysis, is a small pea-sized lump of tissue connected to the inferior portion of the hypothalamus of the brain. Many **blood vessels** surround the pituitary gland to carry the hormones it releases throughout the body.

Hypothalamus: The hypothalamus is a part of the **brain** located superior and anterior to the brain stem and inferior to the **thalamus**. It serves many different functions in the **nervous system**, and is also responsible for the direct control of the endocrine system through the pituitary gland.

Pineal Gland: The pineal gland is a small pinecone-shaped mass of glandular tissue found just posterior to the thalamus of the brain. The pineal gland produces the hormone melatonin that helps to regulate the human sleep-wake cycle known as the circadian rhythm.

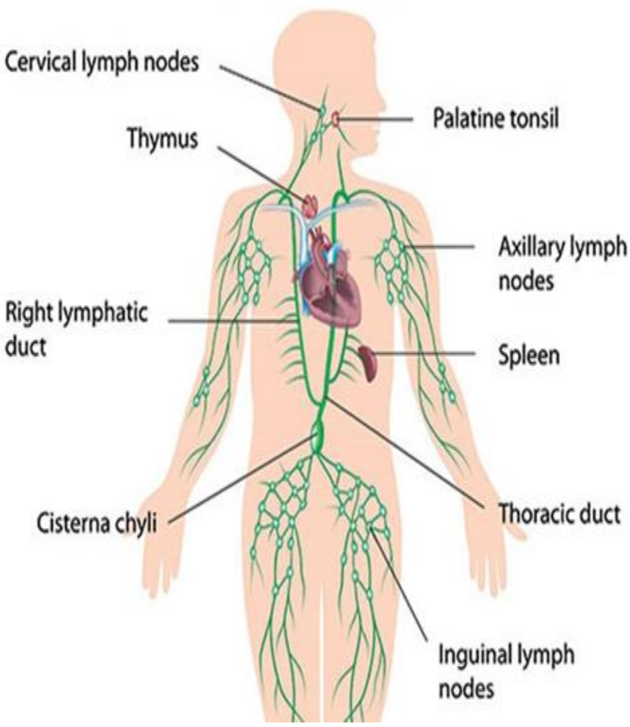
Thyroid Gland: The **thyroid gland** is a butterfly-shaped gland located at the base of the neck and wrapped around the lateral sides of the trachea. The thyroid gland produces few hormones:

- Calcitonin

- Triiodothyronine (T3)
- Thyroxine (T4)

Lymphatic System

The lymphatic system is a network of tissues and organs that help to get rid of the body of toxins, waste and other unwanted materials. Tissue fluid, when enters into the lymphatic system is known as the lymph. The primary function of the lymphatic system is to transport lymph, a fluid containing infection-fighting white blood cells, throughout the body.



The lymphatic system primarily consists of lymphatic vessels, which are similar to the circulatory system's veins and capillaries. The vessels are connected to lymph nodes, where the lymph is filtered. The tonsils, adenoids, spleen and thymus are all part of the lymphatic system.

Components of Lymphatic System:

Lymph vessels

- Lymph capillaries
- Lymph vessels proper
- Terminal lymph ducts

Lymphoid tissue

- Primary lymphatic follicles
- Lymph nodes
- Haemolymph nodes
- Thymus

Functions of Lymphatic System:

- Helps in absorption of digested fat. Two third of the fat is absorbed by the lymphatic system.
- Produces lymphocytes by the lymphatic follicles of the lymph nodes.
- Produces immune substances (antibodies) by the plasma cells of the lymph nodes.
- Under pathological conditions, it provides channels for the spread of infection or malignant cells. Antitoxic serum injected in the tissue space is absorbed by the lymphatic; cobra venom is absorbed partly by blood capillaries and partly by lymph capillaries.

Summary

Anatomical Planes

The anatomical planes refer to imaginary planes that divide the body in two halves, in different orientations.

- ✓ Medial plane
- ✓ Transverse plane
- ✓ Frontal plane

Positional Terms

- Prone
- Supine
- Lateral recumbent or —recovery

Body Region

There are five major regions of human body.

- Head
- Neck
- Trunk
- Upper extremity
- Lower extremity

Body Cavities

Body cavities are spaces within the body that contain vital organs. Five Major body cavities are:

Cranial – houses and protects the brain. Made of immovable joints.

Abdominal – least protected cavity.

Thoracic – contains the heart, lungs and the great vessels. Separated from the abdomen by the diaphragm.

Pelvic – contains the bladder and reproductive organs, consists of the ilium, pubis and ischium. Iliac crests form the wings of the pelvis.

Spinal – houses and protects the spinal cord.

Abdominal Quadrant and Organs

A vertical and horizontal plane whose intersection points is the navel, divides the abdomen into four quadrants.

- **Right Upper Quadrant:** it contains the liver, colon, pancreas and gallbladder
- **Left Upper Quadrant:** it contains the liver, spleen, stomach, colon and

pancreas.

- **Right Lower Quadrant:** it contains the colon, small intestines, major artery and vein to the right leg, the ureter and appendix.
- **Left Lower Quadrant:** it contains the colon, small intestines, major artery and vein to the left leg and the ureter.

In the **Middle Area** are located the aorta, pancreas, small intestines, bladder and spine.

Hollow abdominal organs: stomach, gallbladder, the large and small intestines, and the urinary bladder and the uterus.

Solid abdominal organs: liver, spleen and pancreas.

Body Systems

Body systems are groups of organs and tissues that work together to perform important jobs for the body. There are 10 major organ systems in the human body.

- **Nervous System**
- **Respiratory System**
- **Circulatory System**
- **Digestive System**
- **Reproductive System**
  - Female Reproductive System
  - Male Reproductive System
- **Urinary System**
- **Skeleton System**
- **Muscular System**
- **Glandular System**
- **Lymphatic System**
- **Integumentary System**

Self- Assessment

Objective Questions

1. One of the main function of the integumentary system is:
   a. To prevent infection
   b. To secrete hormones
   c. To produce blood cells
   d. To transmit information to the brain

2. Air can enter the body and travel to the lungs.
   a. Through the mouth and the nose
   b. Through the esophagus and gullet
   c. Through the windpipe and the pores
   d. Through the nose and the nervous system

3. What important activity takes place in the lungs?
   a. Food is digested
   b. Liquid waste is filtered from the blood.
   c. Oxygen is exchanged for carbon dioxide
   d. The trachea is exchanged for the larynx

4. Why is oxygen important to blood and to the cells?
   a. Oxygen is not important carbon dioxide is the most important substance to the body.
   b. Oxygen is necessary for cell growth and energy
   c. Oxygen brings food to the cells.
   d. Oxygen helps the blood to clot.

5. Which type of blood vessels carries blood away from the heart?
   a. Veins
   b. Arteries
   c. Capillaries
   d. Arteries, veins and capillaries

6. What part of the blood carries minerals, vitamins, sugar, and other foods to the body's cells?
   a. Red corpuscles
   b. White corpuscles
   c. Plasma
   d. Platelets.

7. The main function of digestive system is:
   a. To transport nutrients to the body cells.
   b. To breakdown food in to a form of energy.
   c. Both a & b.
   d. None of these.

8. From what source do cells get their food?
   a. Blood
   b. Oxygen
   c. Other cells
   d. Carbon dioxide

9. Which of the following system works with nervous system to coordinate the activities of other body systems?
    a. Circulatory system.
    b. Respiratory system.
    c. Endocrine system.
    d. Digestive system.

10. Which of the following systems work together to provide oxygen to cells?
    a. Circulatory system - Digestive system.
    b. Respiratory system – Nervous system.
    c. Respiratory system - Circulatory system.
    d. Digestive system – Integumentary system.

Descriptive Question

1. What are the different Anatomical Planes and body positional terms, explain them briefly?

2. What are the five body cavities and divide the abdomen into four quadrants with organs present in each quadrant?

3. Explain the function of each of the following with a neat labeled diagram:

- Respiratory System.
- Digestive system.
- Nervous system.

4. Explain the function and organs of the
    - Urinary system,
    - Male reproductive system
    - Female reproductive system
    - Endocrine system

5. What is a musculoskeletal system? Explain its functions?

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- https://en.wikipedia.org/wiki/
- http://www.innerbody.com/
- http://www.dummies.com/education/science/anatomy/anatomical-regions-body/
- https://quizlet.com/basic-processes-of-digestion-flash-cards/
- http://www.innerbody.com/image/digeov.html
- https://www.niddk.nih.gov/health-information/digestive-diseases/digestive-system-how-it-works

LESSON 5

Patient Assessment

Introduction

Many EMS system use an assessment-based approach to providing care to patients. For this Medical First Responder personnel have to trained to identify, prioritize and care for major signs and symptoms.

Outcomes

Upon completion of this lesson, you will be able to explain.

- The five general procedures when a Medical First Responder should have to complete when arriving at the scene.
- The six phases of the patient assessment plan.
- The six steps of the initial assessment.
- Demonstrate a complete physical examination as defined in this lesson

Terminology

I. Scene Size-Up

The scene size-up ensures the safety of the people at the scene to identify the mechanism of injury or the nature of the illness, and determines the need for additional resources. Most likely you will have no patient contact during scene size-up, but your observations, decisions and actions set the foundation for the entire call.

STEPS TO FOLLOW

1. Body substance isolation
2. Scene safe
3. Mechanism of injury (MOI).

4. Number of patients.
5. Additional resources.

1) **BSI-** Body substance isolation.
- ✓ **Gloves:** always wear them.
- ✓ **Eye protection:** protect eyes from body fluids for cases with active bleeding.
- ✓ **Surgical mask.**
- ✓ **HEPA or N-95 mask:** for tuberculosis protection.
- ✓ **Gown**

2) SCENE SAFE

- Never enter an unstable crash scene.
- Traffic safety and control.
  - Limit exposure to traffic.
  - Control traffic with flares or cones.
  - Wear reflective clothing.
  - Turn the wheels of your parked vehicle to point away from the scene (if someone crashes into it, you won't get run over by your own vehicle).
- Do not enter active crime scenes until it is under control by law enforcement. Take extra precautions if you suspect crime, or simply call for law enforcement.
- Take precautions for unstable surfaces and slopes.
- Ice: treat with sand, salt or gravel.
- Frozen lakes surfaces may break.
- Water: wear flotation device. Open water and moving water rescues require specialized training.
- Toxic substances / low oxygen caused by:
  - Spill, leak, or fire.
  - Confined spaces such as caves require SCBA (self-contained breathing apparatus).
  - Suspect toxic environment if everyone in the area suffers from similar symptoms.
- Scene control: tell crowds to step back. Introduce yourself to patients and always ask for their consent to any treatment. Be courteous, let patients know you are here to help.
- Maintain an escape route.
- If a scene turns hazardous at any point, leave.

MOI/NOI

- MOI = Mechanism of injury. For trauma patients.
- NOI = Nature of illness. For medical patients.
- Index of suspicion: your judgment of whether and how severely the patient is injured.

- The MOI is the basis for you index of suspicion
- High index of suspicion for trauma patients include:
  - Falls.
  - Crashes and collisions.
  - Explosions.
  - Violence.
  - Burns.
- Look for signs and symptoms.

Number of patients

- Estimate the total number of patients involved. If it's more than your unit can handle, call for backup.

Additional Resources

- Can your unit handle this? If not, call for additional resources.
- Additional EMS units.
- Law enforcement.
- Fire department.
- Hazmat team.

GENERAL PROCEDURE ON ARRIVAL AT THE SCENE

When arriving on the scene, as medical first responder you should:

1. Ensure your personal safety
2. Ensure patient safety
3. Establish a general impression of the scene (determine mechanism of injury) and begin your initial assessment of the patient (if responsive, identify yourself)
4. Identify and treat life –threatening injuries.
5. Stabilize and continue to monitor the patient.

Identify your self

1. State your name and organization.
2. Identify yourself as a medical responder.
3. Ask the patient if you may help him/her (obtain consent).

Immediate source of information:

1. The scene itself (observe, plan, react)
2. Patient (if responsive)
3. Relative or by standers.
4. The mechanism ofinjury (forces) that caused the injury-kinematics).
5. Any remarkable deformity or obvious injury
6. Any signs or characteristics of certain types of injury or illness.

Initial Assessment

Definition: A process used to identify and treat conditions that pose an immediate threat to the patient‘s life.

- The process used to identify and treat life-threatening problems, concentrating on Level of Consciousness, Cervical Spinal Stabilization, Airway, Breathing, and Circulation.
- You will also be forming a General Impression of the patient to determine the priority of care based on your immediate assessment.
- Determining if the patient is a medical or trauma patient.
- The components of the initial assessment may be altered based on the patient presentation.

Steps of the Initial Assessment

1) **Form a general impression** as you approach the patient. If possible, obtain a chief complaint and a brief assessment of the immediate environment. (The general impression is not designed to be the final word on patient‘s condition, but gets you started on the right track). Determine if the situation is trauma or medical.

   Neck: Examine front and back (covered later in this lesson)

   Apply a cervical collar if needed: For trauma cases with suspected cervical spine injury, before continuing, immediately immobilize the cervical region immediately to prevent paralysis.

2) **Check for responsiveness.**

- Gently shake the patient‘s shoulders and shout, **―Are you okay?‖** This is important for many reasons (for example, a patient with altered mental status may need airway care or other life-saving aid).
- There are four levels of responsiveness commonly used to classify patients. They are: Alert, Verbal, Painful, Unresponsive **(A.V.P.U.):**

  A = Alert: A patient who is alert responsive and oriented (e.g. Aware of surroundings, approximate time and date, and his/her name. Commonly referred to as being responsive to person, place and date-oriented.

  V = Verbal: A patient who responds only when spoken to. We can say he/she responsive to verbal stimulus.

  P = Painful: The patient responds only to painful stimulus.

  U =Unresponsive: The patient does not respond to any stimulus. Does not open eyes, respond verbally or even flinch when pain is applied. A deeply unconscious person is unquestionably in need of airway and other supportive care.

3) **Ensure adequate airway–** How you do this depends on patient responsiveness.

Responsive Patient: Determine if the patient can speak clearly. Gurgling or similar sounds may indicate airway obstruction.

Unresponsive Patient: Needs aggressive airway maintenance immediately – make sure airway is open and patient is breathing adequately.

There are two methods commonly used to open the airway:

- Head-tilt/chin-lift maneuvers
- Jaw thrust maneuvers

Both methods remove the tongue (most common obstruction) from the back of the throat, allowing air into lungs.

4) **Verify breathing –**Look, Listen and feel for air exchange (3-5seconds). Respirations must be adequate. Adequate breathing is characterized by three factors:

- Full rise and fall of chest
- Easy breathing
- Normal respiratory rate

Inadequate breathing is characterized by:

- Insufficient rise and fall of chest
- Increased respiratory effort
- Cyanosis (bluish/gray discoloration of skin, lips or nail beds)
- Mental status changes
- Inadequate respiratory rate (<8 in adults, <10 in children, <20 in infants)

If airway obstruction is present, or if respirations are inadequate or absent, you must take immediate action.

Apply oxygen as needed: Administering oxygen is critical in preventing shock and damage to vital organs. Select appropriate delivery system and appropriate accessories.

- Administering oxygen will be covered fully in the coming chapter.
- Oxygen is used for both medical and trauma patients.

5) **Assess circulation:** Take 5-10 seconds to determine if the patient has an adequate pulse.

Responsive Patient: In verbally responsive adults, check radial pulse. Check brachial pulse for an infant. Check rate and rhythm if possible.

Unresponsive Patient: Check pulse of an unresponsive adult at the carotid artery. In children, check carotid/femoral pulse, and in infants the brachial artery.

Control Serious External Bleeding: Identify and treat life threats.

Do not let minor wounds side track you.

If pulse is absent, begin CPR immediately.

6). Patient status update:

Inform responding EMS units of your findings:

- If more resources will be needed, request them.
- If patient has life threatening injuries or illness, let responding units know.
- If patient is stable with minor injuries, advise responding units.

The initial assessment should be completed and all life threats treated before you can proceed to the physical exam.

II. ***Physical Exam***

- The initial assessment is designed to help you identify and treat life threatening conditions.
- The physical exam is a thorough survey of the patient‘s entire body. It is to reveal any signs of illness or injury.
- The physical exam proceeds in a logical order, usually from head to toe, but may vary from patient to patient. The main purpose of the physical exam is to reveal any injury or medical problem that could be a threat to patient survival if left untreated.

Principles of Patient Assessment

Patient assessment is a skill, and must be practiced. The patient assessment process involves the use of your senses. Three methods are used during your patient assessment:

Inspection (looking): A method of examination that involves looking for signs of injury or illness. Simply make an overall observation of your patient, then an observation of the body.

Auscultation (listening): A method of examination that involves listening for signs of illness or injury. The most important listening you will do is for air entering and leaving the lungs to determine respiratory status.

Palpation (feeling): A method of examination that involves feeling for signs of illness or injury. Palpating, or feeling with your fingertips is usually done last in the exam, because it may cause pain. Actual pressure applied depends on the area and type of problem you suspect.

Conducting an Exam

Medical vs. Trauma Patients

An examination of a trauma patient is different from an examination of a medical patient.

Physical signs of an injury can be observed and palpated. Medical problems are felt by the patient. In order to provide emergency care, you must ask questions to encourage the patient to describe their symptoms.

When conducting an exam, look for the following signs of injury. You may use the mnemonic **―D.O.T.S.** to remember them:

D= Deformities **O**= Open injuries **T**= Tenderness **S**= Swelling

Identify priority patients: *Is the patient:*

Critical Unstable

Potentially Unstable

Stable

If the patient is **CRITICAL UNSTABLE** or **POTENTIALLY UNSTABLE**,
Begin packaging the patient during the **rapid assessment** while treating life threats and transport as soon as possible.

- In addition, perform the **rapid trauma assessment** for the trauma patient if he/she has significant mechanism of injury and apply spinal immobilization as needed.
- For the unresponsive medical patient perform the **rapid medical assessment**.
- If the patient is **STABLE**, perform the appropriate focused physical exam (for the medical pt. perform the **focused physical exam**; for trauma patient perform the **focused trauma assessment**.)

Focused history and physical exam – trauma

Re-consider the mechanism of injury. If there is significant mechanism of injury, perform a ***Rapid Trauma Assessment*** on-scene while preparing for transport and then a Detailed Assessment during transport.
If there is no significant mechanism of injury, perform the ***Focused Trauma Assessment.***

FOCUSED TRAUMA ASSESSMENT

Perform on patients with no significant **MOI**

Assess the patient's chief complaint

- The specific injury they are complaining about – Why they called EMS
  - Assess and treat injuries not found during your Initial Assessment
  - Reconsider your transport decision
  - Consider ALS intercept

Focused Assessment

- Follow order of the Rapid Assessment
- Focus assessment on the specific area of injury or complaint.

Baseline Vital Signs

- Obtain a full set of vital signs including:
- Respirations
- Pulse
- Blood Pressure
- Level of Consciousness
- Skin

Assess SAMPLE History

- Signs & Symptoms

- Allergies
- Medications
- Pertinent Past Medical History
- Last oral intake
- Events leading up to the injury/illness

Obtain baseline vital signs *(respirations rate)*

Watch the chest/abdomen and count for no less than 30 seconds. If abnormal respirations are present count for a full 60 seconds.

- Quality
- Normal
- Shallow
- Any unusual pattern?
- Labored?
- Deep
- Noisy breathing

❖ Physical Exam (Head-to-Toe)

❖ When assessing a trauma patient, have to use a memory aid, such as **BP-DOC** or **DCAP-BTLS**

❖ BP-DOC

❖ **B-** Bleeding

❖ **P-** Pain

❖ **D-** Deformities

❖ **O-** Open wounds

❖ **C-** Crepitus (a grating noise or sensation)

❖ DCAP-BTLS

❖ **D**- Deformities

❖ **C**- Contusions

❖ **A**- Abrasions

❖ **P**- Punctures and penetrations

❖ **B**- Burns

❖ **T**- Tenderness

❖ **L**- Lacerations

❖ **S**- Swelling

❖ Rapid Secondary Assessment- Trauma Patient with Significant Mechanism of Injury (MOI)

❖ The Rapid Secondary Assessment is a head- to- toe physical exam of the patient that should take no more than 90 seconds to complete. It is performed on patients who have a significant Mechanism of injury (MOI). These patients will most likely have a high priority for transport. Check the Vital sign quickly and assume the suspected neck and spine injury.

1) Examination of the Head

- Scalp and skull: Check for deformities, open injuries, tenderness and swelling.
- Ears and nose: Look for blood or cerebrospinal fluid(CSF) in or around openings
- Pupils: Normally constrict with more light and dilate with less light; usually symmetrical (unless otherwise due to prior condition or injury - consider possible artificial eye).
- Abnormal findings include no reactivity to light, pupils that remain constricted, or unequal pupils.
- Mouth: Check for deformities, open injuries, tenderness and swelling. Check for possible airway obstructions such as foreign objects, loose teeth, etc.
- Face: Bones and muscles.

2) Examination of the Neck

- Always go front to back (anterior to posterior).
- Check for deformities, open injuries, tenderness and swelling.
- Check trachea for mid-line position.
- Palpate vertebrae.
- Open injuries (bandage immediately with occlusive dressing (prevent air from entering veins).
- Check for medic alert necklace.

3) Examination of the Chest

Any injury may involve the vital organs or major blood vessels.

- Check for deformities, open injuries, tenderness and swelling.
- Feel ribs for deformities all the way to spine.
- Palpate the sternum.

4) Examination of the Abdomen

Abdominal organs may be injured without external signs.

- Check for rigidity (hardness) or distention.
- Cuts, scrapes (lacerations and abrasions), penetrating wounds, protruding organs. Potential bleeding and infection.
- May indicate underlying injury. Palpate quadrant with pain last.
- Swelling or discoloration.

5) Examination of the Back

- Check chest wall for deformities that may indicate broken ribs.
- Check for obvious deformities and/or tenderness along entire length of spine that may indicate spinal cord injury.
- As with chest injuries, check for sucking wounds, penetrating injuries, cuts, etc.
- Blood accumulation in the flanks and/or tenderness may indicate abdominal injury.

6) Examination of the Pelvis

- Composed of the left and right ileum, ischium and pubic bone.
- Pelvic or hip fracture could result in blood loss of 2litres or more.
- Internal organs, blood vessels and nerves pass through pelvic area.
- Spinal injury possible.
- Genital region: priapism in males.
- Deformities not always obvious. Palpate iliac crest (pelvic wings) and pubic bones.
- Open injuries may occur, but are uncommon. Penetrating injuries possible.
- Assess for tenderness.

7) Examination of the Lower Extremities

Common sites of injury – do not rush your examination.

- Check for deformities, open injuries, tenderness and swelling.
- Check dorsalis-pedis pulse or posterior tibial pulse
- Check for motion – wiggle toes
- Check for sensation – gently squeeze one extremity then another. Ask patient, —Can you feel this?

8) Examination of the Upper Extremities

- *Common sites of injury – do not rush your examination.*
- Check for deformities, open injuries, tenderness and swelling.
- Check radial pulse
- Check for motion – wiggle fingers
- Check for sensation – gently squeeze one extremity then another. Ask patient, Can you feel this?
- Check for medic- alert bracelet.

Secondary Assessment- Responsive Medical Patient

The most important assessment information is obtained through the patient history and the taking of vital signs. Focus the exam on the body part that the patient has a complained about.

O- Onset: Ask the patient , what he/she was doing at the onset of pain (When the pain or symptoms began)

P- Provocation: Ask the patient that what provokes or affects the pain. Like: “Does anything you do make the pain better or worse?

Q- Quality: Ask the quality of the pain patient actually feels like: “Can you describe how your pain feels? Or Is the pain sharp or is it dull? Or Is it steady or does it come and go?”

R- Region and radiate: Ask the victim that where the pain is originating and to where it may be moving or radiating. Like: Can you point with one finger to where your pain is the worst. Or Does your pain move or radiate to any other part of your body?

S- Severity: Ask how severe the pain or discomfort is.

T- Time: Ask the patient how long he may have been experiencing the pain or discomfort.

Measuring Vital Signs

A patient's vital signs include:

- Respiration
- Pulse
- Skin
- Pupils
- Blood pressure

At the conclusion of the lesson, we will practice measuring vital signs.
You can assess and monitor most vital signs by looking, listening and feeling.

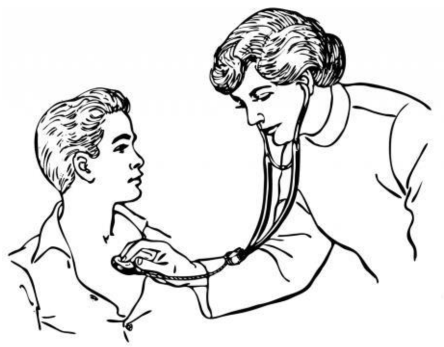
Proper Equipment to Measure Vital Signs

- Wristwatch – count seconds
- Penlight – examine pupils
- Stethoscope – respiration and blood pressure
- Pen and notebook – take notes

Blood pressure cuff (sphygmomanometer) – measure B/P More important than just measuring vital signs are **measuring changes over time.** It is important to establish baseline vital signs. For example, if pulse on initial reading is 80 and later becomes 120, this indicates the possibility of a serious condition developing.

Age Definitions

- **Infant**: Under 1 year
- **Child** : One to 9 years
- **Adult** : 9 and older



Respiration

Normal Respiratory Rates

- **Infant:** 25-50 rpm
- **Child :** 15-30 rpm
- **Adult :** 12-20 rpm

Pulse

A respiration consists of one inhalation and one exhalation. To count respirations, count the number of times a chest or abdomen rises and falls in 30 seconds, then multiply by 2. Pretend to count pulse or do something so the patient is unaware and breathing naturally. When respirations are all the same frequency and depth (shallow or deep breathing), breathing is considered regular. If frequency or rate is different, breathing is irregular (rhythm).

Normal Pulse Rates

Age Group Pulse

- ✓ **Infant**:120-150
- ✓ **Child** :80-120
- ✓ **Adult** :60-80

When measuring pulse, note the following:

- ❖ **Pulse Rate:** Slow or fast
- ❖ **Strength of pulse**
  - **Normal** (full and strong)
  - **Thready** (weak and rapid)
  - **Bounding** (unusually strong)
- ❖ **Rhythm:** Are beats spaced regularly?

Rate, strength and regularity tell you what the heart is doing at any given time.

Other noted locations to measure a pulse:

- ➢ **Brachial** – upper arm
- ➢ **Carotid** – neck
- ➢ **Femoral** – groin
- ➢ **Dorsalis pedis**– top of the foot
- ➢ **Posterior tibial artery** – medial surface of ankle

Skin

Assessment of the temperature, colour and condition can tell you about the patient's circulatory system.

Temperature

Normal body temperature: **98.6 °F or 37°C**

Method: Place the back of the hand against the patient's skin. This type of reading is called ***relative skin temperature***. It is not an exact measurement, but can tell you if it is high or low. Temperature is reported as normal, hot, cool, or cold.

Skin Colour

Skin colour provides information on the heart, lungs and other problems (circulation).

Skin color can be characterized by:

- **Paleness (white ashen):** Caused by shock or heart attack, resulting in impaired blood flow. Also caused by fright, fainting or emotional stress.
- **Redness (flushing):** Caused by high blood pressure, alcohol abuse, sunburn,

heat stroke, fevers, infection or disease.

- **Blueness (cyanosis):** A serious problem, seen first around finger tips and mouth, caused by reduced levels of oxygen due to shock, MI, poisoning, etc.
- **Yellowness:** Indicates liver disease. Includes sclera (eyes).
- **Black and blue mottling:** Caused by blood seeping under the skin (a blow or severe infection)

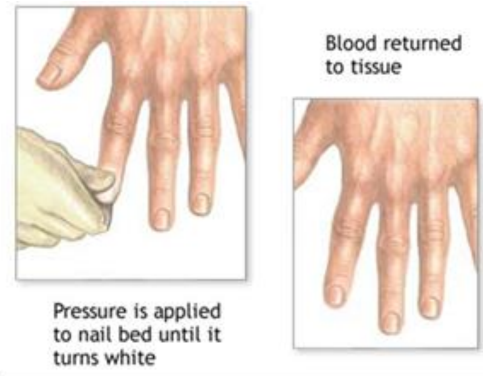
  In people with darker pigmentation, check for color changes on lips, nail beds, palms, ear lobes, inner surface of the lower eyelids, gums and tongue.

Skin Condition

Reported as dry, moist or wet with respect to the immediate environment.

Capillary Refill

Used for infants and children under 6 years old. Not always accurate in adults. Press on nail bed and observe how long it takes for the normal pink color to return after releasing. Always re-check at the same place. Capillary refill may be delayed in patients with cold extremities. This method is used on adults in triage situations



Pupils

Normal response: Pupils constrict with exposure to light and dilate when amount of light is reduced. Both pupils should be the same size unless a prior injury or condition has changed this. To assess, shine a penlight to the eyes. If outdoors, cover the eyes and assess for dilation.

Abnormal findings: No reaction to light, pupils remain constricted (possible drug overdose), or unequal pupils (head injury or stroke).

Blood Pressure

This is the amount of pressure the surging blood exerts against the artery walls. It tells you if cells, organs and tissues are getting the blood necessary. A blood pressure cuff (sphygmomanometer) is used to measure blood pressure.

Systolic pressure: is the result of a contraction of the heart, forcing blood through the arteries.

Diastolic pressure: is the relaxation between contractions. Both normally rise and fall together. Blood pressure varies with age, gender and medical history of the patient. It is usually 10 mm/Hg lower in females than in males.

NORMAL BLOOD PRESSURE VALUES (MMHG)

Adult /Child (up to 12 years old)

Systolic: 100+age, 80+(2 x age) Up to 150 mmHg

Diastolic: 65-90 mmHg, 50-80 mmHg

Methods:

1. Listening for systolic and diastolic sound (Auscultation) using a blood Pressure cuff & stethoscope.
2. Feeling for (palpating) the return of a pulse as cuff is deflated. Used when is too noisy or bumpy to auscultate. Can only measure systolic blood pressure.
   Several factors can influence blood pressure. Some increase blood pressure while others will decrease it, such as:

- Conditions or substances that constrict blood vessels can increase blood pressure such as: Cold environment, stress, pain, smoking, caffeine, and decongestants.
- Heart failure, trauma and/or shock will decrease blood pressure.

Other factors can affect a reading, such as not hearing accurately, placing Stethoscope improperly, not placing arm at heart level, using the wrong size Cuff or deflating the cuff too fast.

III. Patient History

At this point, re-evaluate what you observed when you arrived on scene.

- Secure scene for rescuer and patient, remove obvious mechanism of injury.
- Patient history is gathered mostly in the interview.
- Generally you ask the patient questions; however, if unresponsive, gather facts by observing scene M.O.I., looking for identification tags, speaking to family members and bystanders.

Remember the differences between medical and trauma patients. In trauma, perform physical exam first. For medical patient take a history first.

Discuss optional use of mnemonic —S.A.M.P.L.E.

(S) Signs and Symptoms:

Signs: conditions you can observe (see, feel or hear) such as a broken wrist or unequal pupils.

Symptoms*:* conditions that only the patient can feel or describe, such as stomach pain, tenderness or dizziness.

Begin by asking open-ended questions:

- How do you feel?
- Why did you call us today?
  Avoid closed-ended question that have *"yes" or "no"* answers, or leading questions. Examples:
- Do you feel pain in your leg?
- What do you feel in your chest?

(A) Allergies. Determine if patient is allergic to medications, food or anything in the environment. Can help to determine possible causes of patient‘s condition.

(M) Medication. Identify all medications the patient is currently taking or has recently taken. These may identify a medical condition.

(P) Pertinent history. Pertinent to the emergency care you are providing.

(L) Last oral intake. Ask your patient when the last time was heor she had anything to eat or drink. Pertinent to a patient who is unresponsive or confused. Important if the patient need immediate surgery.

(E) Events. Activities prior to the incident.

IV. Ongoing Assessment

A patient may be in stable or unstable condition. The assessment process must be ongoing until your patient is turned over to the next level of care. Complete the following every 5 minutes for unstable patients and every 15 minutes for stable patients.

- Reassess LOC (alert, verbal, painful, unresponsive).
- Reassess and correct any airway problems.
- Reassess breathing for rate & quality. Ventilate as needed.
- Reassess pulse rate and quality.
- Reassess skin temperature, colour and condition.
- Repeat any part of physical exam that may be needed.
- Reassess your interventions (treatment) to check effectiveness.
- Continue to calm & reassure the patient.

Maintain professionalism and respect for patient’s concerns and modesty.
Do not leave patient unattended.

HAND-OFF REPORT

When you are relieved of your patient by a higher-level care provider. Be prepared to give appropriate information about your patient. This is the hand-off report, also known as patient transfer information.

The hand-off report contains eight items of information:

- Patient age and sex
- Chief complaint
- Level of consciousness
- Circulation status
- Airway status
- Breathing status
- Patient history
- Treatment given

The report is designed to be an up-to-the-minute account of the patient‘s Condition, treatment and other information. Sometimes this will also appear in your written report.

Unit summary

General Procedure on Arrival on The Scene

- Ensure your own personal safety.
- Ensure patient safety.
- Establish a general impression of the scene and begin your initial assessment of the patient
- Identify and treat life-threatening injuries.
- Stabilise and continue to monitor the patient.

Six phases of the patient assessment plan

- Scene size up
- Initial assessment
- Physical exam
- Patient history
- Ongoing assessment
- Hand off report

Six steps of Initial assessment

- Form a general impression
- Check for response
- Check airway
- Verify breathing
- Assess circulation
- Patient status update

Principles of Patient assessment

- Inspection
- Auscultation
- Palpation

Measuring Vital signs

- Respiration
- Pulse
- Skin
- Pupils
- Blood pressure

Ongoing assessment

- Reassess LOC (alert, verbal, painful, unresponsive).
- Reassess and correct any airway problems.
- Reassess breathing for rate & quality. Ventilate as needed.
- Reassess pulse rate and quality.
- Reassess skin temperature, colour and condition.
- Repeat any part of physical exam that may be needed.
- Reassess your interventions (treatment) to check effectiveness.
- Continue to calm & reassure the patient.

Hand-off report

- Patient age and sex
- Chief complaint
- Level of consciousness
- Airway status
- Breathing status
- Circulation status
- Patient history
- Treatment given

Self- Assessment

Objective Type Question

1. How many general procedures should be followed by an MFR?
   a. 5
   b. 7
   c. 6
   d. 3

2. An MFR not tell during introduce him self
   a. Age
   b. Name
   c. Organization
   d. Trained MFR

3. Scene size up not follows one of the following
    a. What is the current situation?
    b. Where is it going?
    c. How do I control it?
    d. Steps of the patient assessment

4. Which of the following is not the part of responsiveness?
    a. Verbal
    b. Pain full
    c. Unstable
    d. Alert

5. Which of the following is the method of Airway open?
    a. Jaw thrust
    b. Head lift
    c. Chin tilt
    d. All of the above

6. When you verify Breathing respiration must be
    a. Inadequate
    b. Fast
    c. Slow
    d. Adequate

7. Which of the following is principle of Patient assessment?
    a. Auscultation
    b. Inspection
    c. Palpation
    d. All of the above

8. CSF stands for:
    a. Cervical spinal fluid
    b. Cerebro spinal follow
    c. Cervical swelling fluid
    d. Cerebro spinal fluid

9. 18 months old baby have normal pulse
    a. 80-120
    b. 80-100
    c. 120-150
    d. 60-80

10. Capillary refill used for the following
    a. 1-5 years old
    b. Up to 5 years old
    c. 1-6 years old
    d. Upto 6 years old

Descriptive Question

Q1. How many phases are there in Patient assessment?

Q2. 08 months baby girl have ……Respiration rate?

Q3. Physical exam start from …… to …….?

Q4. What is the normal body temperature of human?

Q5. Where will you find the Dorsalis pedis pulse?

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- Wikipedia: the free encyclopedia

LESSON -6

Basic Life Support (BLS) & Cardiopulmonary Resuscitation (CPR)

Introduction

BLS stand for "**Basic Life Support**" and **CPR** stands for "**Cardio Pulmonary Resuscitation**" i.e. to survive the brain cells in order to save the victims from irreversible damage to brain cells.

Basic life support (**BLS**) and CPR are the process through which a first responder makes an attempt to stabilize a victim till the arrival of EMS/advance care.

Outcomes

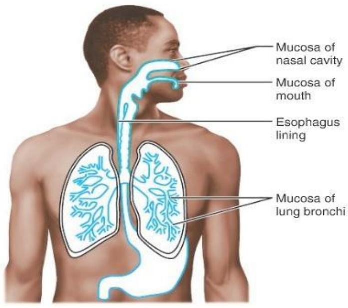
Upon completion of this lesson, you will be able to

- Causes of partial or total upper airway obstruction.
- Demonstrate rescue breathing for adults, children and infants using a mannequin, with and without foreign body airway obstruction.
- Describe and demonstrate CPR in adults, children, and infants using a Mannequin.
- Describe and demonstrate two-rescuer CPR for adults.

Terminology

Neuromuscular system: -The neuromuscular system includes all the muscles in the body and the nerves serving them. Every movement your body requires communication between the brain and the muscles.

Mucus membrane: -A mucous membrane or mucosa Is a membrane that lines various cavities in the body and covers the surface of internal organs. It consists of one or more layers of epithelial cells overlying a layer of loose connective tissue. Some mucous membranes secrete mucus, a thick protective fluid.



Basic Life Support (BLS) -It is a level of medical care which is used for victims of life-threatening illnesses or injuries until they can be given full medical care at a hospital. It can be provided by trained medical personnel, including Emergency Medical Technicians, Paramedics, and by qualified bystanders.

Rescue Breathing– it is a process of providing artificial ventilation to a patient breathing inadequately or not at all.

Abdominal Thrust: In the cases of FBAO, grasp the fist with the other and press the fist into the patients' abdomen with a quick upward thrust.

Chain of survival– The chain of survival‖ has 5 links, and the patient's chances for surviving is the greatest when all the links come together.

Clinical Death–Occurs when a patient is in respiratory arrest or in cardiac arrest. The patient has a period of 4-6 minutes to be resuscitated without brain damage.

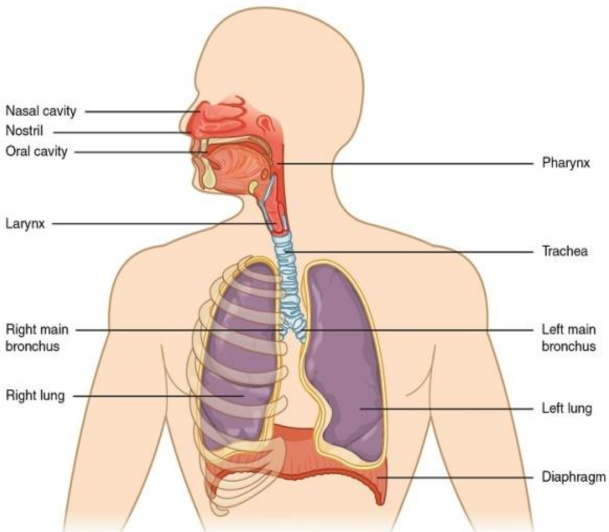
Biological Death- The moment the brain cell begins to die. Biological death cannot be reversed.

The Respiratory System

The respiratory system is made up of four components:

- An airway (upper and lower)
- A neuromuscular system (includes the respiratory center in the brain, respiratory muscles, and the nerves that connect the two)
- Alveoli – Tiny airs sacs surrounded by capillaries
- Arteries, capillaries and veins

The alveoli are surrounded by the capillaries. The brain sends nerve signals to muscles in the thorax and diaphragm, causing us to breathe. With each inhalation, air is carried through the airways to the alveoli in the lungs, where oxygen and carbon dioxide are exchanged.



In combination with the respiratory system, the circulatory system supplies the oxygen necessary for life, and eliminates carbon dioxide from the body.

1. Breathing: To assess the presence of breathing, we follow-**Look, Listen and Feel (LLF).**

Adequate breathing is characterized by:

- Chest and abdomen, proper rise and fall with each breath.
- Air can be heard and felt exiting the mouth or nose.
- Ease of breathing(effortlessness)
- Adequate rate

Inadequate breathing is characterized by:

- Inadequate rise and fall of the chest and abdomen.
- Noisy breathing: bubbles, rales, strider, whistling etc.
- Increased respiratory effort
- Cyanosis
- Inadequate rate
- Altered mental status

Absent breathing is characterized by:

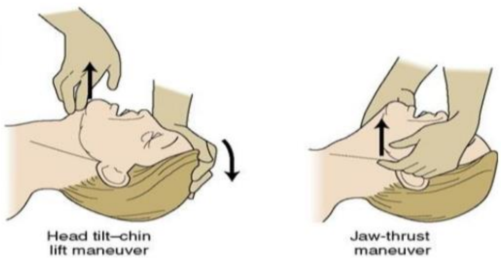
- No chest or abdominal movement.
- Air cannot be heard and felt exiting the mouth or nose.

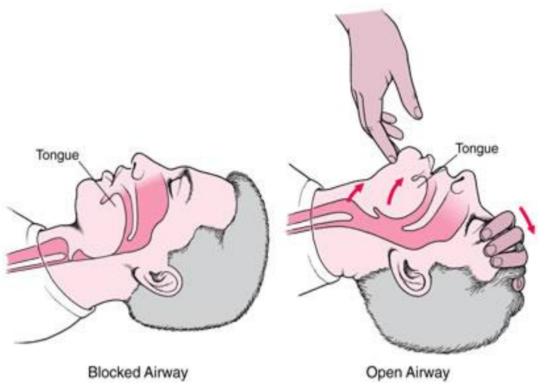
2. Cyanosis

Definition: A bluish coloration of the skin and mucous membranes caused by a lack of oxygen in the blood and tissues.

This condition can be the result of the patient breathing in an environment poor in oxygen, suffering from illness or respiratory injury, or airway obstruction. Cyanosis can be more easily noticed on the lips, ears and nostrils or nail beds.

3. Techniques for Opening the Airway





Head-tilt chin-lift

- This is the method of choice for opening the airway.
- Do not use this method if you Suspect head, neck or spinal injury.

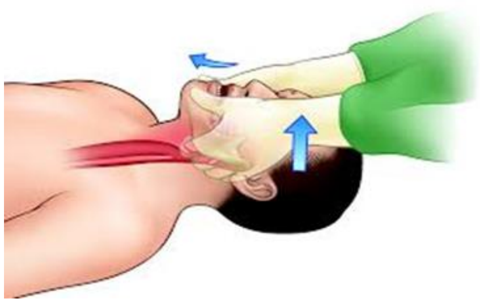
Conduct Demonstration:

1) Position the patient lying face up.
2) Kneel by the patient‘s shoulders towards the head.
3) Place one hand on the forehead and place the fingertips of your other hand under the bony part of the patient’s jaw.
4) Lift up on the chin, supporting the jaw, and at the same time, tilt the head back as far as possible. For infants and children: Place in the —sniffing position – do not over extend.

Important Precautions:

- Always keep the patient‘s mouth slightly open – use your thumb to hold down the patient‘s lower lip.
- Never dig into the soft tissue under the patient‘s chin. Once the airway is open, check breathing. Look, listen and feel. If patient is not breathing, start artificial ventilations. If unable to ventilate, assume the airway is obstructed.

Jaw Thrust: The jaw thrust is the only maneuver recommended on an unconscious patient with suspected head, neck or spinal injury.



Process:

- Position the patient lying face up.
- Kneel above the patient‘s head. Place your elbows next to the patient’s head on the surface where the patient is lying. Place both hands on either side of the patient’s head.
- Grasp the angle of the patient‘s jaw on both sides; for an infant or child use two to three fingers.
- Use a lifting motion to move the jaw forward (up) with both hands.
- Keep the patient‘s mouth slightly open by using your thumbs if needed.

Emphasis the need to reattempt if airway does not open. Reposition and reassess. If unsuccessful, consider using airway adjunct.

4. Artificial Ventilation (Rescue Breathing)

Once the patient has an open airway, you can provide artificial ventilation for a patient breathing inadequately or not at all.

There are many techniques for artificial ventilation. You should be competent in three, listed below in recommended order of preference:

1) Mouth-to-mask
2) Mouth-to-barrier device
3) Mouth-to-mouth

Breathing rates and duration:

- Adults: 12-20 breaths per minute.
- Children: 15-30 breaths per minute.
- Infant: 25-50 breaths per minute.

Up to 6 months:	30-60 BREATHS PER MINUTE
6-12 months:	24-30 BREATHS PER MINUTE
1-5 years:	20-30 BREATHS PER MINUTE
6-12 years:	12-20 BREATHS PER MINUTE
12 years and up	12-20 BREATHS PER MINUTE

Note:-Breathing rate also vary as per age. Look for proper chest rise. With infants and newborns, use puffs from the mouth so as not to over-ventilate.

Hazards to Rescuers

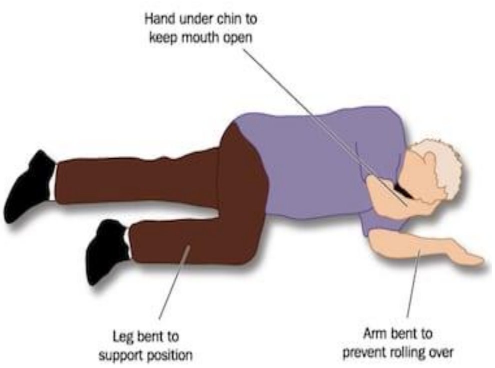
- Diseases: Blood-borne and/or airborne. Mask, gloves, and eye protection should be worn. Use BVM (Bag Valve Mask) or pocket mask.
- Chemicals: Exposure from a contaminated patient. Patient should be decontaminated first.
- Vomits: One-way valve on a pocket mask or BVM should be used.

Gastric Distention

This problem can occur during rescue breathing, which can force some air into the patient's stomach, causing the stomach to become inflated, or distended.

Prevention: Avoid or minimize gastric distention by positioning the patient's head properly and by avoiding giving ventilations that are too forceful or too quick. Volume should be limited to that which causes the chest to rise adequately.

Recovery Position*:* For a patient with a pulse and adequate breathing, place the patient in the recovery position. This position uses gravity to keep the airway clear, allowing fluids to drain out of the mouth instead of into the airway. The recovery position should be used on an unresponsive, uninjured patient who is breathing adequately. Keep the patient in that position until transportation arrives.



Do not move the patient into the recovery position if you suspect trauma or C-spine (cervical spine) injury.

Mouth-To-Mask ventilation procedure

This method uses a pocket face mask with a one-way valve to form a seal around the patient's nose and mouth. It is the preferred method because it eliminates direct contact with the patient and prevents exposure.

1) Place the mask around the patient's mouth and nose. The narrower top portion of the mask should be seated on the bridge of the nose. The broader portion should fit the chin.
2) Seal the mask by placing heel and thumb of each hand along the border of the mask and pressing firmly to provide a tight seal around the edges of the mask.

Mouth-To-Barrier device ventilation procedure

There are two broad categories of barrier devices: masks and shields.

Most have a one-way valve but have no exhalation port. The patient's exhaled air will leak out around the barrier device.

1) Position the barrier device around the patient's mouth and nose, providing an adequate seal.
2) Open the patient's airway, using the appropriate maneuver.
3) Deliver breaths at the appropriate rate and depth, observing chest rise and fall. Listen for patient exhalation.

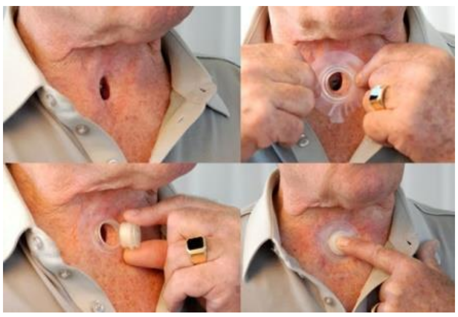
Mouth-to-Mouth ventilation procedure:-

The risk of contracting infectious diseases makes mouth-to-mouth ventilation very risky for use in the field. The decision to use this method is a personal one.

Use barrier devices whenever possible.

1) Open the patient's airway, using the appropriate maneuver.
2) Gently pinch the patient's nose closed with your thumb and index finger (of the hand on the forehead), to prevent air from escaping.

Stoma Patients: Occasionally, you may encounter a patient who has undergone a laryngectomy. This person will have a stoma, a permanent opening from the trachea to the front of the neck. Perform direct mouth-to-stoma ventilation.



5. Foreign Body Airway Obstruction (FBAO)

Definition-"Foreign body airway obstruction: a partial or complete blockage of the breathing tubes to the lungs due to a foreign body (for example, food, a bead, toy, etc.). The onset of respiratory distress may be sudden with cough. There is often agitation in the early stage of airway obstruction."

There are two types of airway i.e. upper and lower airway. An upper airway obstruction is anything that blocks the back of the mouth or throat, or the nasal passages (Upper airway). A lower airway obstruction is caused by breathing in a foreign body or by severe spasm of the bronchial passages, such as asthma. Airway obstruction can be caused by the following:

Causes of Airway Obstruction

- **Tongue:** The tongue fall back, blocking the throat. This problem is common in unconscious patients.
- **Epiglottis:** Occurs when patient try to force breathing. Also caused by allergies.
- **Foreign body:** Objects such as food ,ice, toys, dentures, vomitus and liquid that remain in the upper portion of the throat or airway
- **Tissue Damage:** Can be caused by a penetrating injury to the neck, inhalation of the hot air,
- **Illness:** Respiratory infections and certain chronic conditions (such as asthma) or Sudden Infant Death Syndrome may cause tissue inflammation or muscular spasms and obstruct the airways.

Recognizing (FBAO)

The key to successful treatment is early recognition. Suspect FBAO in any victim who suddenly stops breathing, becomes cyanotic, and loses consciousness for no apparent reason.

There are two types of FBAO – **Partial** and **Complete.**

Partial: An object caught in the throat that does not totally block breathing. A patient with partial obstruction may have adequate or poor air exchange. With adequate air exchange, the patient may cough forcefully, though there maybe wheezing between coughs. Do not interfere with patient's attempt to clear the airway. With poor air exchange, the patient will exhibit a weak, ineffective cough, high-pitched noise while inhaling, increasing respiratory difficulty and possible cyanosis. Treat this situation as a complete airway obstruction.

Complete: The patient is unable to speak, breathe or cough. May clutch neck with thumb and finger – this gesture is known as the **universal sign of choking.** Movement of air will be absent.

6. Managing FBAO in Adults and Children

The method recommended for relieving FBAO with poor air exchange or complete obstruction is the abdominal thrust (Heimlich maneuver). Each individual thrust should be administered with the intent of relieving the obstruction. It may be necessary to perform several thrusts. It is possible to damage internal organs with this method. To minimize the possibility of injury, never place your hands on the xiphoid process or on the lower edges of the ribcage – your hands should be below this area but above the navel.

Manage a complete airway obstruction in children the same way you would for adults, except that you never use a blind finger sweep in children ages 1 to 8 as well in infants. Airway obstruction in children may also be caused by infections such as epiglottis or croup, which produce airway edema. Suspect this condition if an infant or child has a fever with congestion, hoarseness or drooling. A patient with any of these conditions must be transported to the emergency facility. It is dangerous to the patient to attempt to relieve this form of obstruction.

Abdominal Thrusts — Responsive Adult or Child (Patient Standing or Sitting)

1. Determine that there is complete obstruction or partial obstruction.
2. Ask, hey are you choking.
3. Position yourself behind the patient and place the thumb side of one fist on the center of the breast bone.
4. Grasp the fist with the other hand and give up to five chest thrust in rapid succession.
5. Watch and listen for evidence that the object has been removed .The patient will begin to cough or speak if it has been.
6. If the patients' airway remains obstructed repeat the thrust until the airway is cleared or until the patient loses responsiveness.
7. If the patient becomes unresponsive before you are able to clear the airway obstruction, direct someone to call *EMS and begin CPR.*

Unresponsive Adult or Child

1. Take the appropriate BSI precaution
2. With the patient lying face up position (supine) tap and shout to assess responsiveness.

3. If unresponsive, alert EMS
4. Assess for the presence of breathing by looking, listening and feeling for air Exchange .
5. If breathing is absent or only gasping, assess for carotid pulse. If there is a Pulse , attempt to ventilate the patient
6. If after two attempts you are unable to achieve adequate chest rise, begin CPR.

Chest Thrusts — Pregnant or Obese Responsive Adult (Patient Standing or Sitting)

Chest thrusts are to be used only with patients in late stages of pregnancy or with the markedly obese, when abdominal thrusts cannot be applied effectively. So, use chest thrust for pregnant lady and fat person. Also same procedure (unresponsive adult) will be followed after unresponsiveness.

7. Managing FBAO in Infants

Always suspect foreign body airway obstruction in infants who demonstrate sudden onset of respiratory distress associated with gagging, coughing or wheezing.

Removing FBAO in Conscious Infant:

Perform the following procedure only if the infant has a complete obstruction or partial obstruction with poor air exchange, and only if you suspect a foreign object.

1. Take appropriate BSI
2. Pick up the infant and support him between forearms of both arms.
3. Rapidly deliver five back blows between the shoulder blades. If this fails to expel the object proceed the next step.
4. Infant turns over onto his back, again keeping the head lower than the Trunk use your thigh to support your forearm.
5. Locate the compression site and deliver the five chest thrusts.
6. Continue with this sequence of back slaps and chest thrusts until the object

is expelled or the infant loses responsiveness.

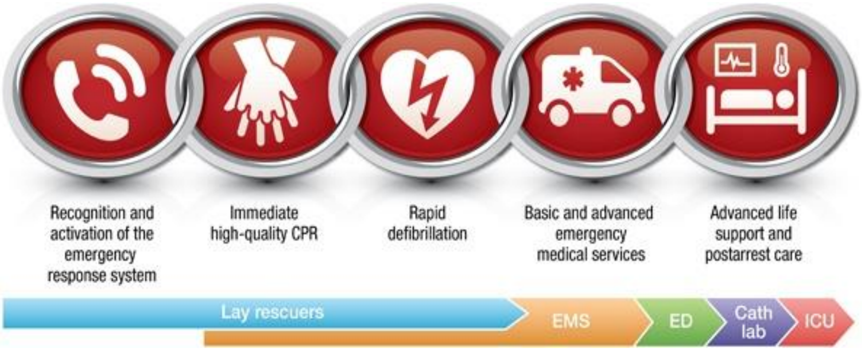
7. If the infant becomes unresponsive before you can expel the object, begin CPR.

Unresponsive Infant:-

1. Take appropriate BSI
2. If the infant is unresponsive and breathing is absent or only gasping, alert EMS
3. If there is no pulse, begin CPR with chest compression. If there is a pulse attempt to Ventilate
4. If after two attempts you are unable to achieve adequate chest rise, begin CPR

8. Chain of survival: The chain of survival refers to the links through which the chance for survival of patient increases once all the links are put together. At present there are **five** links related to the chain of survival. Cardiopulmonary resuscitation (CPR) can save the lives of victims in cardiac arrest. Two-thirds of heart attack victims (due to heart disease) die outside the hospital, most within two hours of the onset of symptoms. Though CPR itself is not enough to save the life of a victim of heart attack, it is a vital link in the chain of survival.

The Chain of Survival has five links. The 5 links in the adult out-of-hospital Chain of Survival are



1. **Recognition** of cardiac arrest and **activation** of the emergency response system
2. Early **cardiopulmonary resuscitation (CPR)** with an emphasis on chest compressions
3. Rapid **defibrillation**
4. Basic and advanced emergency medical services
5. Advanced life support and post-cardiac arrest care

A strong Chain of Survival can improve chances of survival and recovery for victims of cardiac arrest.

The need for these interventions should not be limited to victims of heart disease. Many victims of drowning, trauma, electrocution, suffocation, airway obstruction, allergic reaction, etc may be saved by prompt interventions.

9. Heart Attack Risk Factors-

An association has been found to exist between specific conditions and behaviors, and the development of blood vessel disease. The risk factors concept was developed to create an awareness of these associations.

Factors that cannot be changed

- Family history
- Sex
- Ethnic background
- Age

Risk factors that can be changed

- Smoking
- High blood pressure
- High cholesterol
- Physical activity

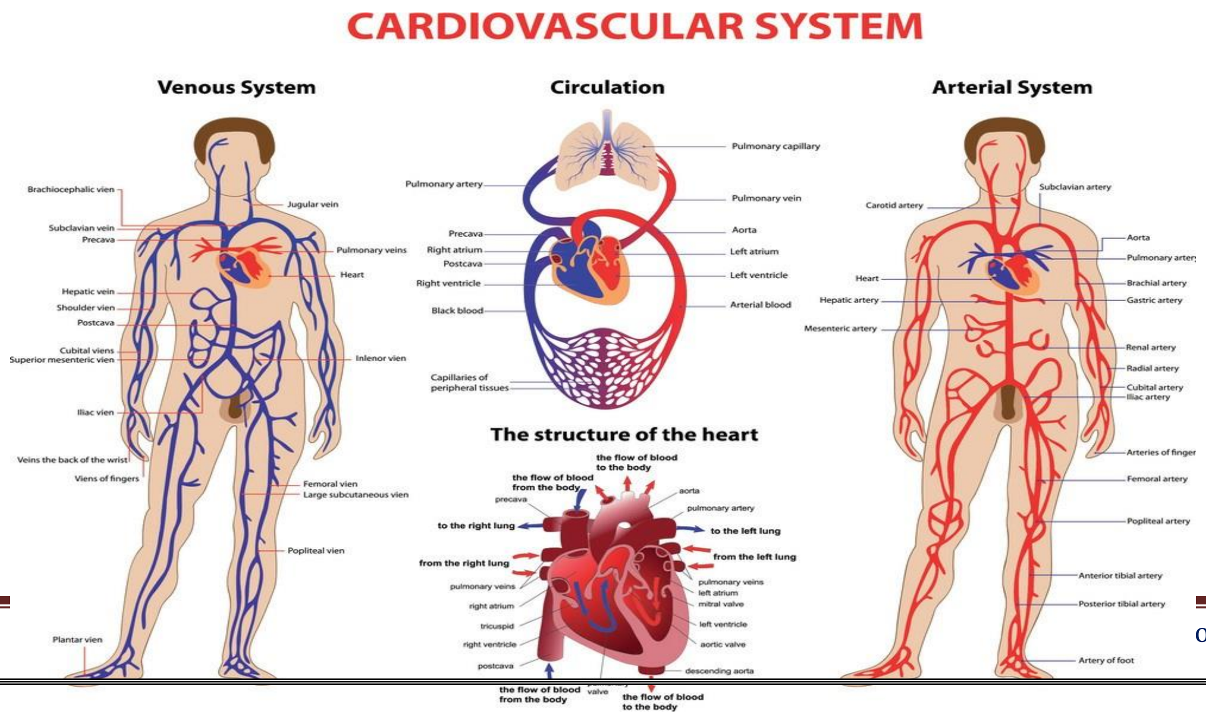
Contributing factors

- Obesity
- Diabetes
- Excessive stress

The greater the prevalence of risk factors, the greater the likelihood of heart disease or other blood vessel disease.

10. Heart and Lung Function and Anatomy

Cardiovascular system: The Cardiovascular system consists of the heart, blood, arteries, capillaries and veins. The heart is a muscular organ, approximately the size of a fist, and is located in the thoracic cavity behind the sternum and between the lungs. The coronary arteries are special arteries that supply blood to the heart muscles themselves.



The function of the heart is to pump blood. The left side receives oxygenated blood from the lungs and pumps it to the body through the arteries. The right side receives, from the veins, the blood that has circulated through the body and pumps it to the lungs to be oxygenated once again.

A system of one-way valves keeps the blood flowing in the right direction and prevents it from flowing backwards.

Clinical and Biological Death

The respiratory and circulatory system is interdependent – if either one stop; the other will do the same in a very short time. The brain is the first organ to suffer the effects of a lack of oxygen. Shortly after oxygen supply is cut off, brain cells begin to die, causing irreversible damage.

Clinical Death: Occurs when a patient is in respiratory arrest (not breathing) or in cardiac arrest (heart not beating). The patient has a period of 4 to 6 minutes to be resuscitated without brain damage. Clinical death can be reversed.

Biological Death: The moment the brain cells begin to die. Biological death cannot be reversed.

Exception:

Cold water drowning.

There have been cases of persons resuscitated One hour or more after cold-water drowning. In a cold environment, a person should not be considered dead until the victim's body is warmed. Cold water can actually help protect against these effects by two different reasons.

First, it triggers something known as the diving reflex, which helps to conserve oxygen by slowing down the heart and shifting blood to vital parts of the body, such as the brain. Interestingly, this response is much stronger in children, which is part of the reason that children are more likely than adults to survive after prolonged submersion.

Second, cold temperatures and swallowing of water can quickly lead to hypothermia. Body temperatures below 30°C cause brain tissue to become significantly resistant to hypoxia and also reduce its energy consumption by around 50%. Our bodies are equipped with temperature regulation mechanisms, but these are not fully developed in infants, making them more susceptible to hypothermia. Children also have higher surface area to body mass ratios and less body fat than adults, meaning they cool much faster and thermo-regulate less efficiently.

Signs of Certain Death

Lividity : The pooling of blood in the lower areas of the body. Shows as a purple to bluish color. A few hours after death, blood will settle in the lowest areas of the body due to gravity.

Rigor mortis: stiffening of the body and limbs that occurs after death, usually within 4–10 hours.

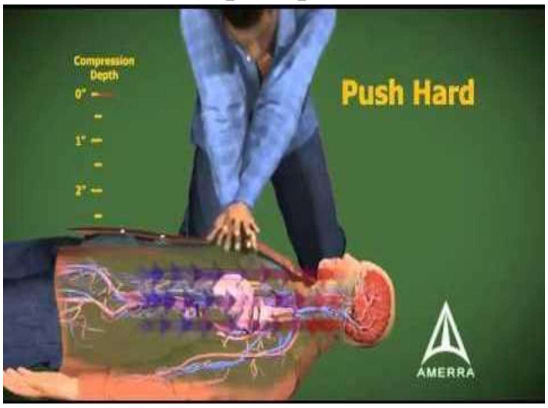
Decomposition: A decomposing body always produces a fetid odor. The rate of decomposition depends on a number of factors, primarily ambient temperature.

Other signs: mortal wounds such as decapitation, dismemberment, incineration, severe crushing injuries etc.

Note: - Only a medical doctor can pronounce a person officially dead.

Cardiopulmonary Resuscitation(CPR)

During respiratory arrest, the heart can continue to pump for several minutes and circulate oxygen. Without early intervention, respiratory arrest may lead to cardiac arrest. Once cardiac arrest occurs, circulation ceases and vital organs are deprived of oxygen.



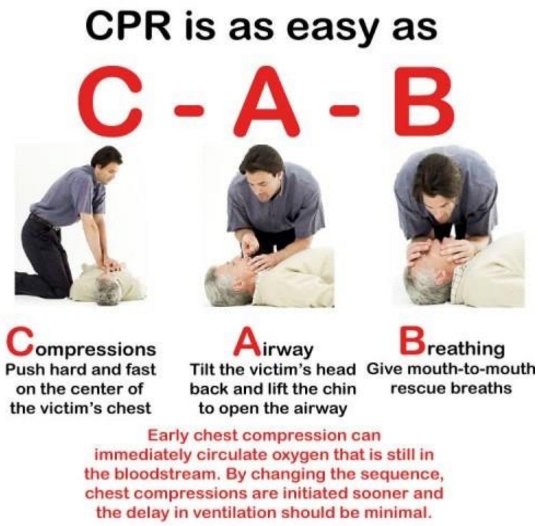
When respiratory and cardiac arrest occurs together, the patient is considered clinically dead. Within 4 to 6 minutes without circulation, brain damage will begin, and after 8 to 10 minutes, the damage is irreversible.

CPR involves a combination of chest compressions and artificial ventilations designed to revive a person and prevent biological death by mechanically keeping a person‘s heart and lungs working.

Note: -CPR must begin as soon as possible

Preparing for CPR

No patient should undergo CPR until the need for resuscitation has been established by appropriate assessment. Before providing CPR you must determine unresponsiveness, breathlessness and pulselessness. *Follow these steps:*



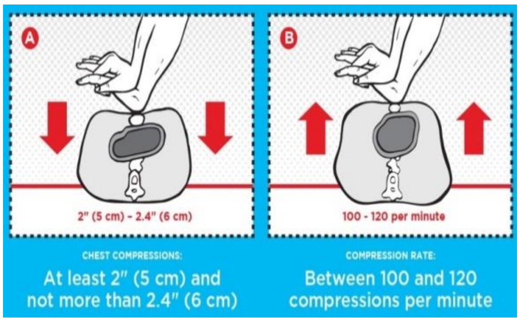
- **Establish unrespons**: Ask the patient, ―**Are you okay**? ―**What is your name**? Or shake/tap the patient. If unresponsive, position the patient properly (supine with arms along the body on a firm, flat surface, or blood flow will be compromised).

- **Activate the EMS system**: (Ask someone else to activate when available)
- **Check CAB's.**
- **Circulation**: Check pulselessness. On an adult and child, check the carotid for 5-10 seconds. On an infant, check brachial pulse. If you detect no pulse, begin CPR immediately.
- **Airway**: Check for open airway. Use appropriate method to open airway.
- **Breathing**: Use the look, listen and feel method to assess respirations. If the patient is not breathing, provide two ventilations. Use small puffs on infants.

CPR Chest Compressions for Adults: The specific steps for 1 rescuer & 2 rescuers CPR will be covered in the stations.

Chest compressions consist of rhythmic, repeated pressure over the lower half of the sternum. When combined with artificial ventilation, it provides enough blood circulation to sustain life. Follow these steps:

1) **Position the patient**: Must be supine on firm, flat surface, with arms along sides.
2) **Expose the patient's chest**: Remove the patient's shirt or blouse, providing for patient's privacy as much as possible.
3) **Get in position**: Kneel close to the patient's side, with your knees about as wide apart as your shoulders.
4) **Locate the xiphoid process:** Feel the lower margin of the rib cage. Run your fingers along the rib cage to the notch where the ribs meet the sternum, in the Centre of the lower chest.
5) **Locate the compression site**: Measure two finger widths from the xiphoid toward the upper chest, this is where you will rest the heel of your firsthand.
6) **Position your hands**: Put your free hand on top of the first hand. Extend or interlace your fingers (do not rest them on the chest wall).



7) **Position your shoulders**: They should be directly over your hands.
8) **Perform chest compressions:** Keeping your arms straight and your elbows locked, thrust straight downward from your shoulders. Release pressure completely after each compression. However, do not lift or move your hands, or you will lose proper position. Count as you perform compressions.

Adult CPR Summary – 8 years and older

- Compression depth: 5-6cm.
- Compression rate: 100-120 per minute
- Each ventilation: 5-6 second
- Pulse location: Carotid artery
- One-rescuer cycle: 30 compressions, 2 breaths
- Two-rescuer cycle: 30 compressions, 2 breaths

CPR Chest Compressions for Infant and Children

The specific steps for infant CPR will be covered in the stations

Cardiac arrest in infants and children is rarely caused by heart problems. Usually the cause is too little oxygen (hypoxia) due to injuries, suffocation, smoke inhalation etc. For this reason, you should resuscitate an infant/child for one minute before activating the EMS system (if you are alone).

1) **Position the patient**: Must be supine on firm, flat surface, with arms along sides. If an infant, place him or her on your forearm, using your palm to support the head.
2) **Expose the patient's chest**: Remove the patient's shirt or blouse.
3) **Locate the compression site**: In a child, use the same location as an adult. In infants, use one finger width below an imaginary line between the nipples.
4) **Perform chest compressions**: For an infant, use the flat part of your middle and ring fingers to compress the sternum. For a child, use the heel of one hand. Release pressure completely after each compression. However, do not lift or move your hands, or you will lose proper position. Count as you perform compressions.

Child CPR Summary – 1-8 years of age American Heart Association(AHA)

- Compression depth: 4-5 cm. (1/3–1/2 total chest depth)
- Compression rate: 100-120 per minute
- Each ventilation: 3-5second
- Pulse location: Carotid artery
- One-rescuer cycle: 30 compressions, 2breaths.
- Two-rescuer cycle: 15 compressions, 2breaths.

Infant CPR Summary – 1 year old and under (AHA)

- Compression depth: 3-4 cm. or 1-1.5 inch, (1/3–1/2 total chest depth)
- Compression rate: 100-120 per minute or more
- Each ventilation: 3-5 second
- Pulse location: Brachial artery
- One-rescuer cycle: 30 compressions, 2 breaths.
- Two-rescuer cycle: 15 compressions, 2 breaths.

14. Special Considerations Regarding CPR

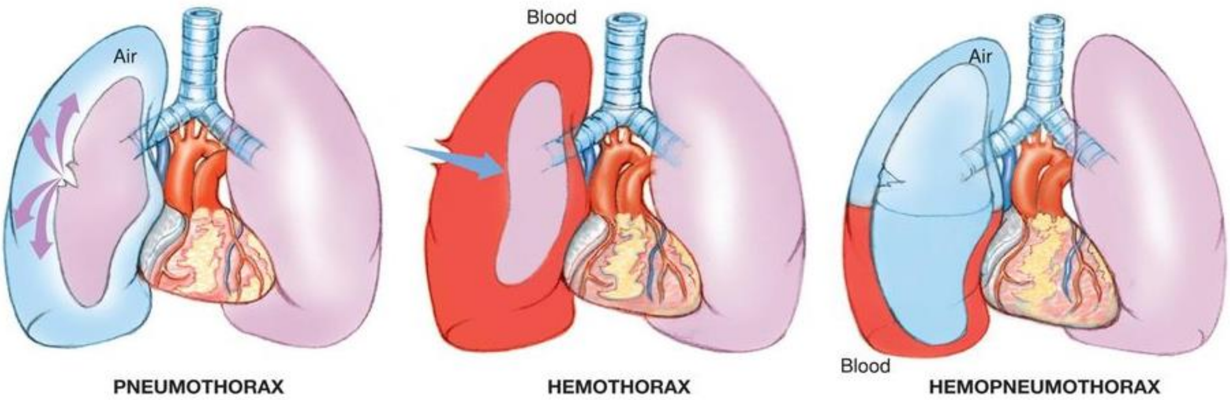
Signs of Successful CPR: —Successful CPR does not mean that the patient survives – it only means that you performed it correctly. Very few patients will survive if they do not receive Advanced Cardiac Life Support (ACLS). **The goal of CPR is to prevent the death of cells and organs for a few crucial minutes.** The patient's condition needs to be monitored throughout CPR to determine if CPR is effective.

- Have someone feel for a pulse during compressions. A pulse should be palpable with every compression.
- The chest should rise and fall with each ventilation.
- The pupils may begin to react normally.
- Patient‘s skin color may improve.
- Patient may attempt to move and try to swallow.
- Heartbeat may return.

Complications Caused by CPR

Even properly performed CPR can cause injuries, including:

- Fracture of the sternum and ribs
- Pneumothorax
- Haemothorax
- Cuts and bruises to the lungs
- Lacerations to the liver



Most of these complications are rare. Take care to use proper technique. Remember that even if CPR results in complications, the alternative is death.

Mistakes in Performing CPR

Problem	Result
Patient is not on a hard surface	Compressions are not effective
Patient is not in horizontal position	If patient‘s head is higher than the rest of the body , there is insufficient blood flow to reach the brain.
Head-tilt chin- lift maneuver improperly performed	Open airway not ensured
Incomplete seal around the patient‘s mouth and/or nose	Ventilation is not effective

Nostrils not completely pinched and the patient's mouth is not fully open during mouth-to-mouth ventilation.	Ventilations are not effectives
Hands not in correct position or compressions incorrectly placed	Fractured ribs ; fractured sternum; lacerated liver, spleen, lungs or injured pleura as a result of fractured ribs
Compressions too deep or frequent	Insufficient amount of blood is pumped
Improper compression/ventilation ration	Inadequate oxygenation of blood

Interrupting CPR: Once you begin CPR, you should not interrupt for more than a few seconds to check for pulse and breathing, or to reposition yourself or the patient. In addition, you interrupt CPR to:

- Move the patient on to a stretcher
- Move the patient down a flight of stairs or through a hallway
- Loading or unloading the patient into the ambulance
- To allow for defibrillation or ACLS (Advanced Cardiac Life
- Support) measures to be initiated
- Recover from physical exhaustion

Automated External Defibrillation

An automated external defibrillator (AED) is a portable electronic device that automatically diagnoses the life-threatening cardiac arrhythmias of ventricular fibrillation and pulseless ventricular tachycardia and is able to treat them through defibrillation, the application of electricity which stops the arrhythmia, allowing the heart to re-establish an effective rhythm. AED designed with simple audio and visual commands, and to be simple to use for the layperson. Certified medical first responder is able to use AED.

AED are design to deliver an electronic shock that will stimulate the heart to begin beating normally. The shock does not start a heart that has stopped or is in arrest, but it will give the heart a chance to spontaneously re-establish an effective rhythm on its own. The entire process is called **defibrillation**.

Conditions That the Device Treats

An automated external defibrillator is used in cases of life-threatening cardiac arrhythmias which lead to sudden cardiac arrest, which is not the same as a heart attack.

Sudden cardiac arrest can happen to anyone, anytime without warning but usually occurs in adults. Most cardiac arrests happen in the home. Therefore, knowing how to activate the emergency medical services (EMS) system, perform CPR and use an automated external defibrillator (AED) could help you save a life.

We discuss the third link in the Cardiac Chain of Survival: early defibrillation, including what it is and how it works in the case of life-threatening abnormal electrical activity of the heart. You will also know about the steps to using an AED. This knowledge will give you the confidence to give care to anyone who experiences sudden cardiac arrest.

The heart's electrical system sends out signals that tell the heart to pump blood. These signals travel through the upper chambers of the heart, called the atria, to the lower chambers, called the ventricles.

When the heart is normal and healthy, these electrical signals cause the ventricles to squeeze together, or contract. These contractions force blood out of the heart. The blood then circulates throughout the body. When the ventricles relax between contractions, blood flows back into the heart. The pause that you notice between heart beats when taking a person's pulse are the pauses between contractions.

If the heart is damaged by disease or injury, its electrical system can be disrupted. This can cause an abnormal heart rhythm that can stop the blood from circulating. The most common abnormal heart rhythm that causes sudden cardiac arrest occurs when the ventricles simply quiver, or fibrillate, without any organized rhythm. This condition is called ventricular fibrillation (V-fib). In V-fib, the electrical impulses fire at random, creating chaos and preventing the heart from pumping and circulating blood. The person may suddenly collapse unconscious, and stop breathing.

Another abnormal rhythm found during sudden cardiac arrest is ventricular tachycardia, or V-tach. With V-tach, the electrical system tells the ventricles to contract too quickly. As a result, the heart cannot pump blood properly. As with V-fib, during V-tach the person may collapse, become unconscious and stop breathing.

Unit Summary

Head-tilt chin-lift

- This is the method of choice for opening the airway.
- Used for medical patient.
- Do not use this method if you suspect head, neck or spinal injury.

Jaw Thrust:

- The jaw thrust is the only recommended on an unconscious patient with suspected head, neck or spinal injury and medical patient also.

Artificial Ventilation (Rescue Breathing)

If patient has an open airway, you can provide artificial ventilation for a patient breathing inadequately or not at all. There are many techniques for artificial ventilation. There are three method of artificial ventilation.

1) Mouth-to-mask
2) Mouth-to-barrier device
3) Mouth-to-mouth

Breathing rates and duration:

- Adults: 12-20 breaths per minute.
- Children: 15-30 breaths per minute.
- Infant: 25-50 breaths per minute.

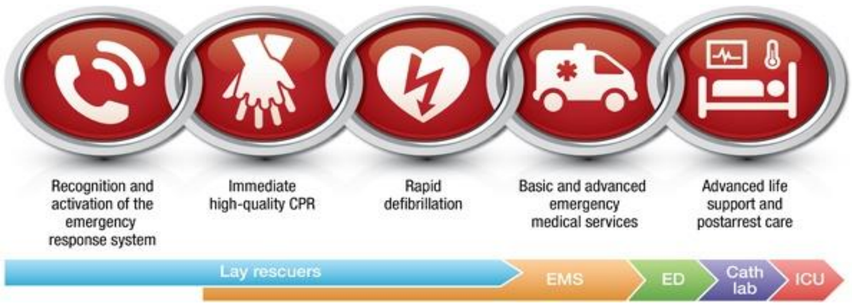
Foreign Body Airway Obstruction (FBAO): -

Foreign body airway obstruction: a partial or complete blockage of the breathing tubes to the lungs due to a **foreign body** (for example, food, a bead, toy, etc.). The onset of respiratory distress may be sudden with cough. There is often agitation in the early stage of **airway obstruction**.

There are two types of airway obstruction

1. **Partial airway obstruction:**
2. **Complete airway obstruction:**

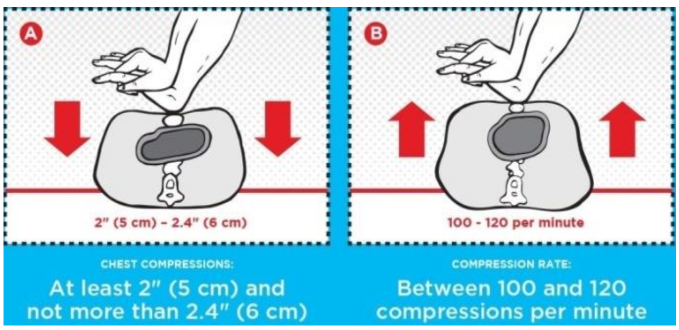
Chain of survival:



CPR- CPR involves the combination of chest compression and artificial ventilations designed to revive a person and prevent biological death by mechanically keeping a person's heart and lungs work.

Preparing for CPR

No patient should undergo CPR until the need for resuscitation has been established by appropriate assessment. Before providing CPR you must determine unresponsiveness, breathlessness and pulselessness.



CPR Chart:-

CPR CHART	Adult (≥ 9 Years)	Child (1-8Years)	Infant (0-1 Year)
Compression depth	At least 2 inch or one third to half of chest depth	About 2 inch or one third to half of chest depth	1.5 inch or one third to half of chest depth
Compression rate	100-120/m	100-120/m	100-120/m
Each breathing	5-6 Sec	3-5 Sec	3-5 Sec
Pulse	Carotid	Carotid	Brachial
One rescuer	30:2	30:2	30:2
Two rescuer	30:2	15:2	15:2
Method	Two hand	Two hand or One hand	Two fingers or two thumbs with hands encircling chest

Components			
HAND POSITION	Two hands in center of chest (on lower half of sternum)	Two hands in center of chest (on lower half of sternum)	Two or three fingers in center of chest(on lower half of sternum, just below nipple line)
CHEST COMPRESSIONS	At least 2 inches Until the chest clearly rises (about 1 second per breath)	About 2 inches Until the chest clearly rises (about 1 second per breath)	About $1\frac{1}{2}$ inches Until the chest clearly rises (about 1 second per breath)
RESCUE BREATHS	30 chest compressions and 2 rescue breaths	30 chest compressions and 2 rescue breaths	30 chest compressions and 2 rescue breaths
CYCLE RATE	30 chest compressions in about 18 seconds(at least 100 compressions per minute)	30 chest compressions in about 18 seconds(at least 100 compressions per minute)	30 chest compressions in about 18 seconds(at least 100 compressions per minute)

Complications Caused by CPR

Even properly performed CPR can cause injuries, including:

- Fracture of the sternum and ribs
- Pneumothorax
- Haemothorax
- Cuts and bruises to the lungs
- Lacerations to the liver

Self-Assessment

Objective Questions:

1. You are the first on scene and the victim is unresponsive, pulseless and has vomited. You do not feel comfortable performing mouth to mouth ventilation. What is the best approach?
   a. Wipe off the face or cover with a shirt
   b. Compression only CPR
   c. Go and get help
   d. Do not initiate resuscitation

2. You are performing single person CPR. The AED (Automated External Defibrillator) advises a shock. After the shock is delivered what is the next immediate step?
   a. Call for help
   b. Resume CPR with chest compression
   c. Check for a pulse
   d. Resume ventilation

3. What are the main differences in care when finding an unresponsive adult versus an unresponsive child if you must leave the person to activate EMS.
   a. There are no differences.
   b. Perform CPR first when with an adult; go for help first when with a child.
   c. Perform 2 minute of CPR when with a child, then go for help; call for help immediately when with an adult.
   d. It depends on the age of child.

4. You are day care provider and find a three year old child unresponsive. She had laid down for a nap because she was not feeling well. When you checked on her, she was not breathing and appeared blue. You are by yourself. What is the first step in managing this case?
   a. Do backblow
   b. Does a blind finger sweep?
   c. Call108
   d. Deliver two minutes CPR

5. You are attempting to relieve choking in an infant. The infant now become

unresponsive what is the next step?

a. Leave the infant to get help.
b. Does a blind finger sweep?
c. Begin CPR.
d. Do abdominal thrust.

6. What is the compression depth of child according to AHA -2015?

a. About two inch.
b. At least two inch.
c. At about one and half inch.
d. None of these.

7. What is the compression depth of adult according to AHA -2015?

a. About two inch.
b. At least two inch.
c. At about one and half inch.
d. None of these.

8. How do you know you are performing effective CPR?

a. The patient may try to swallow, gasp or move his limbs
b. You see the chest rise and fall during ventilations
c. skin color improves
d. All of the above

9. Conditions in which not to begin CPR?

a. Mortal wounds
b. Rigormortis
c. Still birth
d. All the above

10. As a trained MFR you intended to perform CPR on 5 month baby then where you measure pulse and what is the compression depth.

a. Carotid artery, 1.5-2.5cm depth
b. Brachial artery, 1.5-2.5cm depth
c. Brachial vein 3-4cm depth
d. Carotid artery, 1.5-2.5cm depth

Descriptive Questions:

1. What is the 2015 CPR recommendation for bystanders as per AHA?
2. Why are there new limits for depth and rate of chest compression?
3. What are the key recommendations for children?
4. What are the key recommendations for adult in CPR?
5. Why CPR is recommended to adult in case of patient is unconscious during PHT of FBAO?

Reference:

- Respiratory system : source live science http//www.Livescience.com
- Breathing: https://en.m.wikipedia.org.>wiki>Breat
- Jaw thrust manoeuvre : Wikipedia.http://en.m.wikipedia.org>wiki>jaw-t
- Artificial ventilation: wikipedia: https://en.m.wikipedia.org>wiki>
- Artificial Breathing: http://en.m.wikipedia.org>wiki.breat
- Choking and (FBAO):https://patient.info>doctor>choking-an....
- CPR-:https://en.m.wikipedia.org>wiki>cardi...
- American Heart Association
- https://www.mayoclinic.org

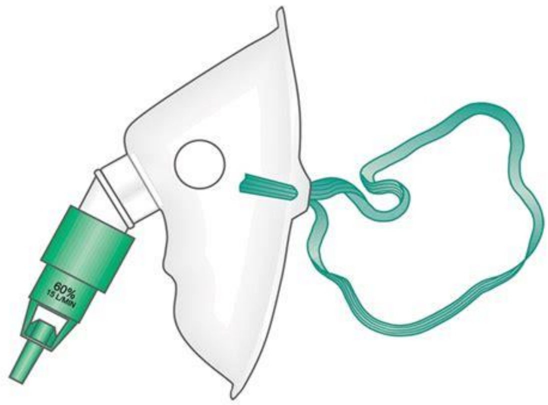
LESSON 7

Oxygen Therapy

Introduction:

Being a Medical First Responder it is our prime responsibility that to the capability to use and apply the different types of Oxygen delivery devices to the needy victims in appropriate manner using local protocol, until Emergency Medical System not arrived at the scene.

Oxygen was discovered by Swedish pharmacist “Carl Wilhelm Scheele”, in Uppsala, in 1773 and “Joseph Priestley” in Wiltshire, England in 1774. But priestly is often given priority because his work was published first. The name oxygen was coined in 1777 by “Antoine Lavoisier”. Its name derives from the Greek roots Oxys, “acid” literally “sharp”, referring to the sour taste of acids and genes, “producer”, literally “be getter”.

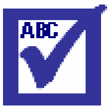


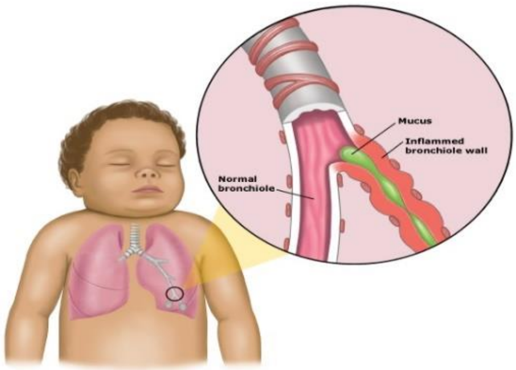
OUTCOMES

Upon completion of this lesson, you will be able to describe about the:

- Five situations in which the use of Oxygen is needed.
- About an Oropharyngeal airway, Nasal cannula, a CPR mask, a Bag valve mask, Non rebreather mask, Simple and Venturi mask.
- Four key pieces of equipment used in an Oxygen delivery system.
- Humidifier, Mechanical Suction and Suction Equipment.

Terminology





Facts of Oxygen:

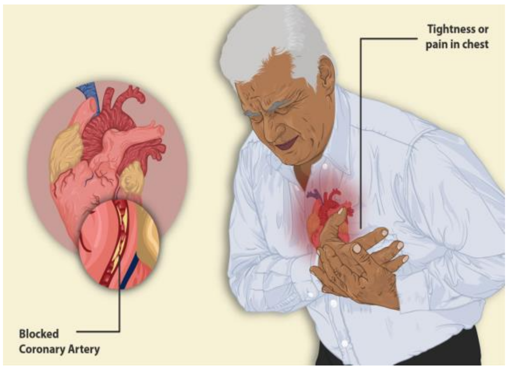
- Atomic number (number of protons in the nucleus): 8
- Atomic symbol (on the periodic table of element): O
- Atomic weight (average mass of the atom): 15.9994
- Density : 0.001429 grams per cubic centimeter.
- Phase at room temperature: Gas
- Melting point: -218.79 degree Celsius

Indications for Oxygen use

Oxygen that is used for medical needs is colorless, and non-combustible. The air we breathe contains 21% oxygen. The oxygen used in medicine has a concentration of 100%.

A patient can require oxygen for a variety of medical needs. There are five typical examples in which the application of oxygen is indicated:

a. Heart failure/heart attack



b. Complications in childbirth

c. Bleeding

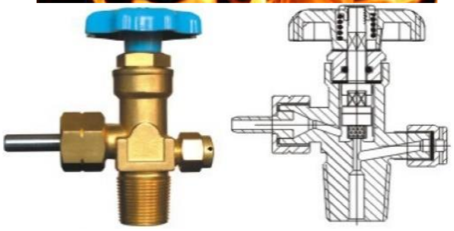
d. Respiratory deficiency

e. Poisoning

Hazards Associated with Oxygen Use:

Fire:

Do not allow smoking or the use of a flame when using oxygen. Oxygen is not combustible, but it does increase the intensity of a fire and will cause fire to flare up.



Explosion:

Never use oil or grease around an oxygen cylinder. Oil and grease near high concentrations of oxygen can cause an explosion.

Valve damage:

Avoid dropping or placing a cylinder where it can fall. The regulator or valve can be damaged and the cylinder can become a projectile.

Oxygen Delivery System

An oxygen delivery system consists of the following parts:

- Oxygen cylinder with valve
- Low pressure regulator
- Flow meter
- Appropriate oxygen delivery device

Oxygen Cylinder with Valve

When providing oxygen in the field, the standard source is a seamless steel or lightweight alloy cylinder filled with pressurized oxygen. A green (steel) or Gray (aluminium) cylinder identifies oxygen.

-The cylinders should be inspected daily and pressure-tested annually due to the high-pressure contents (2,000 psi).

Valve:

The control located at the top of the cylinder, used to turn the bottle on and off. Keep in mind that a certain valve type might not work with different types of regulators.

Most common cylinder types:

- Cylinder D– 350 litres
- Cylinder E– 625 litres
- Cylinder M– 3,000 litres

Cylinder Size	Oxygen Capacity IN LITERS	Service Pressure PSI – BAR 1 PSI =0.0689 BAR	Cylinder Length = H INCH – MM 1 INCH = 25.4 MM	Cylinder Weight LBS - KG 1 POUND = 0.454 KG
M2	40	2200 - 153	9.0 - 228	.74 - .34
M4 = A	113	2200 - 153	12.0 - 305	1.6 - .74
M6 = B	165	2200 - 153	15.0 - 381	2.8 - 1.50
ML6	165	2200 - 139	10.68 - 245	3.4 - 1.60
M9 = C	255	2000 - 139	14.1 - 358	3.7 - 1.69
D	425	2000 - 139	20.0 - 508	5.3 - 2.41
Jumbo D	640	2000 - 139	20.0 - 508	8.1 - 3.68
E	680	2000 - 139	29.0 - 737	7.9 - 3.58
M60 - CGA540	1738	2200 - 153	23.0 - 584	21.7 - 9.86
MM - CGA540	3455	2200 - 153	35.75 - 908	38.6 - 17.55
H (K) - CGA540 (steel)	7842	2000 - 136	55.0 - 1120	120 - 83.9

Low-Pressure Regulators and Flow meters

Regulators

Reduce the high pressure (2,000-2200 psi) from the oxygen cylinder and decrease up to 40 and 70 psi.

Flowmeters

Control the flow of oxygen, which is usually administered at between 2 and 25 litres per minute.

Precautionary steps when giving Oxygen

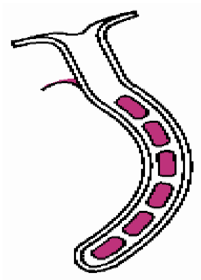
a. Firstly check the outer body surface condition of the O2 cylinder, if found any type of swollen or damage, don’t use.
b. Check valve of oxygen cylinder is in good condition or not, means the threads of the neck valve is proper or not if found improper or some thread missing then don’t use.
c. Check the two teeth holes of valve is in good condition.
d. Check the both teeth is good, if found broken or missing then don’t use.
e. Apply the regulator and check, needle is working properly or not.
f. Check flow meter is working properly or not.
g. Check present pressure in the cylinder.
h. Install low pressure regulator, flow meter, oxygen delivery pipe, nasal cannula, bag valve mask to the cylinder.

i. The pressure in a full cylinder is between 2,000 and 2,200psi. Reduce the pressure to 40-70 psi
j. Before administering oxygen to a patient, check once again all installation.
k. Appropriate delivery of oxygen to a patient is achieved by using a flowmeter and regulator. They are usually connected as one piece.

Oxygen is considered as a medication.

Accessories for Ventilation

Oropharyngeal Airway



Device usually made of plastic, can be inserted into the patient's mouth and curves back into the throat. The airway holds down the patient's tongue and creates an air passage. Airways come in several sizes, from **0 for new born to number 7 for adults**.

Procedure for inserting airway:

1) Select proper size. If the patient is a child, use a tongue depressor to help insert the device.
2) Open the patient's mouth.
3) Insert the adjunct upside-down (tip facing the roof of the mouth).
4) Advance the adjunct gently until you encounter slight resistance (when the adjunct touches the back of the roof of the mouth).
5) Turn the airway 180 degrees.
6) Advance the adjunct until the flange rests on the patient's teeth, then secure it with tape.

If the patient exhibits a gag reflex during insertion or after it is in place, remove the adjunct.

CPR MASK

- The mask is applied to all unconscious patients.
- The pocket face mask is designed to aid the rescuer when providing ventilations during CPR. It is made of a soft plastic that conforms to the patient's face. The mask can come either with or without an oxygen inlet.
- Its use avoids direct contact with the patient's mouth and decreases the chance of contamination.

HEPA FILTER:

- High efficiency particulate air (HEPA) OR High efficiency particulate absorber, is a type of air filter.
- The original HEPA filter was designed in the 1940 and

it was commercialized in the 1950.

- The filter must satisfy certain standards of efficiency, set by the United States Department of Energy (DOE).
- As per DOE, HEPA filter remove at least 99.97% of airborne particles (bacteria and viruses) to protect against transmission of airborne diseases.

What Is a Pulse Oximeter ?

A Pulse Oximeter is a small, lightweight device used to monitor the amount of oxygen carried in the body. This non-invasive tool attaches painlessly to your fingertip, sending two wavelengths of light through the finger to measure your pulse rate and how much oxygen is in your system. Once the Oximeter finishes its assessment, its screen will display the percent of oxygen in your blood coming from your heart—as well as your current pulse rate.

What is a low Oxygen level?

Normal: A normal Arterial Blood Gas (ABG) oxygen level for healthy lungs falls between 80 and 100 millimetre of mercury (mm Hg). If a pulse oximeter measured your blood oxygen level, a normal reading is typically between 95 and 100 percent. However, in COPD or other lung diseases, these ranges may not apply. Your doctor will let you know what is normal for your specific condition.

Below normal: A below-normal blood oxygen level is called hypoxemia. Hypoxemia is often cause for concern. The lower the oxygen level, the more severe the Hypoxemia. This can lead to complications in body tissue and organs.

Above normal: If your breathing is unassisted, it's difficult for your oxygen levels to be too high. In most cases, high oxygen levels occur in people who use supplemental oxygen.

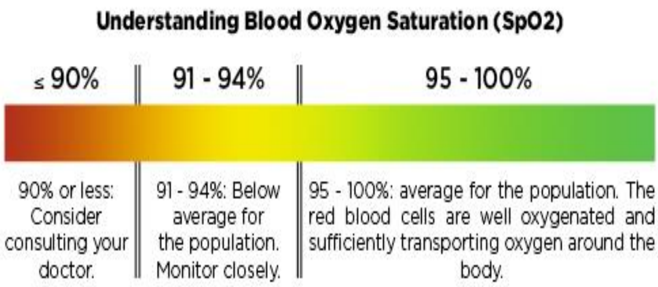
The symptoms of Low Oxygen Level are...

- Shortness of breath
- Chest pain
- Confusion
- Headache
- Rapid heartbeat
- Cyanosis

Causes of Blood Oxygen Levels to be low...

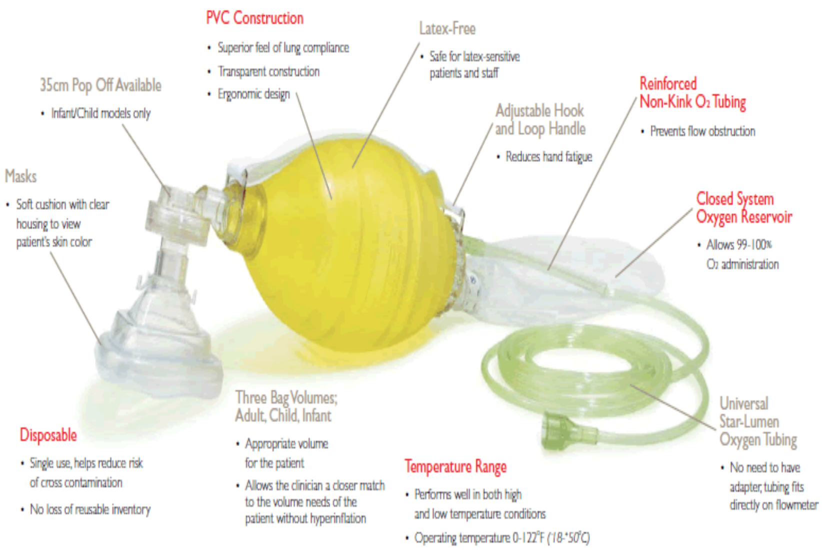
- COPD (including chronic bronchitis and emphysema)

- Acute respiratory distress syndrome
- Asthma
- Collapsed lung
- Anaemia
- Congenital heart defects
- Heart disease
- Pulmonary embolism



Bag-Valve-Mask (BVM) (manual resuscitator)

Many different types of BVM are available. The bag-valve-mask is a hand-held device you squeeze to ventilate a patient. It comes in adult, child and infant sizes. All have the same basic parts: face mask, non-rebreather patient valve, a bag (rubber or vinyl), intake valve/oxygen reservoir valve, oxygen supply connection tube, and oxygen reservoir.



Adjunct Equipment for Administering Oxygen

Nasal Cannula:

Description: Nasal Cannula has two stems that are placed into the patient's nostrils. Used most often in a hospital setting. Most patients tolerate it well and it is the best accessory for administration of low-concentration oxygen.

Flow Rate: 1-6 lpm (each litre increases O_2 concentration 3-4%)

O_2 Delivered: 24-44% Oxygen concentration

Notes: May cause the nasal mucus membranes to dry at higher flow rates. Appropriate for patients who cannot tolerate a mask.

The approximate relationship of oxygen concentration to litre per minute flow is:

- LPM- 24% OXYGEN
- LPM- 28% OXYGEN
- LPM- 32% OXYGEN
- LPM- 36% OXYGEN

- LPM- 40% OXYGEN
- LPM- 44% OXYGEN

Non-Rebreather Mask

Description: Face mask with an oxygen reservoir bag and one-way valves. Requires a tight seal to ensure high oxygen concentration delivery.

Flow Rate: 12-15 lpm

O_2 Delivered: Approximately 80-90% oxygen concentration.

Notes: Reservoir must always contain enough oxygen so that it does not deflate by more than one third when patient inhales (must maintain proper flow rate). Delivery system of choice for patients requiring high O_2 concentration.

Safety feature: Exhalation port is open in case oxygen supply fails (prevents 100% O_2 delivery).

OXYGEN DELIVERY DEVICE	FLOW RATE	% OXYGEN DELIVERED	SPECIAL USE
Nasal Cannula	1 to 6 lpm	24% to 44%	Most medical and COPD patients at low concentration
Non Rebreather Mask	Start with 10 lpm, practical high is 15 lpm	80% to 95%	Good for patients with respiratory distress and shock; provides high O2 concentration

SIMPLE MASK:

- The Simple Face Mask (SFM) is a basic disposable mask, made of clear plastic, to provide Oxygen therapy for patients who are experiencing conditions such as chest pain (possible heart attacks), dizziness and minor haemorrhages.
- This mask is only meant for patients who are able to breathe on their own.
- The Simple face mask can deliver higher flow rates **than** Nasal Cannula, (6-10 liters per minute) of 40-60% oxygen.
- Nasal Cannula and simple face masks are described as low flow delivery systems.
- The simple face mask **lacks** a reservoir bag.

Humidifier

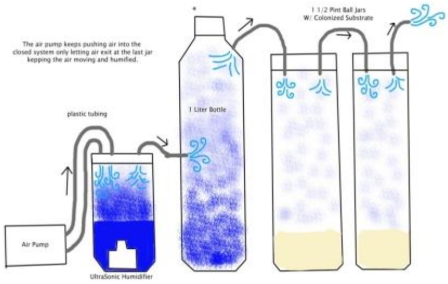
Description: Non-breakable jar of water attached to the flow meter. Provides moisture to the dry oxygen coming from the supply cylinder.

Notes: Must be kept clean. Can become a breeding ground for algae, harmful bacteria and fungal organisms. No longer used, as not indicated for short transport due to risk of infection.

Mechanical Suction-

- Maintain airway at all times – keep free of blood, vomit, secretions and other liquids or objects. Use mechanical suction to remove these substances or objects.
- Solid objects such as food, teeth or very thick secretions cannot always be removed with suction, and may require alternative equipment or a finger sweep.
- Suction should be performed rapidly to decrease the chance of blood or other foreign matter from moving into the lungs, which may cause pneumonia or complete airway obstruction.

Suction Equipment



- A suction unit consists of a suction source, a collection container, tubing and suction tips. May be portable or truck-mounted.
- Suction devices use negative pressure. Manual or electrically powered, air or oxygen powered. Must have wide bore, thick walls, non-kinking tubing to fit a suction catheter.
- Several disposable catheters should be available, made of either rigid or flexible plastic.
- Unbreakable collection container with water for rinsing and cleaning.
- Enough vacuum power and flow to be effective

Administering oxygen

Procedure

1. Remove the seal of the cylinder.
2. Clean the valve of the cylinder.
3. Connect the regulator to the cylinder.
4. Open the cylinder.
5. Connect the mask with the reservoir to the flowmeter.
6. Regulate the flow (according to the patient's medical needs).
7. Fill the reservoir bag.
8. Place the mask on the patient.

9. Repeat Steps 5, 6 and 8 using a nasal cannula in place of the mask

Using airways, mask, and the Bag Valve Mask.
Procedure:

1. Inserting the adult and paediatric oropharyngeal airway.
2. Application of the CPR mask with oxygen.
3. Use of a bag-valve-mask.

Unit Summary

Indications for Oxygen Use

There are five typical examples in which the application of oxygen is indicated:

- Heart failure/heart attack
- Respiratory deficiency
- Bleeding
- Complications in childbirth
- Poisoning

Oxygen Delivery System

An oxygen delivery system consists of the following parts:

- Oxygen cylinder with valve
- Low pressure regulator
- Flow meter
- Appropriate oxygen delivery device

Precautions steps when giving Oxygen

a. Firstly check the outer body surface condition of the O2 cylinder, if found any type of swollen or damage, don’t use.

b. Check valve of oxygen cylinder is in good condition or not, means the threads of the neck valve is proper or not if found improper or some thread missing then don’t use.

c. Check the two teeth holes of valve is in good condition.

d. Check the both teeth is good, if found broken or missing then don’t use.

e. Apply the regulator and check, needle is working properly or not.

f. Check flow meter is working properly or not.

g. Check present pressure in the cylinder.

h. Install low pressure regulator, flow meter, oxygen delivery pipe, nasal cannula, bag valve mask to the cylinder.

i. The pressure in a full cylinder is between 2,000 and 2,200 psi. Reduce the pressure to 40-70 psi.

j. Before administering oxygen to a patient, check once again all installation.

k. Appropriate delivery of oxygen to a patient is achieved by using a flowmeter and regulator. They are usually connected as one piece.

Self- Assessment

Define:

1. Oxygen Delivery System
2. Oropharyngeal Airway
3. Precautionary steps when applying Oxygen
4. Non-Rebreather Mask
5. Name five situations in which the application of oxygen is indicated.

References

- Peer instructor’s guide for medical first responder course
- Brady: first responder book 8th edition
- Wikipedia
- www.livescience.com

LESSON- 08

Haemorrhage and Shock

Introduction

Haemorrhage is blood escaping from the circulatory system. Bleeding can occur internally, inside the body or externally, either through a natural opening such as the mouth, nose, ear, urethra, vagina or anus, or through a break in the skin. Blood from an artery is bright red in color and comes in spurts, from a vein is dark red and comes in a steady flow.

Shock is a life-threatening condition that occurs when the body is not getting enough blood flow. Lack of blood flow means that the cells and organs do not get enough oxygen and nutrients to function properly. Many organs can be damaged as a result. Shock requires immediate treatment and can get worse very rapidly.

Outcomes

Upon the completion of this lesson you will be able to:

- Differentiate between arterial, venous, and capillary bleeding.
- Describe haemorrhage.
- Differentiate between internal and external haemorrhage.
- Different classes of haemorrhage.
- Describe shock and list major categories of shock.
- Sign and symptoms of shock.
- Describe procedures for preventing and caring for shock.

Terminology

Perfusion: Perfusion is the passage of fluid through the circulatory system or lymphatic system to an organ or a tissue, usually referring to the delivery of blood to a capillary bed in tissue. Perfusion is measured as the rate at which blood is delivered to tissue or volume of blood per unit time (blood flow) per unit tissue mass.

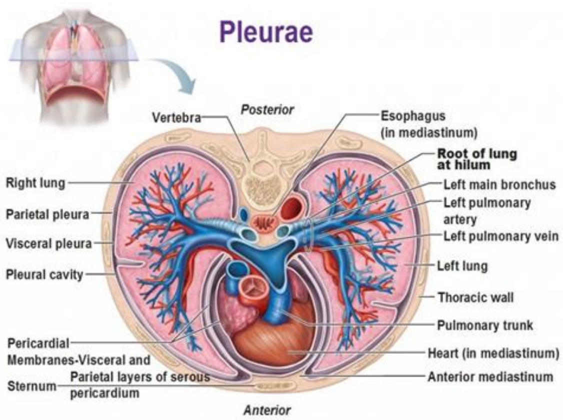
Hypo perfusion: Hypo perfusion is the inadequate perfusion of body tissues, resulting inadequate supply of oxygen and nutrients to the body tissues.

Circulatory System: The system that moves blood throughout the body. The circulatory system is composed of the heart, arteries, capillaries and veins. This remarkable system transports oxygenated blood from the lungs and heart throughout the body via the arteries.

Blood vessel: A vessel in the human or animal body in which blood circulates. The vessels that carry blood away from the heart are called arteries, and their very small branches are arterioles. Very small branches that collect the blood from the various organs and parts are called venules and they unite to form veins, which return the blood to the heart.

Cyanosis: A bluish discoloration of the skin due to poor circulation or inadequate oxygenation of the blood.

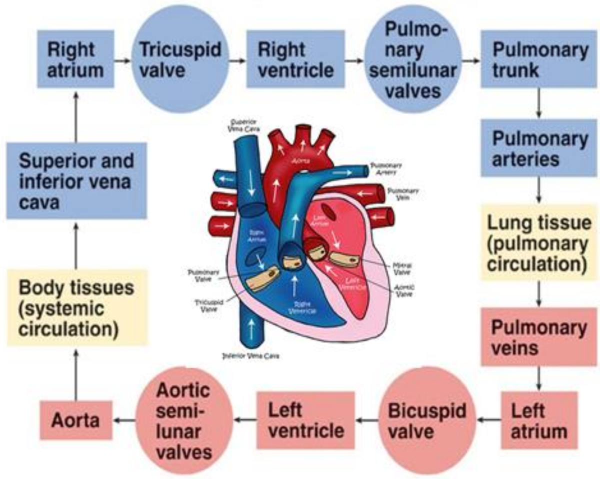
Lungs: The lungs (Two in nos.) are situated in right and left side of chest cavity. Each lung is made up of a no. of small sacs called alvolie. The lung is covered by the membrane **pleura** which lying the inner wall of chest cavity.



Over view of the organ and how they work in the circulation system.

The Heart

The heart is the center of the circulatory system. It pumps blood through the many miles and types of vessels to all the body‘s tissues, organs, and systems. If the heart stops functioning, as in cardiac arrest, blood does not circulate or carry fuel and oxygen to the body‘s parts, and they die.



The heart has four separate chambers. The top two are called atria (plural), or the right and left atrium (singular).

The right atrium receives deoxygenated blood from the body; the left atrium receives oxygenated blood from the lungs.

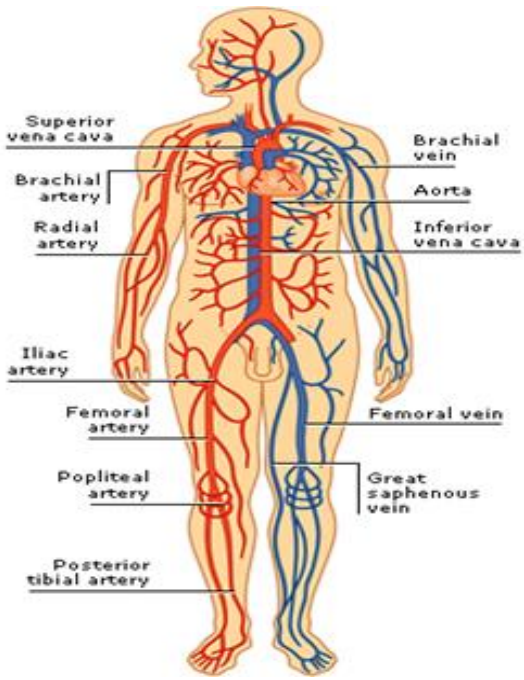
The bottom two chambers are called ventricles (plural), or the right or left ventricle (singular).

The right ventricle receives the deoxygenated blood from the right atrium and pumps it to the lungs through pulmonary artery (the only artery that carries deoxygenated blood and is named so because arteries carry blood away from the heart).

The left ventricle receives oxygenated blood from left atrium, which received it from the lungs through the pulmonary veins (the only veins that carry oxygenated blood but they are still called veins because they return blood to the heart).

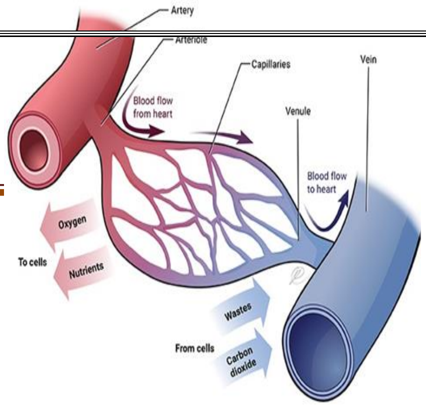
The left ventricle pumps blood to the body, leaving the heart by way of the aorta. The venous system carries blood from the body back to the heart, entering by way of the superior vena cava and inferior vena cava.

Blood Vessels

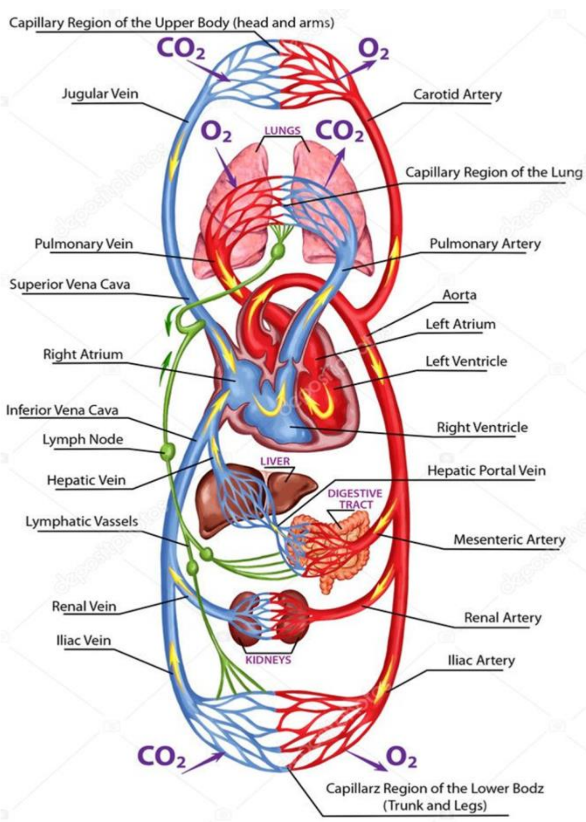


Arteries carry blood away from the heart and to the tissues, organs, and systems of the body. The largest artery is the aorta. The smallest artery is called an *arteriole*. All sizes between the *Aorta* and the arteries are referred to as *arteries*. At certain points in the body, where arteries are close to the skin surface, you can feel the blood pumping through the artery. These points are called pulse points, places where you can feel the pumping heart at work and assess pulse rate.

Veins carry blood from the tissues, organs, and system of the body back to the heart. The largest veins are the superior and inferior vena cava. The smallest vein is called a venule. Sizes in between are just referred to as veins. On some parts of the arms (inside the wrist and elbow) and legs (lower leg and ankle), and sometimes the face (temple), you can see the blue of veins showing through skin where they are close to the surface.

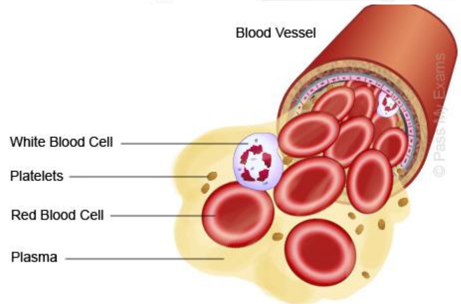


The oxygen and nutrients carried by arteries are passed off to the body's cells when the blood reaches a small system of vessels called **capillaries**. Capillaries act as an exchange point for nutrients and wastes, some of our organs act as disposal and maintenance organs, such as the kidneys and liver, but the heart is the organ that works with the lungs to replenish oxygen. Once the blood has dropped off all its supply of oxygen for the body's cells to use, it travels from the capillary system into the veins and back to the heart, through the lungs to pick up oxygen, and back to the heart again to be pumped through vessels to the body. By the time blood reaches the capillaries, pressure and speed are greatly reduced and the beating action of the heart no longer causes pulsations. Blood moving through the capillaries in a constant flow is called ***perfusion***. (A reduction in blood volume can seriously affect perfusion)**.**



Blood: Bloods perform many functions necessary to sustain life. Blood carries oxygen to the body's cells and carries away carbon dioxide. It transports nutrients to the cells and carries away certain waste products. The blood contains cells that destroy bacteria and produce substance that help resist infection. There are elements in the blood that act with calcium and chemical factors to combine blood cells, forming sticky clots around cuts to help control bleeding. Compounds carried in the blood called *hormones*, such as insulin, regulate many body activities. Without blood circulating through your body, you would quickly die.

Blood contains **Red Blood Cells, White Blood Cells** and **platelets** involved in forming blood clots. These are carried by a watery, salty fluid called *Plasma*. The volume of blood in the typical adult's body is approximately six liters. When bleeding occurs, the body not only loses blood cells and clotting elements, it also loses plasma and total fluid volume.



This loss can be significant because the volume of blood must be maintained at a certain level in order to have proper heart action, blood flow, and nutrient exchange between the blood and the body cells. The body has more blood than is needed to produce minimum circulation. During bleeding, once this reserve is gone, the patient experiences circulatory system failure, followed very quickly by death.

Factors	I	II	III	IV
Blood loss	<15% (<750ml)	15-30% (750-1500ml)	30-40% (1500-2000ml)	>40% (>2000ml)
Pulse	>100	>100	>120	>140
B.P.	Normal	Normal	↓	↓↓
Pulse pressure	N or ↓	↓	↓↓	↓↓
Capillary refill	<2s	2-3s	3-4s	>5s
Resp. rate	14-20	20-30	30-40	>40
Urine output ml/hr	30 or more	20-30	5-10	Negligible
Mental status	Slightly anxious	Mildly anxious	Anxious & confused	Confused Lethargic

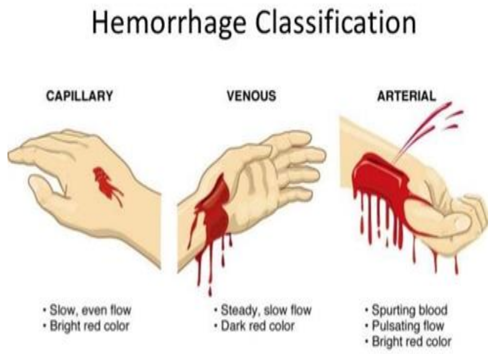
BLOOD VOLUMES AND SERIOUS BLOOD LOSS		
PATIENT	**TOTAL BLOOD VOLUME**	**LETHAL BLOOD LOSS (RAPID)**
Adult male (70 kgs)	5-6 Liters approx.	2.2 Liters
Adolescent (48 kgs)	3.3 Liters	1.3 Liters
Child (early to late childhood: depends on size)	1.5 to 2.0 liters	0.5 to 0.7 liters
Infant (newborn, normal weight range)	300 plus milliliters	30 to 50 milliliters

Haemorrhage

Haemorrhage is blood escaping from the circulatory system. Bleeding can occur internally, where blood leaks from blood vessels inside the body, or externally, either through a natural opening such as the mouth, nose, ear, urethra, vagina or anus, or through a break in the skin. Hypovolemia is a massive decrease in blood volume, and death by excessive loss of blood is referred to as exsanguination (Excessive loss of blood). Bleeding can be classified as ***external*** or ***internal.***

Note:- The blood could spurt from the neck is 6 inch or 15 cms vertically and 18 inch or 46 cms laterally (Adult human).

External bleeding may be classified as: ***Arterial bleeding*** blood spurts from an artery with each beat of the heart. The color of the blood is bright red because it contains oxygen. Depending on the size of the artery, a great deal of blood can be lost in a short amount of time.

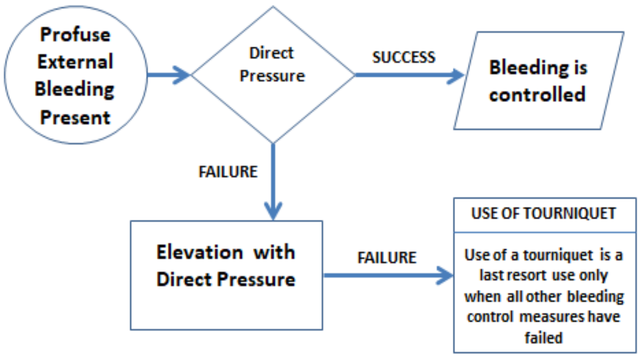


Venous bleeding blood flows steadily from a vein. The color of the blood is dark red, often appearing deep maroon (because it contains little oxygen). However, it may look or become a brighter red when exposed to the oxygen in the air. Depending on the size of the vein affected, venous bleeding can also be profuse.

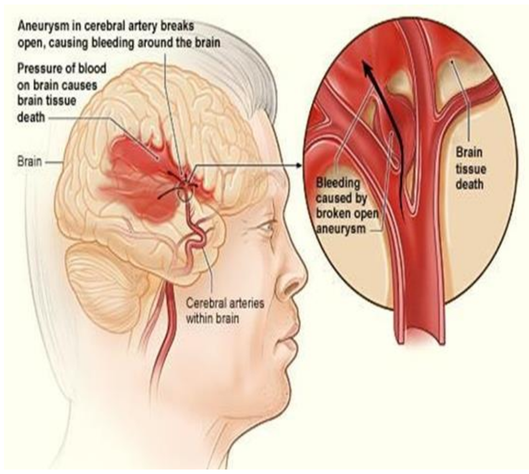
Capillary bleeding: blood oozes from a bed of capillaries. The color of the blood is bright red, but usually less bright than arterial blood. The flow is slow, as seen in minor scrapes and shallow cuts to the skin.

Controlling external bleeding: there are three steps to the procedure used by emergency medical responders to control external bleeding.

- Direct pressure, including use of pressure dressing
- Elevation combined with direct pressure
- Application of a tourniquet
- Tourniquet is last resort, used only when the other methods of controlling life threatening bleeding have failed.



Internal Bleeding can range from a minor bruise to a major life-threatening problem. Most small, simple bruises are examples of minor internal bleeding. Such minor blood loss is not of great significance. Of primary concern to emergency medical responders is internal bleeding that brings about shock, heart and lung failure, and eventual death. Some cases of internal bleeding are so severe that the patient dies in a matter of seconds. Other severe cases of internal bleeding take minutes to hours before death. Medical responder might keep this patient alive until the EMS arrives.



Even when internal bleeding is not profuse, it does not take long for serious reactions to occur in the body. The care you provide for internal bleeding and shock, even when the bleeding is not profuse, may save the patient‘s live. Because since, it is difficult to assess the severity of internal bleeding therefore, always assume it is severe and care for the patient aggressively.

Detecting Internal Bleeding: It is difficult to detect internal bleeding there wouldn't be any obvious cuts/bleeding through major vessels however the following signs of internal bleeding may help responder to detect internal bleeding.

Signs of internal bleeding

- Wounds that have penetrated the skull.
- Blood or clear fluids draining from the ears and or nose.
- Patient vomits or coughs up blood (Coffee grounds or frothy red appearance)
- Bruises on the neck.
- Bruises on the chest, possible fractured ribs (Possible cuts to the lungs and liver) and wounds that have penetrated the chest.
- Bruises or penetrating wounds to the abdomen.
- Rigidity or distention of the abdominal muscles.
- Abdominal tenderness.
- Bleeding from the rectum or vagina.
- Possible fractures (with special emphasis on the pelvis, the long bones of the upper arm and thigh, and the ribs)

Evaluating Internal Bleeding: It is very difficult to determine the amount of blood lost in cases of internal bleeding. However as a first responder whenever there is penetration of the chest cavity over or immediately above the heart, if the spleen or liver may have been injured or if you suspect the pelvis is fractured, suspect fracture in the upper arm, or thigh bone consider the blood loss as severe. Estimate blood loss of at least one liter if there is a suspected major fracture in the upper arm or thigh bone.

Management of internal bleeding: In general, the steps in the care of patients with suspected internal bleeding include:

- Make certain that someone activates the EMS system
- Take appropriate BSI precautions
- Perform a scene size-up
- Perform an initial assessment. (Maintain the airway and monitor breathing and pulse)
- Keep the patient in the proper position and lying still.
- Loosen restrictive clothing and provide care for shock.
- Be alert in case the patient starts to vomit

- Do not give the patient anything by mouth
- Reassure the patient and keep him calm
- Report the possibility of internal bleeding as soon as more highly trained EMS personnel arrive at the scene.

Shock

Whenever the body is hurt, either by injury or illness, it reacts by trying to correct the effects of damage. If the damage is severe, one consequence is shock, which often indicates a problem with the circulatory system. The problem can be related to the:

Heart: The heart should be pumping blood and doing so efficiently. If the heart fails to pump an adequate volume of oxygenated blood, shock will develop.

Vessels: Blood circulates throughout the body through a closed system. If there is any opening in this system, such as a cut or rupture, with enough blood loss, shock will develop.

Blood volume: An adequate amount of blood must be present to fill the vessels. If there is loss of blood volume or if the vessels dilate (enlarge) to a size that no longer allows the system to properly fill, shock will develop.

Shock is the failure of the body‘s circulatory system to provide enough oxygenated blood and nutrients (perfusion) to all vital organs. There must be enough blood being pumped efficiently to allow for a steady flow through the capillaries so that exchange can occur (perfusion). Oxygen and carbon dioxide are exchanged, nutrients and waste are exchange, and fluid and salt balance must be maintained between the blood and the tissues. When this cannot take place, hypo-perfusion (lack of adequate perfusion), develops and the patients goes into shock.

Types of shock

Shock can be classified into several categories, because there are several causes of shock. The patient in shock may have one or more of the following.

Hypovolemic: shock is caused by blood loss or by the loss of plasma (a compound of blood) as in case of burns. (The term hypovolemic means low volume). This term includes all shock caused by fluid loss, such as bleeding, burns, vomiting and diarrhea, and severe dehydration. Shock caused by vomiting and diarrhea is also called metabolic shock.

Hemorrhagic shock is caused when the body loses a significant amount of blood from the circulatory system. It can be caused by either uncontrolled internal or external bleeding.

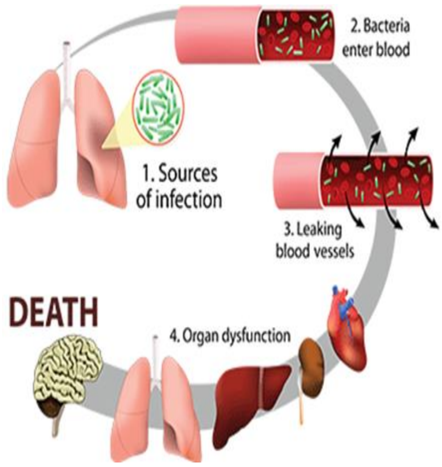
Cardiogenic shock is heart shock, caused by the heart failing to pump enough blood to all parts of the body. It may be due to the damage of the heart itself as in the case of a heart attack.

Neurogenic shock is nerve shock, caused when something goes wrong with the nervous system (such as from an injury to the spinal cord) and there is a failure to control the tone of blood vessels. The vessels become dilated. There is not enough blood in the body to fill this increased space, causing inadequate circulation.

Anaphylactic shock is allergy shock, a life threatening reaction of the body caused by something to which the patient is extremely allergic.

Psychogenic shock is fainting. It usually occurs when some factor, such as fear, causes the nervous system to reach and rapidly dilate the blood vessels. The proper flow of blood to the brain is interrupted. In most cases, fainting is a self-correcting form of shock; with the interruption of proper blood flow being a temporary condition fainting is not the same as neurogenic shock.

Septic shock is caused by infection. Poisons are released that cause the blood vessels to dilate. As in other cases of shock, the blood volume is too low to fill the circulatory system. This type of shock is seldom seen by emergency medical responders.



As a medical first responder you need not classify the shock but the exception is anaphylactic or allergic shock. For all other cases, while reporting about the patient must reflect his/her sign and symptoms of shock along with other factors such as bleeding and loss of fluid.

Signs and Symptoms of Shock

The symptoms of shock are weakness, nausea, thirst, dizziness, anxiety, agitation, and fear. The signs of shock are:

- Entire body assessment:
    - -restlessness or combativeness.
    - -profuse external bleeding.
    - -vomiting
    - -shaking and trembling
- Altered mental status. The patient may become disoriented, confused, unresponsive (often suddenly), or faint.
- Breathing, shallow and rapid.
- Pulse, rapid and weak.
- Skin, pale, cool, and moist often with blue color (cyanosis) seen at the lips, tongue, and earlobes (may be profuse sweating).
- Eye, lack luster. Pupils are sluggish and may be dilated.

All signs and symptoms of shock may not be present at once and they do not necessarily occur in the order. Shock is progressive (becoming worse with time). Look for the following patterns:

- **Increased pulse rate**. The body is trying to adjust to the loss of blood and poor perfusion. Unlike the rapid pulse rate associated with the stress of an injury or the fear of needing help during an emergency, this increased rate will not slow down.

- **Increased breathing rate**. When the body is not receiving enough oxygen and the level of carbon dioxide increase, the body tries to compensate by increasing the breathing rate. This increased rate will not slow down as it usually does after experiencing stress.
- **Restlessness or combativeness.** The patient is reacting to the body's attempt to adjust the loss of proper circulatory function. The patient feels that something is wrong and may often look afraid. In some cases, this behavioral change may be the first sign or developing shock.
- **Skin appears pale**. Skin nail bed and other color changes occur. The skin feels cool to the touch. Sweating may be profuse.
- **Rapid, weak pulse and labored, shallow respirations.** The body is failing in its attempt to adjust to the circulatory system failure.
- **Change in mental status.** As adequate circulation to the brain continues to fail, the patient will become confused, disoriented, sleepy, or unresponsive.
- **Respiratory and cardiac arrest can develop**.

Provide care for all injured patient as shock develops. Do the same for all patients with problems involving the heart, breathing, abdominal pain, diabetes, drug abuse, poisoning, and abnormal childbirth. Carefully monitor all the patients for early signs of shock.

Pre-hospital treatment /Preventing and caring for shock

Help delay the onset of shock by the following:

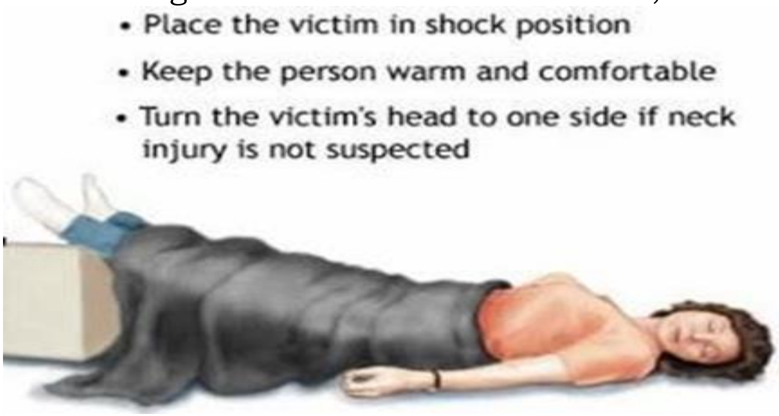
- Make sure someone activates the EMS system
- Perform a scene size-up.
- Take appropriate BSI precautions.
- Perform an initial assessment.
- Control external bleeding. Administer oxygen as per local protocol.
- Assist the patient in lying
- **Provide care for shock.** Calm and reassure the patient, and maintain his normal body temperature. Ensure not to overheat the patient because overheating can worsen his condition. Place at least one blanket under and one blanket over the patient, covering all body parts except the head. Do not try to place a blanket under a patient who has possible spinal injuries.
- **Properly position the patient.** Regardless of the position used, make sure that the patient has an open airway and be alert for vomiting. If there is no indication of spine injury, use one of the following position
  - **Option 1:** elevate the lower extremities. This procedure is performed in most cases. Place the patient flat, face up, and elevate

the legs 8 to 12 inches. Do not tilt the patient's body. Do not elevate the legs if there are suspected fractures to the pelvis. Remember to consider the mechanism of injury for every patient.

- **Option 2:** lay the patient flat, face up. This is the supine position, used for patients with serious injuries to the extremities. If the patient is placed in this position, you must constantly be prepared for vomiting.

- **Do not give the patient anything by mouth**. Even if the patient expresses serious thirst, do not give any fluids or food.
- **Monitor the patient vital signs**. This must be done at least every five minutes. Stay alert for vomiting, give nothing to the patient by mouth, and provide emotional support to the responsive patient.

Fainting is usually a self-correcting form of mild shock. However, the patient may have been injured in a fall due to fainting. Be certain to examine the patient for injury. Even if no other problems are apparent, keeps the patient lying down and at rest for several minutes.



In some cases, fainting is caused by a sudden drop in blood pressure. Fainting can also be a warning of some serious condition, including brain tumors, heart disease, undetected diabetes, and inner ear problems. Always recommend that the patient see a physician as soon as possible.

Unit summary

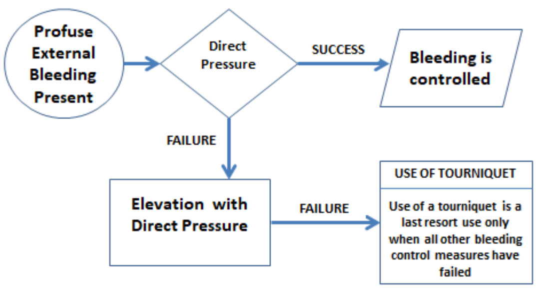
Haemorrhage:

Loss of blood from circulatory system. It may be external or internal.

Types of bleeding:

External bleeding
Internal bleeding

Controlling external bleeding:



Pre hospital treatment/ Management of Internal Bleeding:

- Make certain that someone activates the EMS system
- Take appropriate BSI precautions
- Perform a scene size-up
- Perform an initial assessment. (Maintain the airway and monitor breathing and pulse)
- Keep the patient in the proper position and lying still.
- Loosen restrictive clothing and provide care for shock.
- Be alert in case the patient starts to vomit
- Do not give the patient anything by mouth
- Reassure the patient and keep him calm
- Report the possibility of internal bleeding as soon as more highly trained EMS personnel arrive at the scene.

Shock

Shock is a life-threatening condition that occurs when the body is not getting enough blood flow. Lack of blood flow means that the cells and organs do not get enough oxygen and nutrients to function properly.

Types of shock

- Cardiogenic shock (due to heart problems)
- Hypovolemic shock/Metabolic shock (caused by too little blood volume)
- Anaphylactic shock (caused by allergic reaction)
- Septic shock (due to infections)
- Neurogenic shock (caused by damage to the nervous system)
- Hemorrhagic shock (caused by body loses a significant amount of blood from thecirculatory system)
- Psychogenic shock

Signs of Shock

- Altered mental status.
- The patient may become disoriented, confused, unresponsive (often suddenly), or faint.
- Breathing, shallow sand rapid.
- Pulse, rapid and weak.
- Skin, pale, cool, and moist often with blue color (cyanosis) seen at the lips, tongue, and earlobes (may be profuse sweating).
- Eye, lack luster. Pupils are sluggish and may be dilated.

Symptoms of Shock

- Weakness
- Nausea and Possible Vomiting,

- Thirst,
- Dizziness, Anxiety, Agitation and Vertigo
- Uneasiness and Fear.

Pre-hospital treatment /Preventing and caring for shock

Help delay the onset of shock by the following:

- Make sure someone activates the EMS system
- Perform a scene size-up.
- Take appropriate BSI precautions.
- Perform an initial assessment.
- Control external bleeding. Administer oxygen as per local protocol.
- Assist the patient in lying down.
- Provide care for shock.
- Properly position the patient.
- Do not give the patient anything by mouth.
- Monitor the patient vital signs.

Self-Assessment

Objective questions

1. Failure of the heart to pump effectively causes the following type of shock:
    a. Anaphylactic
    b. Cardiogenic
    c. Hypovolemic
    d. Septic

2. Overwhelming infection and resulting vasodilation can lead to the following type of shock:
    a. Anaphylactic
    b. Cardiogenic
    c. Hypovolemic
    d. Septic

3. Trauma to the spinal cord and resultant loss of autonomic and motor reflexes below the injury level can lead to the following type of shock:
    a. Cardiogenic
    b. Hypovolemic
    c. Neurogenic
    d. Obstructive

4. What carries the elements involved in forming blood clots?
    a. White blood cells
    b. Hormones
    c. Red blood cells
    d. Plasma

5. The skin is warm and dry in the following type of shock:
    a. Cardiogenic
    b. Hypovolemic
    c. Neurogenic
    d. Obstructive

6. What should be the position given to a patient in shock?
    a. Head low
    b. Fowler's
    c. Semi fowler's
    d. Supine

7. Which position is most often used when treating a patient for shock when no spinal injury is present?
    a. Place the patient flat and face up
    b. Slightly raise the head and shoulders
    c. Place the patient flat, face up and elevate the legs
    d. Slightly raise the head and shoulder and elevate the legs

8. Which is NOT correct when treating a patient for suspected internal bleeding?
    a. Give the patient sips of water
    b. Take appropriate BSI precautions
    c. Be alert in case the patient starts to vomit
    d. Reassure the patient and keep him calm

9. Most cases of external bleeding may be controlled by:
    a. Applying direct pressure
    b. Using a tourniquet.
    c. Securing a pressure dressing
    d. Elevation.

10. Which one of the following procedures is usually the last resort used to control bleeding.
    a. Direct pressure
    b. Tourniquet
    c. Elevation combined with direct pressure
    d. Elevation

Descriptive questions

1. Describe the functioning of heart with diagram.
2. Explain the rationale for body substance isolation when dealing with bleeding.
3. Explain the steps of pre-hospital treatment for shock victim.
4. List sign and symptoms of internal bleeding.
5. Explain how to treat fainting.

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- https://en.wikipedia.org/wiki/
- MedscapeReference.com. septic shock prognosis.
- Med scape Reference.com. Cardiogenic shock.
- jeffreysterlingmd.com
- nurse-ocha.com
- healthmetrics.com.ph

LESSON NO – 09

Soft Tissue Injuries

Introduction

Soft tissue injuries (STI) are when trauma or overuse occurs to muscles, blood vessels, skin, tendons or ligaments. Most soft tissue injuries are the result of a sudden unexpected or uncontrolled movement due to trauma or other reasons. However, soft tissue damage can also occur from excessive overuse or chronically fatigued structures, especially muscles and tendons.

When soft tissue is damaged, there is usually immediate pain along with immediate or delayed swelling. Stiffness is also very common as a result of the trauma and swelling. Bruising may also develop after 24-48 hours.

Outcomes

Upon completion of this lesson, you will be able to:

- Define soft tissue injuries and its classification.
- Define close wound and its types.
- Steps to treat a closed wound.
- Define open wound and its types.
- Steps to treat an open wound.
- List the steps for pre-hospital treatment for eye, ear, nose and mouth injuries.
- List the steps for pre-hospital treatment of abdominal and genital injuries.
- Demonstrate the PHT of Soft Tissue Injuries with help of dressing and bandaging.
- Demonstrate the PHT procedure for the following:
    - Impaled object in the eye or cheek.
    - Bleeding neck injuries.

Terminology

Wound: A wound is a type of injury which happens relatively quickly in which skin is torn, cut, or punctured (an **open wound**), or where blunt force trauma causes a contusion (a **closed wound**).

Tendonitis: (Also spelled tendinitis) is an acute condition where the tendons that connect muscle to bone become inflamed.

Bruise: A bruise is an injury which appears as a purple mark or discoloration on your body, although the skin is not broken.

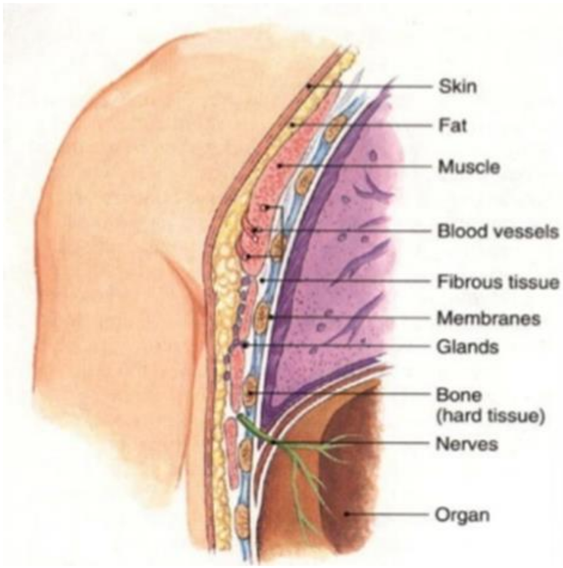
Ligament: A short band of tough, flexible fibrous connective tissue which connects two bones or cartilages or holds together a joint.

Muscle: Muscle is a soft tissue. Muscle cells contain protein filaments of actin and myosin that slide past one another, producing a contraction that changes both the length and the shape of the cell. Muscles function to produce force and motion.

Soft Tissues Injury: A Soft tissue injury (STI) is the damage of muscle, ligaments and tendons throughout the body. Common soft tissue injuries usually occur from a sprain, strain, a one off blow resulting in a contusion or overuse of a particular part of the body. Soft tissue injuries can result in pain, swelling, bruising and loss of function.

Soft Tissue in human body

a. Skin
b. Fatty tissues
c. Muscles
d. Blood vessels
e. Fibrous tissues
f. Membranes
g. Glands
h. Nerves



Functions of the Skin

- **Protection:** - Keeps out microorganisms.
- **Water balance:** - Prevents water loss; preserves chemical balance
- **Temperature regulation: -** Sweat glands produce perspiration that evaporates.
- **Excretion: -** Salts, carbon dioxide and excess water.

- **Shock absorption: -** From minor impacts and pressures.

Classifications of Soft Tissue Injuries

- **Acute injuries**
- **Overuse injuries**

Acute Injuries

Any type of injury that occurs to the body through sudden trauma, such as a fall, twists, or blows to the body. A few examples of this type of injury would be sprains, strains, and contusions.

Overuse Injuries

An overuse injury occurs when a certain activity is repeated frequently, and the body doesn't have enough time to recover in between occurrences. Some examples include bursitis and tendinitis.

Closed Wounds

Definition: The skin is intact and the underlying tissue is not directly exposed to the outside world.

Closed wounds can involve superficial damage to the skin or can be severe with damage to internal organs. Small contusions generally do not need treatment, whereas more serious injuries can be fatal. Closed wounds are generally caused by impact with a blunt object.

Closed wounds are usually caused by direct blunt trauma sustained when falling down or in motor vehicle accidents. Even with the skin intact, the damage can reach down to the underlying muscle, internal organs and bones. Crush wounds can sometimes be caused by heavy falling objects, it might happen in car accident or collapsing building.

How to recognize closed wounds

- Swelling
- Tenderness
- Discoloration
- Possible deformity

Types of Closed Wounds

- Contusion
- Hematoma
- Crush Injury

CONTUSION

These are common type of sports injuries, where a direct blunt trauma can damage the small blood vessels and capillaries, muscles and underlying tissue, as well the internal organs and, in some cases, bone. Contusions present as a painful bruise with reddish to bluish discoloration that spreads over the injured area of skin.

Hematomas

These include any injury that damages the small blood vessels and capillaries resulting in blood collecting and pooling in a limited space. Hematomas typically present as a painful, spongy rubbery lump-like lesion. Hematomas can be small or large, deep inside the body or just under the skin, depending on the severity and site of the trauma.

Crush injuries

These are usually caused by an external high pressure force that squeezes part of the body between two surfaces. The degree of injury and pain can range from a minor bruise to a complete destruction of the crushed area of the body, depending on the site, size, duration and power of the trauma.

Pre-hospital treatment for closed wounds

Use universal precautions and secure the scene.

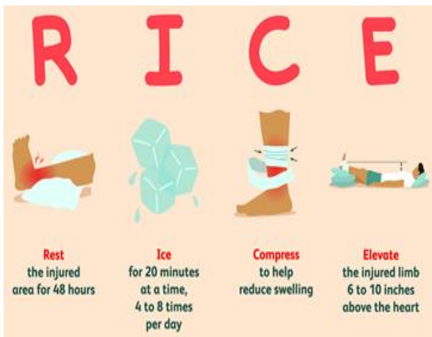
- Apply "RICE" method: Rest, Ice, Compress, and Elevate
- Monitor the patient for any rapid changes in vital signs that might indicate internal bleeding, which should be treated by a physician
- Treat for shock

Transport the patient as soon as possible.

RICE VS MEAT

	RICE	MEAT
Immune System Response	Decreased	Increased
Blood Flow to Injured Area	Decreased	Increased
Collagen Formation	Hindered	Encouraged
Speed of Recovery	Delayed (lengthened)	Hastened (shortened)
Range of Motion of Joint	Decreased	Increased
Complete Healing	Decreased	Increased

R.I.C.E. Method:



R - Rest is recommended for initial 24-48 hours after that moderate activity should start.
I - Apply ice not more than 20 min with interval of 40-45 min & apply till maximum 48 hours.
C - Aim is to reduce endematous swelling.
E – Elevation aims to reduce swelling by increasing venous return of blood to the systematic circulation.
Note :- If skin colour changes don't apply ice.

M.E.A.T. Method: (Movement, Exercise, Analgesia and Therapy)

The MEAT method is an effective procedure used in the initial treatment of a soft tissue injury.

Movement: Controlled movement of the injured body part helps prevent the formation of adhesions (scar tissue) and increases circulation to the area. Gentle range of motion movements can and should begin immediately after the injury (although there may be very little movement possible in the early stages). Simple ankle circles or very gentle movement stretching through the affected muscles can be helpful in the early stages.

Exercise: Once you are able to tolerate gentle controlled movements, you can try to push the boundaries a bit and start to encourage muscle activation. You can do this by flexing the muscles in the area as well as by incorporating low resistance strengthening of tissues. This will help to increase circulation to the injured area and will help reduce instances of muscle atrophy, disuse osteoporosis, thickened scar tissue, and joint stiffness.

Analgesia: Pain management is necessary with injury, but we want to make sure medication doesn't interfere with tissue healing. Avoid the use of NSAIDS such as Advil or Ibuprofen as we need some degree of inflammation to promote proper tissue healing. Other forms of analgesia can be ice (for short periods), topicort creams that desensitize the area (if you do not have any open wounds) and over the counter medications such as Tylenol. Always speak to a medical professional before starting any of these treatment methods to ensure they are safe for you. Non-traditional treatment methods can also be used for analgesia such as acupuncture, electrical stimulation.

Treatment: Corrective exercise, manual therapy, joint mobilizations, myofascial release and acupuncture are all methods of treatment that can help get you back to full function quickly and safely after an injury. Consulting with a healthcare professional such as a Physiotherapist, Chiropractor or a Registered Massage Therapist are all health professionals that can offer a treatment plan based on your injury.

- Monitor the patient for any **rapid changes in vital signs** that might indicate internal bleeding, which should be treated by a physician.
- Treat for shock.

Transport the patient as soon as possible.

Open Wounds

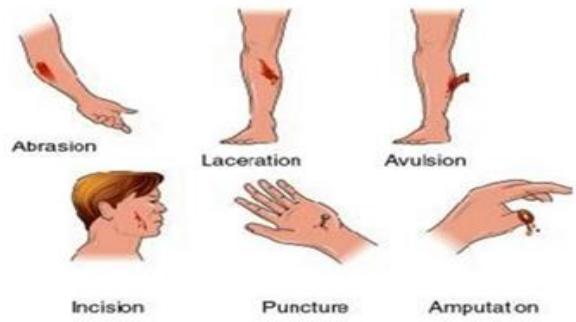
Definition: The skin is broken and the underlying tissue is exposed outside.

- Skin is interrupted or broken.
- Tissues underneath are exposed.

A wound is an injury that causes either an internal or external break in body tissue. An open wound (as in a knife cut) is a break in the skin or mucous membrane.

The most common accidents resulting in open wounds are falls, mishandling of sharp objects, accidents with tools or machinery, and road accidents.

Types of open wounds



- Scratches and abrasions
- Lacerations – regular and irregular
- Penetration and puncture wounds
- Avulsions
- Amputations
- Crushing injury (may be open or closed)
- Gunshot wounds
- Impaled object

Abrasions

An abrasion is a skin wound caused by rubbing or scraping the skin against a hard, rough surface. Bleeding in this type of wound is usually limited, but it is important that the skin be cleaned against infection.

- Includes scrapes and scratches
- Outer layer of skin damaged
- All layers not penetrated

Lacerations

A laceration is a jagged, irregular or blunt breaking or tearing of soft tissues, often resulting from mishandling tools and machinery and other accidents. Bleeding from a laceration may be rapid and extensive.

- Smooth or jagged cut
- Sharp edge
- Severe blow or impact with blunt object
- Impossible to determine depth
- Considerable bleeding

Punctures

A puncture is a piercing wound that causes a small hole in the tissues. Such objects as nails, needles, ice picks and other pointed objects can produce puncture wounds. Even if external bleeding is slight, there may be serious internal bleeding resulting from internal damage to an organ (as in a gunshot wound).

- Sharp, pointed object through the skin
- Caused by nails, ice picks, splinters, or knives
- Threat of contamination
- Two types
  – Penetration
  – Perforation

Avulsions

An avulsion is a forcible tearing or partial tearing away of tissues. It occurs in such accidents as gunshot wounds, explosions, animal bites or other body-crushing injuries. Bleeding is heavy and rapid.

- Flaps of skin and tissues torn loose
- Tip of nose or eye socket
- Completely pulled off
- Tissue cut off from its oxygen supply

Types of avulsions

- Skin
- Ear
- Eyelid
- Nail
- Nerve (brachial plexus)
- **Tooth:** During a tooth avulsion, a tooth is completely or partially (such that the dental pulp is exposed) detached from its socket.
- Periosteal
- Surgical

Amputations

Amputation is the removal of a limb by trauma, medical illness, or surgery. As a surgical measure, it is used to control pain or a disease process in the affected limb, such as malignancy or gangrene. In some cases, it is carried out on individuals as a preventative surgery for such problems. A special case is that of congenital amputation, a congenital disorder, where fetal limbs have been cut off by constrictive bands.

- Extremities
- Massive bleeding
- Blood vessels collapse

Impaled objects

Impaled objects are items that have punctured the body's soft tissue and are still embedded. Depending on the location of the impalement and the size of the object, emergency medical response may be necessary.

Gunshot wounds

The immediate damaging effect of a gunshot wound is typically severe bleeding, and with it the potential for hypovolemic shock, a condition characterized by inadequate delivery of oxygen to vital organs. In the case of traumatic hypovolemic shock, this failure of adequate oxygen delivery is due to blood loss, as blood is the means of delivering oxygen to the body's constituent parts.

Incisions

An incision is a cut caused by a knife, the rough edge of metal, broken glass, a razor blade or some other sharp object. This type of wound generally bleeds rapidly and heavily. If the cut is deep, muscles, tendons and nerves may be damaged.

Pre-Hospital Treatment for open wounds

Use universal precautions and secure the scene.

- **Expose the wound.** Remove all clothing and expose soft tissue. Avoid removing clothing by pulling it over the patient's head. Best method is to remove clothing by cutting with trauma scissors.
- **Control bleeding.** Begin with direct pressure or indirect pressure and elevation. If wound continues to bleed use a pressure point. Use a tourniquet only as last resort.
- **Prevent contamination.** Remove debris and contamination around the surface of the wound. Do not try to remove embedded particles.
- **Dress and bandage.** Use a sterile dressing and secure with a bandage to cover the wound.
- Cover the patient and Keep him calm.
- Treat for shock.

Transport the patient as soon as possible.

Dressings and Bandages

Dressing: - Any material used to cover a wound that helps control bleeding and aids in the prevention of additional contamination.

Bandage: - Any material used to hold a dressing in place.

Occlusive dressing: - Any water-resistant material (plastic or waxed paper) applied to a wound to prevent the entrance of air and the loss of moisture from internal organs.

Bulky dressing: Multiple stacked dressings made to form a single dressing 2-3 centimeters thick, such as a thick sanitary towel or any similar material.

Applying Dressings and Bandages

- Control bleeding.
- Apply the dressing using the aseptic technique.
- Cover the wounds completely.
- Ensure that the dressing and the bandage are firm, fixed and comfortable, but not so tight as to affect circulation.
- Ensure there are no loose ends that can get caught.
- Avoid covering the fingertips.

Advantages of dressing and bandages

- Prevent infection
- Absorb discharge
- Control bleeding
- Avoid further injuries
- Reduce pain

The pre-hospital treatment of wounds and soft tissue injuries is directed at controlling bleeding and preventing contamination

Bandaging Unusual Wounds

Penetrating Injury

- Cover any open wound completely.
- Examine the patient for possible exit wound.

Impaled Objects

- Do not remove unless impaled in the cheek or obstructing the airway or CPR.
- Control bleeding.
- Stabilize the object with a bulky dressing and apply a bandage.

Avulsion (skin flap)

- Clean the wound surface
- Return skin flap to original position
- Control bleeding
- Cover with bulky dressing and apply a bandage

Amputations or unattached avulsion

- Clean the wound

- Control bleeding.
- Apply dressing and bandages
- Keep amputated part cool and moist, but not wet

Special Situations

Injuries to the Scalp

Suspect spinal injury in any patient with a head injury. Do not apply direct pressure if you suspect a skull fracture.

Wounds to the Eyes (puncture wound or impaled object)

- Bandage the good eye to prevent movement of injured eye.
- In an unconscious patient, close the eyes before blindfolding the patient to prevent the eyes from drying, which may cause blindness.
- Treat an extruded eye the same way as you would treat an eye with an impaled object. Do not replace the eye if it has been expelled. Cover it with a cup or cardboard cone before applying the bandage.

Injuries to the Ear

Blood, clear fluid, or blood-tinged fluid draining from the ear may indicate skull fracture or severe head trauma.

- Never probe the ear.
- Never pack the ear to stop bleeding; check for clear fluid (CSF) which may indicate a skull fracture.
- Place a loose, clean dressing across the opening to absorb the fluids.
- Do not apply pressure.

Nosebleeds

A nosebleed in an emergency can be serious and should not be neglected. The loss of blood can be great and lead to shock. If the patient has a suspected skull fracture or spinal injury, do not try to stop the bleeding. (This topic will be discussed in more detail in the lesson on skull injuries.)

Pre-hospital Treatment for nosebleeds

Use universal precautions and secure the scene. Maintain open airway.

- Pinch nostrils together or place a dressing between the upper lip and the gum and apply pressure.
- Keep patient seated and still.
- Do not pack the nose; check for clear fluid (CSF) which may indicate a skull fracture.
- Do not remove any objects you may find inside the nose.

- For avulsions, apply a compressive dressing.

Injuries to the Neck

- Visible lacerations or other wounds can produce massive bleeding or air embolism.
- Difficulty speaking, loss of voice.
- Airway obstructions without foreign bodies in mouth, nose or airway. Often caused by inflammatory process (subcutaneous emphysema).
- Tracheal deviation.
- Deformities or depressions.
- Immobilize the patient if you suspect a spinal injury.

Pre-hospital treatment for injuries to the neck

Use universal precautions and secure the scene.

- Ensure airway open.
- Gloved hand over wound.
- Apply occlusive dressing.
- Place dressing over occlusive dressing.
- Apply pressure as needed.
- Bandage dressing.
- Immobilize cervical spine.

IMPORTANT: With any head, face, scalp, eye, ear, nose or neck injury, the MFR should also suspect a possible spinal injury.

Injuries to the Abdomen

The abdomen contains solid and hollow organs. The rupture of hollow organs (stomach, large and small intestine) can cause the contents (acids, digestive enzymes, bacteria) to spill into the peritoneal cavity, causing an inflammatory reaction. Rupture of the solid organs (liver, spleen, etc.) can cause severe hemorrhage. (Contusion may indicate injury to the abdomen or pelvis)

Signs and Symptoms of Abdominal Injury

- Pain or cramps in the abdominal area, local or diffuse.
- Guarding the abdomen or lying down in fetal position.
- Tenderness of the abdomen.
- Signs of shock.
- Rigid, tense or distended abdomen.
- Mild discomfort progressing to intolerable pain.
- Deep, penetrating pain in the pelvis or lower back.
- Vomiting blood, bright red or like coffee grounds.
- Blood in the stool, bright red or tarry black.

Pre-hospital treatment of Abdominal Injuries

Use universal precautions and secure the scene.

Be alert for patient vomiting.

- Cover all open wounds.
- Do not replace exposed internal organs – cover them with thick, moist sterile dressing. Then loosely cover moist dressing with occlusive dressing. Keep exposed area warm by placing a dressing or towel over the occlusive dressing.
- Do not remove impaled objects – stabilize it with bulky dressings.
- Constantly monitor vital signs.
- Put patient in supine position.
- Treat for shock.

Injuries to the Genitals

Pre-hospital treatment for wounds to genitalia

Wounds to the genitals should be treated the same as any other wound. However, special care and attention should be given to protect the patient's privacy.

Unit summary

Closed Wounds

The skin is intact and the underlying tissue is not directly exposed to the outside world.

Types of Closed Wounds

- Contusion
- Hematoma
- Crush Injury

Pre-hospital treatment for closed wounds

Use universal precautions and secure the scene.

- Apply "**RICE**" method: Rest, Ice, Compress, and Elevate
- Monitor the patient for any rapid changes in vital signs that might indicate internal bleeding, which should be treated by a physician
- Treat for shock

Transport the patient as soon as possible

Open Wounds

The skin is broken and the underlying tissue is exposed to the outside environment.

- Skin is interrupted or broken.
- Tissues underneath are exposed.

Pre-hospital treatment for Open Wounds

Use universal precautions and secure the scene.

- Expose the wound.
- Control bleeding.
- Prevent contamination.
- Dress and bandage
- Cover the patient. Keep patient calm.
- Treat for shock.
- Transport the patient as soon as possible.

Bandaging Unusual Wounds

Penetrating Injury

- Cover any open wound completely.
- Examine the patient for possible exit wound.

Impaled Objects

- Do not remove unless impaled in the cheek or obstructing the airway or CPR.
- Control bleeding.
- Stabilize the object with a bulky dressing and apply a bandage.

Avulsion (skin flap)

- Clean the wound surface
- Return skin flap to original position
- Control bleeding
- Cover with bulky dressing and apply a bandage

Amputations or unattached avulsion

- Clean the wound
- Control bleeding.
- Apply dressing and bandages
- Keep amputated part cool and moist, but not wet

Self-Assessment

Objective questions

1. Which type of wound is the loss of a tooth?
    a. Amputation
    b. Laceration
    c. Avulsion
    d. Puncture

2. When a pressure point must be used to control bleeding of the forearm, what angle should the arm be placed into?
    a. 30-degree
    b. 60-degree
    c. 45-degree
    d. 90-degree

3. Which of the following should not be done when treating a patient with an impaled object?
    a. Pack the object
    b. Stabilize the object
    c. Remove the object
    d. Care for shock

4. When should the distal pulse be checked when applying a bandage?
    a. Before application only
    b. Before, after and during application
    c. After application only
    d. Before and after application

5. Which of the following is your best chance for controlling bleeding on the abdomen or neck?
    a. Pressure dressing
    b. Gloved hand and dressing
    c. Elevation alone
    d. Tourniquet

6. Which is most often effective when trying to control external bleeding?
    a. Pressure points
    b. Elevation with direct pressure
    c. Direct pressure
    d. Use of a tourniquet

7. Which is the most commonly seen type of closed wound during Emergency Medical Responder care?
    a. Puncture
    b. Contusion
    c. Abrasion
    d. Incision

8. To what level should the wound be raised when using elevation to control the bleeding?
    a. Below the heart
    b. Above the waist
    c. Above the heart
    d. Below the waist

9. What position should an unresponsive patient be placed into when he has a nosebleed?
    a. Prone
    b. Supine
    c. Recovery
    d. Semi sitting

10. Which of the following should not be done with an amputated part?
    a. Keep the part cool
    b. Wrap the part in sterile dressing
    c. Put the part in water
    d. Place the part in a plastic bag

Descriptive questions

1. Define the close wound and types.
2. Define the open wound and types.
3. Write the function of skin.
4. Define soft tissue and soft tissue injuries.
5. Write the short notes on given topic.
    a. Occlusive dressing
    b. Bulky dressing
    c. Gunshot wound
    d. Impaled object

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- https://en.wikipedia.org/wiki/
- www.livestrong.com › Health
- https://www.woundcarecenters.org/article/wound-basics/different-types-of-wounds
- firstaidcprhamilton.ca › Minor Medical Emergencies
- www.healthline.com/health/open-wound
- www.livestrong.com › Diseases and Conditions

LESSON NO – 10

Musculoskeletal Injuries

Introduction

Musculoskeletal injuries are injuries in the Human Musculoskeletal System, including the joints, ligaments, muscles, nerves, tendons, bones, and structures that support limbs, neck and back.

Musculoskeletal injuries can arise from a sudden exertion (e.g., lifting a heavy object) or they can arise from making the same motions repeatedly repetitive strain or from repeated exposure to force, vibration or awkward posture. Injuries and pain in the musculoskeletal system caused by acute traumatic events like a road accident or fall are also considered in musculoskeletal injuries. Musculoskeletal injuries can affect many different parts of the body including upper and lower back, neck, shoulders and extremities (arms, legs, feet, and hands).

Outcomes

Upon completion of this lesson, you will be able to:

- Define skeletal system and types.
- Define human bones structure and joints.
- Define open fracture and close fracture.
- Signs & symptoms of open fracture and close fracture.
- Define dislocation, sprain and strain.
- Signs & symptoms of dislocation sprain and strain.
- Demonstrate the Pre-hospital treatment of fractures and dislocations.

Terminology

Tendon: A flexible but inelastic cord of strong fibrous collagen tissue attaching a muscle to a bone.

Ligament: A short band of tough, flexible fibrous connective tissue which connects two bones or cartilages or holds together a joint.

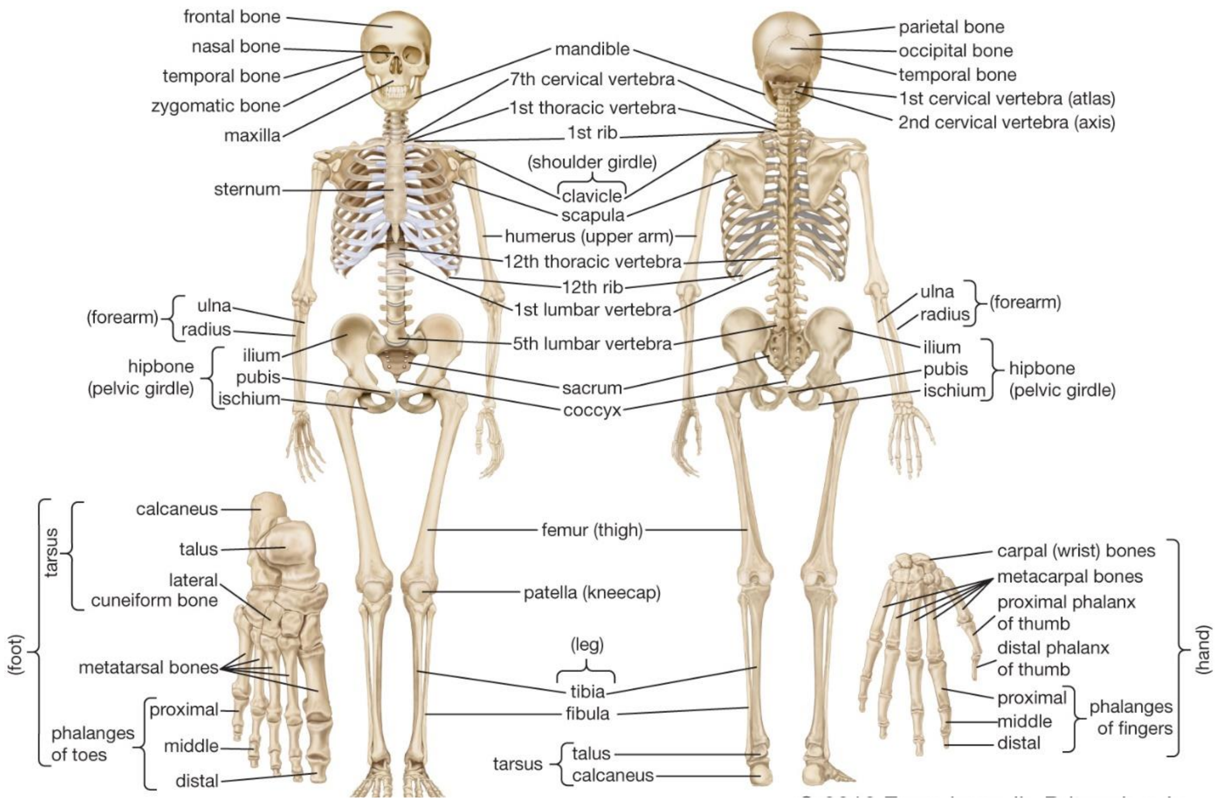
Cartilage: A resilient and smooth elastic tissue, rubber-like padding that covers and protects the ends of long bones at the joints, and is a structural component of the rib cage, the ear, the nose, the bronchial tubes, the intervertebral discs, and many other body components. It is not as hard and rigid as bone, but it is much stiffer and much less flexible than muscle.

Fascia: Fascia is the sheet of fibrous connective tissue that covers, supports, and separates muscles or group of muscles.

Tunnel vision: Tunnel vision is the loss of peripheral vision with retention of central vision, resulting in a constricted circular tunnel-vision.

Human Musculoskeletal System

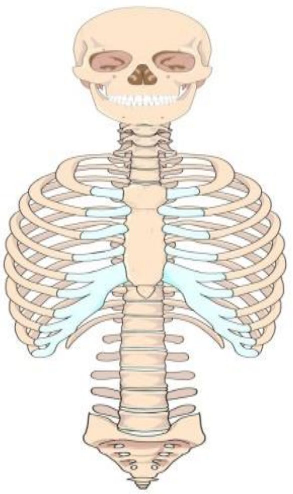
Definition: - The human musculoskeletal system (also known as the Loco-motor System, and previously the activity system) is an organ system that gives humans the ability to move using their muscular and skeletal systems. The musculoskeletal system provides form, support, stability, and movement to the body.



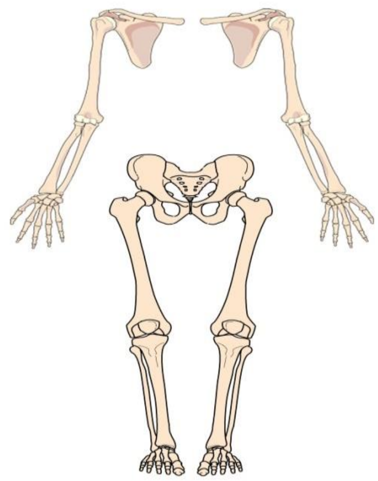
It is made up of the bones of skeleton, muscles, cartilage, ligaments, tendons, joints and other connective tissue that supports and binds tissues and organs together. The musculoskeletal system's primary functions include supporting the body, allowing motion, and protecting vital organs. The skeletal portion of the system serves as the main storage system for calcium and phosphorus and contains critical components of the hematopoietic system.

This system describes how bones are connected to other bones and muscle fibers via connective tissue such as tendons and ligaments. The bones provide stability to the body. Muscles keep bones in place and also play a role in the movement of bones. To allow motion, different bones are connected by joints. Cartilage prevents the bone ends from rubbing directly onto each other. Muscles contract to move the bone attached at the joint.

The skeleton of an adult human consist of 206 bones. It is composed of 300 bones at birth, which decreases to 206 bones by adulthood after some bones have fused together. It consists of 80 bones in the axial skeleton (28 in skull and 52 in torso) and 126 bones in the appendicular skeleton (32 x 2 in upper extremities including both arms and 31 x 2 in lower extremities including both legs).



Axial Skeleton



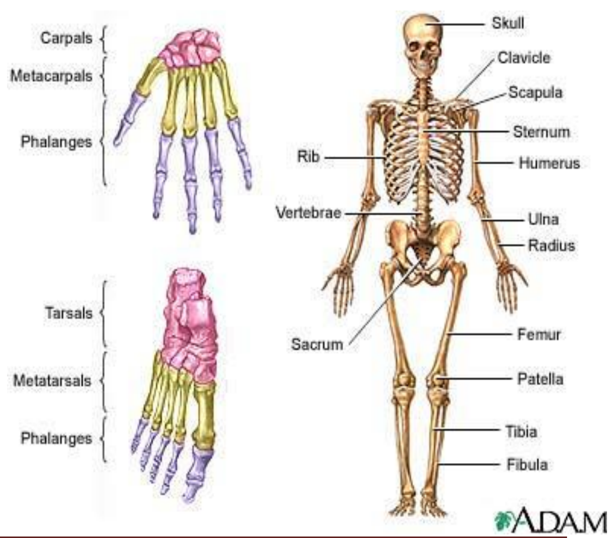
Appendicular Skeleton

Axial Skeleton:- The axial skeleton consists of 80 bones, including:

- Skull
- Thorax
- Vertebral (spinal) column

Appendicular Skeleton: - The appendicular skeleton consists of 126 bones which include:

- Shoulder: clavicle and scapula
- Upper extremities: arms, hands, fingers
- Pelvis (hips)
- Lower extremities: legs, feet, toes

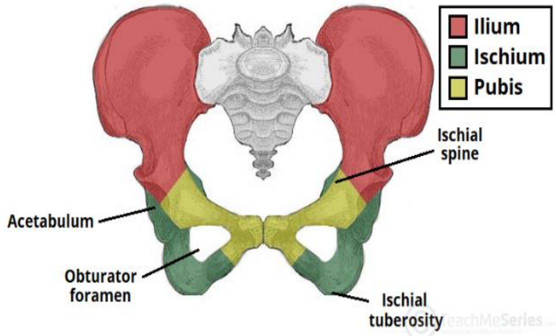


Functions of the skeletal system

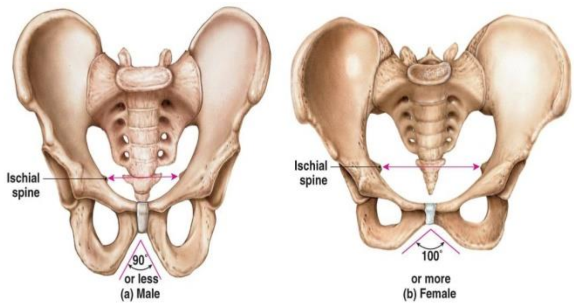
- ✓ Provide support for the body
- ✓ Store minerals and lipids
- ✓ Produce blood cells
- ✓ Protect body organs
- ✓ Provide leverage and movement

Scull	The bones of the skull surrounding the brain, not including the face bones; the bone just above/in front of the ear is the temporal bone
Mandible	The jaw bone, so the hinge of the jaw is the temporo-mandibular joint, and problems with malfunctioning of this joint are known as TMJ
Vertebrae	Bones which make up the spine, which include:
Cervical vertebrae	The vertebrae in the neck region
Thoracic vertebrae	The vertebrae attached with ribs
Lumbar vertebrae	The vertebrae in the lower back
Sacrum	Five fused vertebrae which are joined to the pelvis
Coccyx	Four fused vertebrae comprising the tailbone
Ribs	Bones protecting the chest cavity (we all have twelve pairs)
Sternum	The breastbone
Clavicle	The collar bone
Scapula	The shoulder blade
Humerus	The top of the arm
Ulna	The little finger side of the lower arm which also forms the elbow
Radius	The thumb side of the lower arm; the radius rotates around
Carpels	The wrist bones
Metacarpels	The palm of the hand
Phalanges	The fingers and toes
(Os) coxa	The hips bones

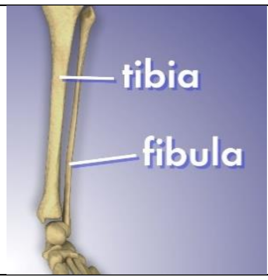
Ilium	The big bone on top that we think of as the hip bone
Ischium	The bones on which you sit
Pubis	The lower front hip bone



Ways to differentiate male pelvis from female:

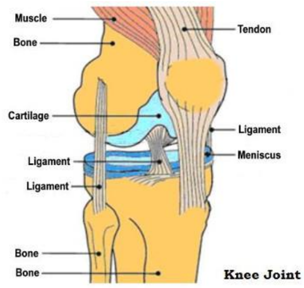


a. Spread of ilium: female more flared and cradle-like with anterior iliac spines farther apart vs. More straight “up-and-down” in male.
b. Shape of hole in ischium: smaller and triangular in female vs. Larger and rounded in male.
c. Angle across pubic symphysis = pubic arch: less than 90° (acute angle) and more sharply angled in male, greater than 90° (obtuse angle) and more rounded in female.
d. Inner diameter and distance between ischia larger in female--big enough for head of baby to pass through.

Femur	The thigh bone
Patella	The knee cap
Tibia	The tibia also known as the shinbone or shank bone, is the larger and stronger of the two bones in the leg below the knee in vertebrates (the other being the fibula), and it connects the knee with the ankle bones 
Fibula	The thin, outer (little-toe side) shinbone
Tarsals	The heel bones
Metatarsals	The arch of the foot, the sole
Phalanges	The fingers and toes

Other Elements of the Musculoskeletal System

- **Joints** — A joint is where two or more bones come together, like the knee, hip, elbow, or shoulder. Each joint reflects a compromise between stability and range of motion.

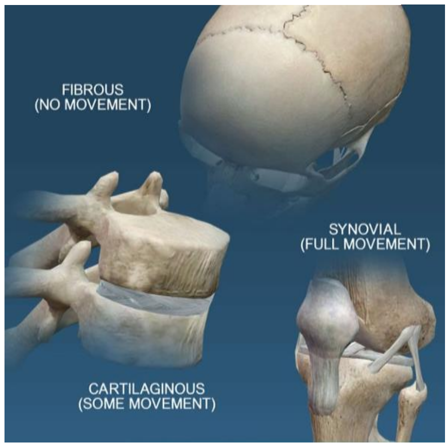


There are three main types of joints:

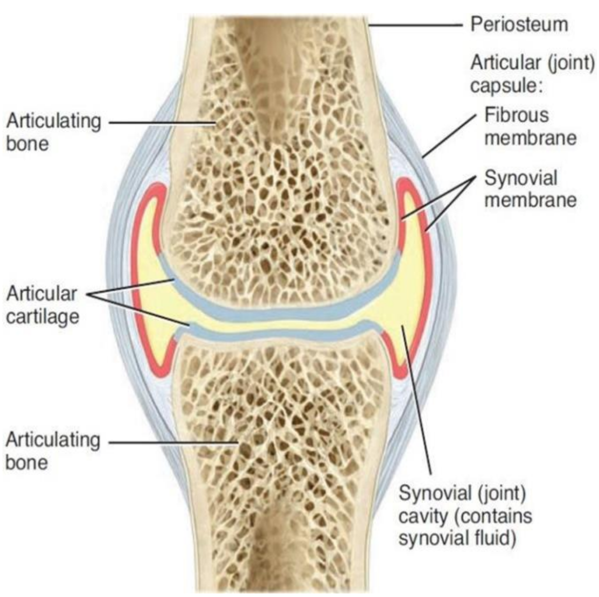
- Fibrous (Immoveable)

- Cartilaginous (Partially moveable)
- Synovial (Freely moveable)

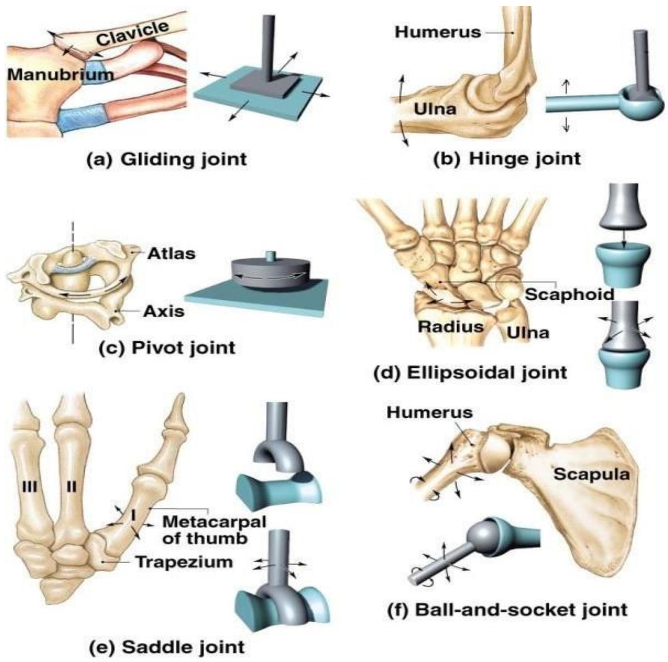
- **Fibrous (synarthrodial):** This type of joint is held together by only a ligament. Examples are where the teeth are held to their bony sockets and at both the radioulnar and tibiofibular joints.
- **Cartilaginous (synchondroses and sympheses):** These joints occur where the connection between the articulating bones is made up of cartilage for example between vertebrae in the spine.
- **Synovial (diarthrosis):** Synovial joints are by far the most common classification of joint within the human body. They are highly moveable and all have a synovial capsule (collagenous structure) surrounding the entire joint, a synovial membrane (the inner layer of the capsule) which secretes synovial fluid (a lubricating liquid) and cartilage known as hyaline cartilage which pads the ends of the articulating bones.



Structure of synovial joints



Types of synovial joints



- **Tendons** — A tendon is a fibrous connective tissue which attaches muscle to bone. Tendons may also attach muscles to structures such as the eyeball. A tendon serves to move the bone or structure.

- **Ligaments** -A ligament is a fibrous connective tissue which attaches bone to bone, and usually serves to hold structures together and keep them stable.
- **Skeletal muscles** -These muscles contract to pull on tendons and move the bones of the skeleton. In addition to producing skeletal movement, muscles also maintain posture and body position, support soft tissues, guard entrances and exits to the digestive and urinary tracts, and maintain body temperature.
- **Nerves** — Nerves control the contraction of skeletal muscles, interpret sensory information, and coordinate the activities of the body's organ systems.
- **Cartilage** — This is a type of connective tissue. Cartilage is the tough but flexible tissue that covers the ends of your bones at a joint. It also gives shape and support to other parts of your body, such as your ears, nose and windpipe. Healthy cartilage helps you move by allowing your bones to glide over each other. It also protects bones by preventing them from rubbing against each other.

Musculoskeletal Injuries

Musculoskeletal injuries result from the damage of muscular or skeletal systems, which usually occur due to a strenuous and/or repetitive activity. They are among the most common work-related injuries. It also occurs due to trauma.

They include a number of disorders involving muscles, bones, tendons, blood vessels, nerves, and other soft tissues. Treatments vary and can produce different results. Musculoskeletal pain is pain that affects the muscles, ligaments and tendons, and bones.

Symptoms of Musculoskeletal Injury

- Pain in the hands, arms, shoulders, neck, back, legs or feet.
- May include swelling, numbness, tingling and a feeling of heaviness and/or tiredness in the affected area.
- Some workers may experience multiple symptoms due to more than one injury.

Fractures

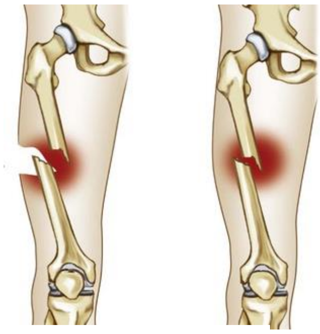
Definition: A fracture is a break, usually in a bone. Fractures commonly happen because of road accidents, falls or sports injuries. Other causes are low bone density and osteoporosis, which cause weakening of the bones. Overuse can cause stress fractures, which are very small cracks in the bone.

Symptoms of a fracture are

- Intense pain
- Deformity - the limb looks out of place

- Swelling, bruising, or tenderness around the injury
- Numbness and tingling
- Problems moving a limb

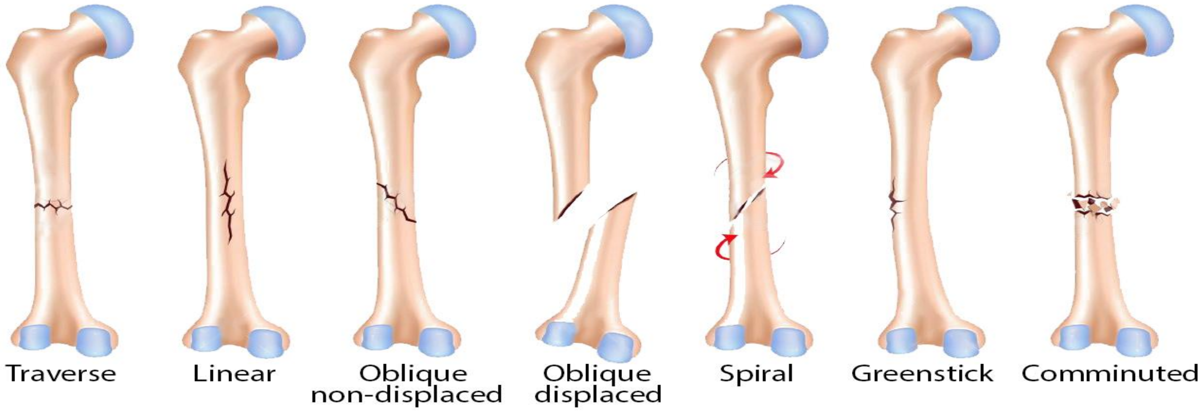
Fractures can be open or closed.



Closed fracture:- One in which the overlying skin is intact. Proper splinting may reduce the damage of closed fracture.

Open fracture:- If the broken bone punctures the skin, it is called an **open or compound fracture**. The bone may or may not protrude through the wound. Open fractures are serious because of risk of contamination.

Types of Bone Fracture



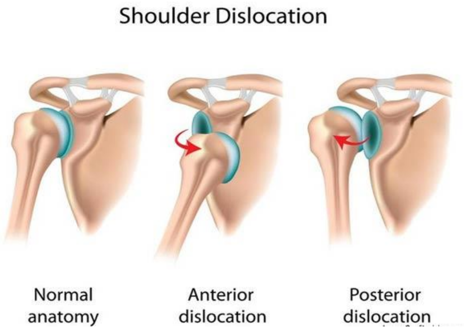
Dislocations

Definition: Injury in which a bone is moved out of its normal position in a joint and remains that way.

A dislocation is a separation of 2 bones from the joint. Joints are areas where 2 bones come together. A dislocated joint is a joint where the bones are no longer in their normal positions.

Symptoms of Dislocation

- Accompanied by numbness or tingling at the joint or beyond it
- Very painful, especially if you try to use the joint or put weight on it
- Limited in movement
- Swollen or bruised
- Visibly out of place, discolored, or misshapen



Pre-hospital treatment for Dislocation

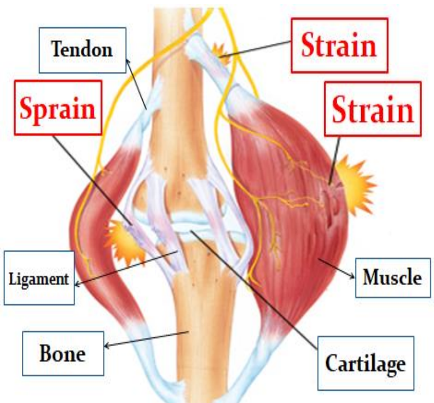
- Call EMS before treating someone who may have a dislocation, especially in the accidental case and injury is life threatening.
- If the person has a serious injury, check their circulation, Airway and breathing. If necessary, begin CPR.
- Do not move the person if you think that their head, back, or leg is injured. Keep the person calm.
- If the skin is broken, take steps to prevent infection. Don't blow on the wound. Rinse the area gently with clean water to remove any dirt you can see, but do not scrub or probe. Cover the area with sterile dressings before immobilizing the injured joint.
- Splint or sling the injured joint in the position in which you found it. Do not move the joint. Also immobilize the area above and below the injured area.
- Check blood circulation around the injury by pressing firmly on the skin in the affected area. It should turn white, then regain color within a couple of seconds after you stop pressing on it. Apply ice packs to ease pain and swelling, but do not put ice directly on the skin. Wrap the ice in a clean cloth.
- Take steps to prevent shock.

Don't

- Do not move the person unless the injury has been completely immobilized.
- Do not move a person with an injured hip, pelvis, or upper leg unless it is absolutely necessary. If you are the only rescuer and the person must be moved, drag them by their clothing.
- Do not attempt to straighten a misshapen bone or joint or try to change its position.
- Do not test a misshapen bone or joint for loss of function.
- Do not give the person anything by mouth.

Sprains and strains

- **A sprain** is a stretched or torn ligament. Ligaments are tissues that connect bones at a joint. Falling, twisting, or getting hit can cause a sprain.
  Ankle and wrist sprains are common. Symptoms include pain, swelling, bruising, and being unable to move your joints. You might feel a pop or tear when the injury happens.



- **A strain** is a stretched or torn muscle or tendon. Tendons are tissues that connect muscle to bone. Twisting or pulling these tissues can cause a strain. Strains can happen suddenly or develop over time. Back and hamstring muscle strains are common. Many people get strains playing sports.
- At first, treatment of both **sprains and strains** usually involves resting the injured area, icing it, wearing a bandage or device that compresses the area, and medicines.
  Later treatment might include exercise and physical therapy.

Signs and Symptoms of a Musculoskeletal Injury

- Deformity or angulation: compare with opposite limb
- Pain and tenderness upon palpation or movement
- Crepitus (grating) – a sound or feeling of broken bone ends rubbing together.
- Swelling
- Bruising or discoloration
- Exposed bone ends
- Joint locked in position – reduced motor ability or reduced ability to move a joint.
- Numbness and paralysis – may occur distal to site of injury caused by bone pressing on a nerve.
- Compromised circulation distal to injury evidenced by alteration in skin colour, temperature, pulse or capillary refill **never intentionally induce crepitus. This may cause or aggravate soft tissue injury.**

Splinting

Definition: A device that is used to stabilize any painful, swollen or deformed body part. The primary objective of splinting is to prevent further movement of body parts. For any splint to be effective it must immobilize adjacent joints and bone ends.

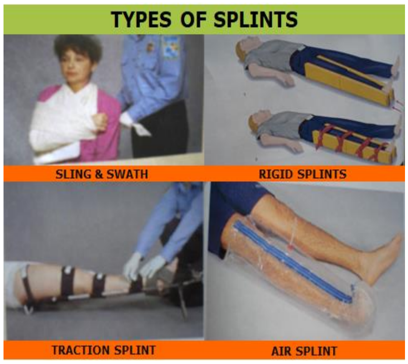
Splinting techniques are used to treat musculoskeletal system abnormalities. The main indications for splinting are to temporarily immobilize a limb for pain and spasm, to decrease swelling, and to minimize further potential soft-tissue or neurovascular injuries associated with contusions, sprains, lacerations, fractures, dislocations, or painful joints due to inflammatory disorders.

Reasons for splinting include:

- To prevent motion of bone fragments or dislocated joints
- To reduce pain and suffering
- To minimize damage to soft tissues (for example, nerves, arteries , veins and muscle)

- To prevent a closed fracture from becoming an open fracture
- To minimize blood loss or shock

Types of Splints



Effective splinting may require some ingenuity. Though you may carry many types of splinting devices, many situations will require you to improvise.

Five basic types of splints:

- **Rigid splint:** Requires limb to be in anatomical position. Ideal for long-bone injuries (for example cardboard, wood).
- **Conforming splint:** Can be molded to different angles or surrounds the extremity (for example air or vacuum splints).
- **Traction splint:** Used specifically for femur fractures.
- **Sling and swathe:** Two triangular bandages used to hold an injured arm in place against the body.
- **Improvised splints:** a book, cardboard, pillow or blanket etc.

General Rules for Splinting

Regardless of the method of splinting, general rules apply to all types of immobilization, as follows:

- Always communicate your plans with your patient if possible.
- Before immobilizing an injured extremity, expose and control bleeding.
- Always cut and remove clothing around the injury site before immobilizing the joint. Remove all jewelry from the site and below it.
- Assess PMS (pulse, motor function and sensation)
- If limb is severely deformed or distal circulation is compromised (cyanosis distal to fracture site or no distal pulse), align the bone with gentle traction (pulling). If pain or crepitus worsens, discontinue.
- Do not attempt to push protruding bone ends back into place. However, when realigning, they may slip back into place. Make a note if this occurs.
- Pad a splint before applying it.
- If a joint is injured, immobilize it and the bones above and below.

Avoid tunnel vision

• **Do not over-splint the patient** - In trauma patients, do not distract your attention from life-threatening injuries after gross appearance of non-critical injuries.

• After securing the patient to a long backboard supports and splints every bone and joint in one step without wasting time.
• Be flexible while splinting. Keep in mind patient's comfort and principles of splinting.

PHT for Suspected Fractures, Dislocations or Sprains

Examination involves use of your senses and skills of inspection (looking), auscultation (listening) and palpation (feeling). Use universal precautions and secure the scene.

1) **Perform initial assessment.**
    - Identify and treat **life-threatening problems**.
    - Do not be distracted by **dramatic-looking injuries**.
    - Remember cervical collar and oxygen, if necessary

2) **Perform a physical exam.**

You can use the mnemonic "**BPDOC**" to guide your exam as you look for signs and symptoms of injuries.

- Check for visible **Blooding.**
- Check for **Sevier pain/injury pain**
- Check for visible **Deformities**. Check all joints and bones of entire body.
- Check for **Open injuries**, common with extremity injuries.
- Check for **crepitus sound.** Check all joints of entire body.

For Extremity Injuries, always assess for distal pulse, motor function and sensation of (PMS) ***before and after splinting.***

- **Pulse:** Radial in upper extremity injuries or pedal pulse such as, dorsalis pedis (top of foot) or posterior tibial pulse (back of ankles, medially) for lower extremities.
- **Motor function:** check patient's ability to move, such as wiggling toes or fingers (movement indicates intact nerves).
- **Sensation:** Gently squeeze or pinch the finger of the extremity then ask if patient feel your touch.

3) **Stabilize the injury.**

    After physical examination, secure injury site providing manual stabilization. Do not release manual stabilization of an injured extremity until it is properly immobilized.

4) **Expose the injury.**

    Cut away clothing and remove jewelry before swelling occurs.

5) **Treat open wounds and control bleeding.**

Cover with a clean or sterile dressing and avoid direct pressure over broken bone ends. Use pressure points as needed if bone ends protrude from injury, use caution not to allow bone ends to reenter wound.

6) **Prepare your splinting materials.**

7) **Apply the splint carefully to victim.**

- Measure or adjust the splint and maintain manual stabilization during splinting until procedure is completed.
- Apply and secure adjacent joints and injury site.
- Be careful regarding circulation.

8) **Reassess pulse, motor function and sensation.**

9) **Apply cold packs or ice** to reduce pain and swelling.

10) **Treat for shock.**

PHT for Specific Injuries and Application of Splints

IMPORTANT: Always reassess pulse, motor function and sensation before and after splinting.

Splinting the Upper Extremities

Shoulder and clavicle

- **Signs and symptoms:** Shoulder appears to be "dropped," deformity (Asymmetry), pain.
- **Treatment:** Apply a sling and swath. Use pad if necessary, to fill the gap between body and arm.

Humerus (Upper Arm) and Shoulder

- **Signs and symptoms:** Pain, swelling, deformity.
- **Treatment:** Use rigid splint to outside of the arm and pad in voids, then apply sling and swath.

Elbow

- ***Important:*** Splint in position found, do not attempt to straighten.
- **Signs and symptoms:** Pain, swelling and deformity.
- **Treatment:** If arm is bent at elbow, splint with sling & swath. Alternate is pillow or blanket. If elbow is straight, splint entire arm, armpit to fingertips, both sides.

Forearm and Wrist

- **Signs and symptoms:** Pain, swelling and deformity.
- **Treatment:** Splint area with arm board, then sling and swath. (Pneumatic splints are an option.)

Hands and Fingers

- ***Important:*** Pulse can be checked by capillary refill.
- **Signs and symptoms:** Pain, swelling and deformity.
- **Treatment:** If one finger is fractured, tape it to an adjacent finger or use tongue depressor to splint. If more than one finger is fractured, splint the entire hand in the position of function. Place a roll of bandage in palm of hand, or other object, and then wrap entire hand and place on arm board.

Splinting the Lower Extremities

Pelvis

- Pelvic injuries can be life-threatening due to **massive blood loss**.
- Suspect shock.
- Any force strong enough to injure the pelvis can also injure **the spine.**

Signs and symptoms of pelvic injury

- Pain, especially when pressure is applied to iliac crests or pelvic bones
- Inability to lift legs while lying on back

Pre-hospital treatment for pelvic injury

1. Minimize patient movement.
2. Do not log roll or lift with pelvis unsupported.
3. Place a folded blanket between patient's legs from groin to feet and bind together with cravats (2 to upper leg, 2 to lower leg).
4. Place the patient on long backboard.
5. Treat for shock.

Hip Injuries

With this type of injury, it is difficult to differentiate an upper femur fracture from a hip or pelvic fracture or dislocation. Assess for life threatening injuries as with pelvic injuries.

Signs and symptoms of hip injury

- Pain, swelling and discoloration
- Inability to move leg(s)
- Possible foot rotation (outward or inward)

Pre-hospital treatment for hip injuries

1. Bind legs together with a folded blanket between patient's legs
2. Support the hip with pillows.
3. Stabilize patient on long backboard, or use long splints along outer thigh, from foot to armpit with pad and along the inner thigh, from groin to foot.
4. Secure with cravats

Femoral Injuries

A femoral fracture can produce massive internal bleeding which may lead to shock. Treat for life-threats first.

Signs and symptoms of femoral fracture

- Pain (often intense)
- Deformity
- Rigidity
- Shortened limb

Pre-hospital treatment: If you find the leg in a straight position, use two padded splints one along the inner thigh from groin to the foot, the other along the outer thigh from the armpit to the foot. Secure with cravats.

Knee Injuries

- **Signs and symptoms:** Pain, swelling and deformity.
- **Bent position:** Immobilize in the position found. The bones above and below it should be splinted with short padded boards.
- **Straight position:** Use two padded long splints, the first on the inner thigh from groin to beyond foot. Place the second on the outer thigh, from hip to beyond foot. Secure with cravats.

Tibia or Fibula Injury

- **Signs and symptoms:** Pain, swelling and deformity
- **Pre-hospital treatment:** Use two padded long splints – groin to foot and thigh to foot. Secure with cravats. Alternative method for a closed injury to the tibia or fibula is to use a circumferential splint or pneumatic splint.

Ankle and Foot Injuries

- **Signs and symptoms:** Pain, swelling and deformity.
- **Pre-hospital treatment:** Stabilize, remove shoes and socks if possible (Expose injury). Circumferential or formable splint such as a pillow secured with cravats is recommended.
- **Alternative:** Padded boards to mid-thigh.

Unit summary

Human Musculoskeletal System

Definition: - The human musculoskeletal system (also known as the Locomotor system, and previously the activity system) is an organ system that gives humans the ability to move using their muscular and skeletal systems. The musculoskeletal system provides form, support, stability, and movement to the body.

Axial Skeleton: The axial skeleton consists of 80 bones, including:

- Skull
- Thorax
- Vertebral (spinal) column

Appendicular Skeleton: - The appendicular skeleton consists of 126 bones which include:

- Shoulder: clavicle and scapula
- Upper extremities: arms, hands, fingers
- Pelvis (hips)
- Lower extremities: legs, feet, toes

Splinting

A device that is used to stabilize any painful, swollen or deformed body part. The primary objective of splinting is to prevent further movement of body parts.

Types of Splints

- Rigid splint
- Conforming splint
- Traction splint
- Sling and swathe
- Improvised splints

PHT for Suspected Fractures, Dislocations or Sprains

Examining involves use of your senses and skills of LLF. Use universal precautions and secure the scene.

- Perform initial assessment.
- Perform a physical exam.
- For extremity injuries, always assess for distal pulse, motor function and sensation of (PMS), *before and after splinting.*
- Stabilize the injury.
- Expose the injury.
- Treat open wounds and control bleeding.
- Prepare your splinting materials.
- Carefully splint individual injuries.
- Reassess pulse, motor function and sensation.
- Apply cold packs or ice to injury site to reduce pain and swelling.
- Treat for shock. Pain and swelling.

Self- Assessment

Objective questions

1. A fracture is defined by:
    a. Bone that is broken, chipped, cracked or splintered
    b. Occurs when one end of a bone that is part of a joint is pulled or pushed
    c. Ligaments or tendons that stretch or tear
    d. Overexerting, overworking, overstretching or tearing of a muscle

2. When splinting an injury to the extremity you should:
    a. Check distal circulation, sensation and motor function before splinting
    b. Check distal circulation, sensation and motor function after splinting
    c. Firmly secure the splint, leaving fingertips or toes exposed
    d. All of the above

3. Which statement is not correct?
    a. Ligament connect bone to bone
    b. Tendon connect bone to muscles
    c. Fascia connect muscle to muscle
    d. None of these

4. Which of the following is not part of the axial skeleton?
    a. Femur
    b. Mandible
    c. Sternum
    d. Sacrum

5. Sprain is the cause of _________.
    a. Injury in bone
    b. Injury in tendon
    c. Injury in joint
    d. Injury in ligament

6. How many bones are found in each wrist?
    a. 4
    b. 8
    c. 10
    d. 6

7. What is the function of Tendon?
    a. To link bone to bone
    b. To link muscle to ligament
    c. To link muscle to bone
    d. To bind the cell in compact bone chaser together

8. There are _____ cranial bones and _____ facial bones in the adult skull.
    a. 6, 10
    b. 8, 14
    c. 12, 12
    d. 5, 9

9. The type of joint that is distinguished by having a fluid-filled joint cavity is a____.
    a. Fibrous
    b. Cartilaginous
    c. Synovial
    d. Suture

10. Cartilage present in ______________ tissue of human body.
    a. Muscular tissue
    b. Connecting Tissue
    c. Epithelium tissue
    d. Germinal Tissue

Descriptive questions

1. What is the difference between closed fracture and open fracture?

2. Explain sprain and strain?

3. Write the function of skeletal system.

4. Write the difference between fracture and dislocation.

5. Write short notes on the given topics.

    a. Splinting
    b. Hip injury
    c. Tendon
    d. Ligament

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- https://en.wikipedia.org/wiki/
- www.livestrong.com › Health
- https://www.livescience.com/22537-skeletal-system.htm
- https://medlineplus.gov › Medical Encyclopedia
- https://en.wikipedia.org/wiki/Tendon
- www.mananatomy.com › Body System
- anatomyandphysiologystudyguides.blogspot.com/.../components
- https://en.wikipedia.org/wiki/Cartilage

LESSON NO – 11

Skull, Spinal Column and Chest Injuries

Introduction

The head, spine and chest contain the body's most vital organs. Although they are well protected, blunt or penetrating trauma can cause life threatening injuries when any of these areas get injured.

Apart from head or chest injuries, injury to spinal cord leads to multiple nature of complication. Injuries to spinal cord at times incapacitate the mobility of the victims therefore the understanding of injuries to head spine and chest is of vital importance for responder to discharge his scope of duties.

Outcomes

Upon completion of this lesson, you will be able to:-

- Describe about skull, chest and spinal column.
- Signs and symptoms of skull, spine and chest injuries.
- PHT of skull spine and chest injuries.
- PHT of Rib Fractures, Flail Chest and Penetrating Chest Injuries.

Terminology

Spinal cord: The spinal cord is a collection of nerves that travels from the bottom of the brain down your back. These nerves allow your brain to give commands to your muscles and cause movements of your arms and legs. The nerves also control the function of your organs including your heart, lungs, bowels, and bladder.

Central nervous system: A system that is responsible for involuntary functions of the body such as heartbeat, respirations, and temperature regulations, composed of the brain and spinal cord. The brain and spinal cord together make up the Central Nervous System (CNS).

Peripheral Nervous System: The peripheral nervous system comprises the many nerves that extend from the spinal cord throughout the body.

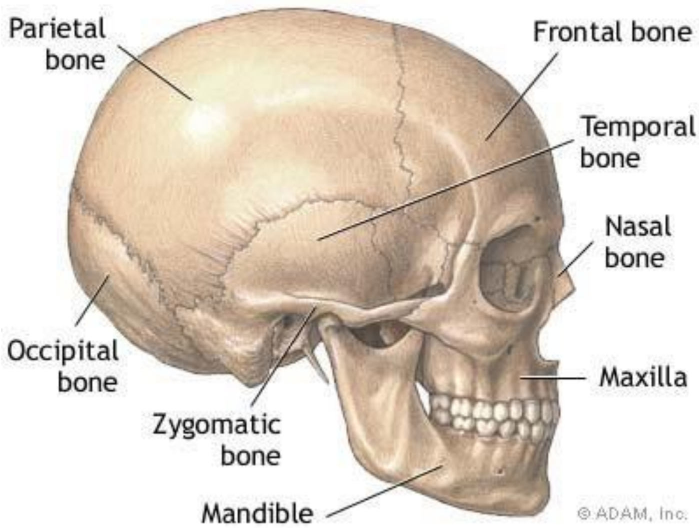
Cerebrospinal Fluid (CSF): CSF is a clear, water-like cushion that protects the brain and spinal cord from trauma. It is made up by plasma.

The cerebrospinal fluid (CSF) is contained in the brain ventricles and the cranial and spinal subarachnoid spaces. At a time approx. 150 ml CSF is present in an adult human, with 25 ml in the ventricles and 125 ml in subarachnoid spaces. Production & Absorption of CSF is continue process and in a day (24 hrs) 450-500 ml CSF, replaced.

Occlusive dressing: An occlusive dressing is an air and water tight dressing used in first aid. These dressings are generally made up with a waxy coating so as to provide a total seal.

The Skull

The skull is composed of 22 bones that are fused together except for the mandible. These 21 fused bones are separate in children to allow the skull and brain to grow, but get fused in adults to give added strength and protection. The mandible remains as a movable jaw bone and forms the only movable joint in the skull with the temporal bone.

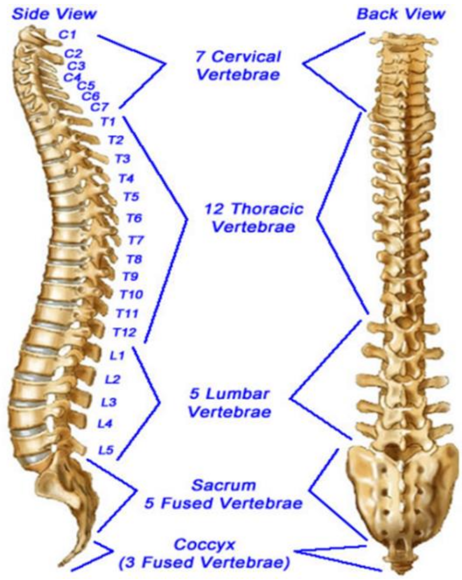


The bones of the superior portion of the skull are known as the cranium and protect the brain from damage. The bones of the inferior and anterior portion of the skull are known as facial bones and support the eyes, nose, and mouth.

Functions of the skull include protection of the brain, fixing the distance between the eyes to allow stereoscopic vision, and fixing the position of the ears to enable sound localization of the direction and distance of sounds. In some animals such as horned ungulates, the skull also has a defensive function by providing the mount (on the frontal bone) for the horns.

The Spinal Column

The spinal column houses and protects the spinal cord. The spinal column is the central supportive bony structure of the body. The spine (also called the vertebral column or spinal column) is composed of a series of bones called vertebrae stacked one upon another.



The spinal cord is a long, thin, tubular bundle of nervous tissue and support cells that extends from the medulla oblongata in the brainstem to the lumber region of the vertebral column.

The **Cervical Spine** is made up of seven cervical vertebrae. They are named by region:

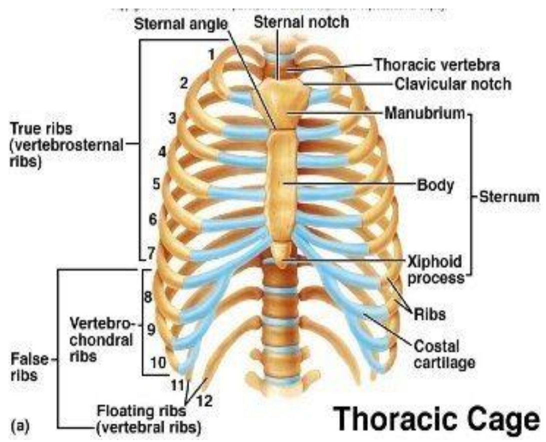
- **Cervical** (neck) - 7 vertebrae
- **Thoracic** (chest) - 12 vertebrae
- **Lumbar** (lower back) - 5 vertebrae
- **Sacrum** - 5 vertebra
- **Coccyx** (tailbone) - 4 vertebra

With the exception of the singular sacrum and coccyx, each vertebra is named for the first letter of its region and its position along the superior-inferior axis. For example, the most superior thoracic vertebra is called T1 and the most inferior is called T12. Between each pair of vertebrae is a disc of cartilage that acts as a shock absorber and allows movement. Muscle and ligaments attached to the vertebra stablise the spine and control the movement of the back. Inside the central canal the spinal cord passes which carries impulses from and to the brain.

The Chest

In the human body, the region between the neck and diaphragm in the front of the body is called the chest.

Bony structure: The chest or rib cage includes the ribs, the thoracic vertebrae and the sternum. The ribs are attached at the back to the vertebrae. All but the bottom two ribs are attached to the sternum.



Organs: The thoracic cavity contains the lungs, the heart and the major blood vessels (arteries and veins). Damage to the rib cage can cause injury to the vital organs.

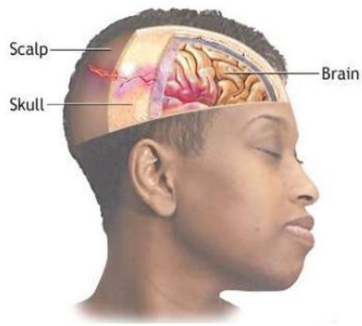
Ribs and Sternum: Sternum is a thin, knife-shaped bone located along the midline of the anterior side of the thoracic region of the skeleton. The sternum is connected to the ribs by thin bands of cartilage called the costal cartilage.

There are 12 pairs of ribs that together with the sternum form the ribcage of the thoracic region. The first seven ribs are known as **"true ribs"** because they connect the thoracic vertebrae directly to the sternum through their own band of coastal cartilage. Ribs 8, 9, and 10 are connected to the sternum through cartilage of the seventh rib so that we consider these to be **"false ribs."** Ribs 11 and 12 are also false ribs and also named as **"floating ribs"** because they do not have any cartilage attachment to the sternum at all.

Note: - The circumference of the normal adult human rib cage expands by 3 to 5 cms during inhalation.

Head injuries

A head injury is any sort of injury to your **brain, skull, or scalp**. Common head injuries include concussions, skull fractures, and scalp wounds. The consequences and treatments vary greatly, depending on what caused your head injury and how severe it is. Head injuries may be either closed or open.



A closed head injury is any injury that doesn't break your skull.

An open, or penetrating, head injury is one in which something breaks your skull and enters your brain.

It is not easy to assess how serious a head injury is just by looking. Some minor head injuries bleed a lot, while some major injuries don't bleed at all. **It's important to treat all head injuries seriously and get them assessed by a doctor.**

Causes: These can be caused by:

- Motor vehicle accidents
- Assaults through blunt force trauma
- Sporting accidents
- Accidents at home
- Industrial accident
- Exposure to solvents
- Exposure to drugs and alcohol

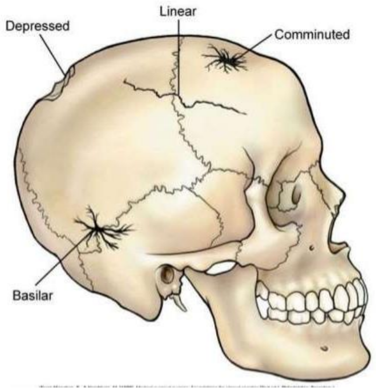
Skull Fracture

A skull fracture is a break in one or more of the eight bones that form the cranial portion of the skull, usually occurring as a result of blunt force trauma. If the force of the impact is excessive, the bone may fracture at or near the site of the impact and cause damage to the underlying physical structures contained within the skull such as the membranes, blood vessels and brain. An injury to the brain can also accompany the fracture, but that's not always the case.

Types of skull fractures

The type of skull fracture depends on the force of the blow, the location of the impact on the skull and the shape of the object making impact with the head. A pointier object is more likely to penetrate the skull than a hard, blunt surface, such as the ground. Different types of fractures lead to differing levels of injury and trauma.

Closed fracture: With a closed fracture, also called a simple fracture, the skin that covers the fracture area isn't broken or cut.



Open fracture: Also known as a compound fracture, an open fracture occurs when the skin is broken and the bone emerges.

Depressed fracture: This refers to a fracture that causes the skull to indent or extend into the brain cavity.

Basal fracture: A basal fracture occurs in the floor of the skull: the areas around the eyes, ears, nose, or at the top of the neck, near the spine.

Other types: In addition to the above types, fractures can also be classified as:

- **Linear** (in a straight line)
- **Comminuted** (broken into three or more sections)

Sign and Symptoms of skull fracture

- Altered mental status, ranging from confusion to unresponsiveness
- Pain or inflammation at the injury site
- Deep laceration or hematoma in the scalp or forehead
- Softness or depression of the skull
- Facial bruising
- Bruising behind the ears or "Battle's Sign"
- Bruising around the eyes, or "raccoon eyes"
- One or both eyes appear sunken

- Unequal pupil size
- Headache, disabling in severity or appearing suddenly
- Blood or cerebrospinal fluid leaking from the ears or nose
- Deterioration of vital signs
- Nausea and vomiting
- Abnormal posturing
- Seizure

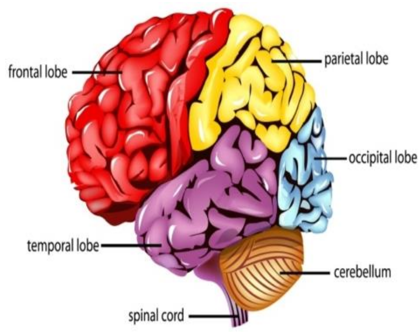
Pre hospital treatment of skull fracture

Use universal precautions and secure the scene.

- Perform initial assessment. Treat life-threatening conditions. If brain injury is suspected, hyperventilate patient at 25 rpm.
- Control bleeding. Do not try to stop the draining of blood or cerebrospinal fluid from the nose and ears.
- Suspect cervical injury or another type of injury to the spinal column. Manually immobilize head and neck neutral in-line position. Apply cervical immobilization device.
- Administer oxygen if needed.
- Cover and bandage open wounds.
- Position the patient properly and do not allow patient to move or change positions. If the patient is not hypotensive, consider elevating the head 30 degrees.
  Caution: Be alert for possible patient vomiting. Beware of cervical injuries.
- Assess level of consciousness. Monitor vital signs.

Brain injuries

The brain is enclosed in the bony vault of the skull. The cerebrospinal fluid surrounds the brain and, most of the time, protects it from impact with the skull. If there is a rapid force applied to the skull or rapid deceleration of the head, the brain may strike the inside of the bony vault. Brain tissue may stretch or tear because of the rapid movement. This can injure the nervous tissue of the brain directly. If a projectile such as a bullet enters the skull, it can directly injure the brain. Other causes of head injuries are chemical exposure and alcohol related damage.



Open/penetrating: An open brain injury is accompanied by a break in the skull, caused by a fracture or an impaled object. This usually implies exposure of the cranial cavity.

Closed: A closed brain injury does not involve a break in the skull although the skin may be broken; even if the brain can be seriously injured.

Signs and symptoms of brain injury

- Vomiting
- Sickness
- Weakness
- Vision problems
- Headache
- Unconsciousness or decreased level of consciousness
- Posture change (decorticates and decerebrate)
- Altered breathing

Pre-hospital treatment for brain injuries is the same as those indicated for skull fractures.

Facial fractures: The main danger of facial fractures is the possibility of bone fragments and blood causing airway obstruction. Always check for airway obstruction.

Signs and symptoms of facial fracture:

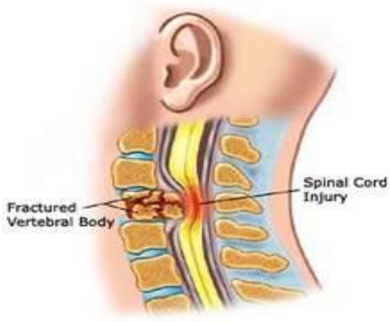
- Blood in the airway
- Facial deformities
- Colour change below the eyes
- Inflammation of the jaw or limited motion
- Teeth that do not meet normally
- Pain or numbness in the face
- Loose or broken teeth
- Swelling
- Any indication of a severe blow to the face (contusions or bruising)

Pre-hospital treatment for facial fractures:

Use universal precautions and secure the scene.

- Ensure open airway.
- Control bleeding.
- Bandage open wounds.
- Monitor vital signs.
- Treat for shock.

Spinal injury



Spinal injuries are caused by traumatic forces on the body. The spine is a set of vertebrae held together by a series of ligaments. The spinal cord passes through the Centre of the vertebrae, and its nerves transmit the signals to and from the brain that control muscle movement such as breathing, and monitor sensation such as temperature. The majority of spinal injuries involve the ligaments in the spine; this will cause pain but will not generally cause serious disability. More serious spinal injuries occur when the vertebrae shift, causing damage to the spinal cord. This can result in paralysis and, in severe cases, can cause death.

Some common causes of spinal injuries include:

- Motor vehicle crashes
- Diving accidents
- Head injuries
- Falls when the casualty lands on their feet or head
- Assaults
- Industrial accidents

Signs and symptoms of Spinal injury

- Numbness, tingling sensation in the arms or legs.
- Paralysis of the arms or legs.
- Pain during movement of the arms and legs.
- Sensitivity or pain along the later part of the neck or the back.
- Deformity of the head or neck.
- Head injury or hematomas in the shoulders, back or the patient's sides .
- Loss of bowel or bladder control.
- Difficulty breathing with little or no chest movement.
- The patient may be found supine with arms extended above the head (also known as posturing), which may indicate damage in the cervical region.
- Priapism (persistent erection of the penis).

Determining possible Spinal Injury:

Conscious Patient

- Ask what happened. Ask the patient how he/she is feeling. Ask the patient to move his/her hands or feet.
- Observe for hematomas, lacerations and deformities.
- Feel (palpate) for sensitive areas, deformities.

Signs of spinal injury may not be apparent. However, that does not rule out spinal injury.

Unconscious Patient

- Observe for cuts, hematomas, and deformities.
- Feel for deformities and injuries.
- Ask others: What happened and how?

Complications:

- Respiratory arrest. Caused by paralysis of the thoracic muscles. Breathing can be accomplished only by the diaphragm, and paralysis of the thoracic muscles can severely reduce or compromise breathing.
- Neurological injury can affect the diameter of the blood vessels, thereby producing shock (neurogenic shock).
- General paralysis.

Pre-hospital treatment for Spinal Injury

Use universal precautions and secure the scene.

- Determine the mechanism of injury.
- Provide manual in-line neutral stabilization of the head and neck upon first contact with the patient.
- Conduct initial assessment. Consider any unconscious patient a trauma victim with possible neck or spinal injury until proven otherwise.
- Administer oxygen if needed.
- Perform physical exam and provide treatment.
- Maintain manual stabilization until patient is completely immobilized.
- Continually monitor vital signs during transport.

Chest injuries

A chest injury can occur as the result of an accidental or deliberate penetration of a foreign object into the chest. This type of injury can also result from a blunt trauma leading to chest wall injury (causing rib bruises, fracture and lung or heart contusions).

Methods of injury

Blunt trauma – Usually results in closed injury; chest cavity is not penetrated. Can be associated with severe injury. A **compression injury** is a form of blunt trauma in which the chest is rapidly compressed.

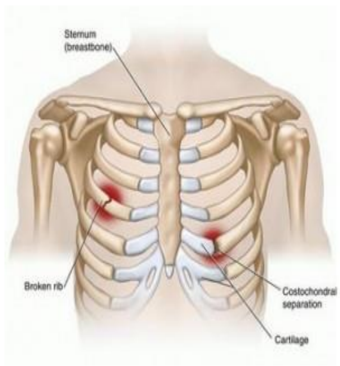
Penetrating injury – open injury; chest cavity is penetrated

Signs and symptoms of chest injury

- Tenderness/pain at the injury site
- Chest deformity, coughing blood
- Shallow breathing with possible crackling sensation near site
- Increased pain during breathing
- Patient's posture toward the side of the fracture or injury
- Extensive, visible bruising to the chest
- Grating (crepitus) upon palpation
- Subcutaneous emphysema
- Distended neck veins, bloodshot eyes, cyanotic tongue and lips, swollen upper torso.

Rib Fracture

A rib fracture is a crack or break in one of the bones of the rib cage. A break in the thick tissue (cartilage) that connects the ribs to the breastbone may also be called a fractured rib, even if the bone itself is not broken.



The most common cause of a fractured rib is a direct blow to the chest, often in a road accident or a fall. Coughing hard can also fracture a rib. This is more likely to happen if you have a disease that has made your bones weak, such as osteoporosis or cancer.

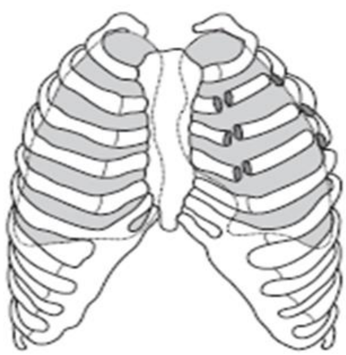
Pre-hospital treatment for Rib Fractures

Use universal precautions and secure the scene. Your first priority is to ensure patient can breathe adequately.

- Apply a sling and swathe to hold the patient's arm against the injured side of the chest. Give the patient a pillow or blanket to hold against the ribs for support.
- If alert, allow the patient to assume a comfortable position.

Flail Chest

Flail chest is a closed chest injury causing the chest wall to become unstable, due to multiple fractures of the sternum/ribs, cartilage connecting the ribs to the sternum or fractured ribs (the chest between the fractures becomes unstable).



Pre-hospital treatment for flail chest

Use universal precautions, secure scene and alert EMS.

- Locate the flailed section of the chest by carefully feeling the injured site.

- Stabilize flail chest by applying a pillow or bulky dressing. You can also use a small object as a weight (less than 2 kg.)
- Use adhesive tape to secure the bulky dressing. If no tape is available, use your hand to secure the injured site.

Penetrating Wounds

Penetrating chest injuries are open chest wounds in which the chest wall is torn, typically by a foreign object. Look for possible exit wound (perforating injury).

Sucking Chest Wound

A 'Sucking Chest Wound' occurs when the chest wall is punctured by a penetrating object. Air is then sucked into the chest cavity (Pneumothorax), which may cause the lung to collapse. If air continues to enter the chest space faster than I can escape, then the rising pressure can force to collapse the lungs.

Treating a sucking chest wound requires two things:

- Stop air going inside.
- Let the air come to out.

It can be difficult to identify when a penetrating wound to the chest is sucking air or not, so it's best to assume any penetrating wound to the chest is a sucking chest wound.

Note: A sucking chest wound is a life threatening critical incident and requires immediate medical attention.

Signs and Symptoms of Sucking Chest Wound

- Obvious trauma to chest (gun shot or stabbing)
- Pink frothy blood oozing out
- Difficulty breathing
- Unequal chest (one side looks different to the other)
- Veins on the neck bulging (jugular vein distension)
- Blue lips, neck or fingers (cyanosis)
- No lung sounds on one side
- Severe shortness of breath

Pre-Hospital Treatment of Sucking Chest Wound

Use universal precautions, secure scene and alert EMS.

- If an object is present, leave the penetrating object in the chest, do not remove it.
- Cover it with an occlusive dressing (one that doesn't allow air to pass through it). Tape to hold it in place along 3 sides leaving the bottom open.

- Position patient in the recovery position with the injured side towards the ground so that the wound drains and does not build up.
- Carry out secondary assessment
- Do not give the victim anything to eat or drink, including water
- Keep patient warm, rest and reassure

Impaled Objects

Injuries to the chest may occur due to impaled object. Impaled object must be stabilized as soon as possible to minimize further injury to internal structure. If it is removed, the patient may bleed profusely. It should be stabilized with bulky dressing and adhesive tape to secure the dressing in place.

Pre Hospital treatment of Impaled Object

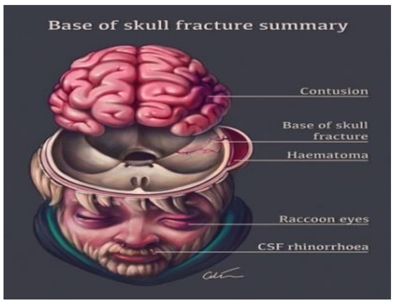
Use universal precautions, secure scene and alert EMS.

- Take appropriate BSI precautions.
- Performing a primary assessment and ensure CAB are intact.
- Immediately stabilize the object. It should be stabilized with bulky dressing and adhesive tape to secure the dressing.
- Provide high-flow oxygen as per local protocol.
- Treat for shock.
- Transport the victim.

Injuries to the Heart and Lungs

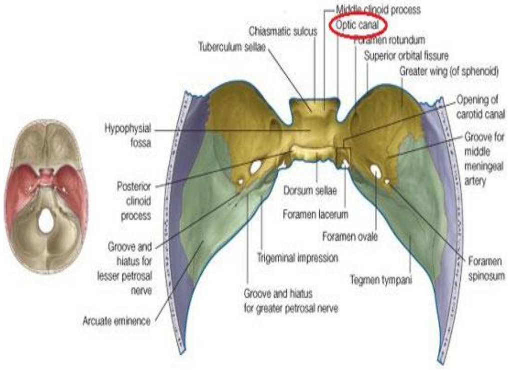
- A collapsed lung may be caused by air escaping to lung due to injury or by blood accumulation in the chest cavity. (Haemothorax)
- The blood in the cavity of the pericardium (the membrane that encloses the heart) can cause the heart to collapse.

Raccoon Eyes: Raccoon eyes are a condition that refers to bruises around both eyes. These bruises look like the dark patches around the eyes that are characteristic of raccoons. Raccoon eye is a signal of serious skull or brain injury. Prompt diagnosis is crucial to reduce the risk of complications.



Causes of raccoon eyes: Raccoon eyes are most often caused by a basal skull fracture (BSF). The basal part of your skull is the bottom portion where the brain rests. When a fracture occurs, symptoms such as raccoon eyes may follow. BSF can occur from car accidents, falls, sports injuries, and other sources of head trauma.

Another possible cause of raccoon eyes is the breaking of the thin bones that surround your eyes. This can result from facial injuries. A broken nose or broken cheekbones are other possible causes. It's important to note that raccoon eyes may not develop immediately after an injury. If head or facial swelling remains within a couple of days, then raccoon eyes may soon follow.



Battle Sign: In medical terminology, Battle's sign also called as mastoid ecchymosis, is an indication of fracture of middle cranial fossa of the skull, and may suggest underlying brain trauma. Battle's sign consists of bruising over the mastoid process, as a result of extravasation of blood along the path of the posterior auricular artery. The sign is named after William Henry Battle.

Note well that this sign will take at least one day to appear after the initial traumatic basilar skull fracture, similar to Raccoon eyes. Battle's sign is usually seen after head injuries resulting in injury to mastoid process leading to bruising.

Battle's sign may be confused with a spreading hematoma from a fracture of the mandibular condyle, which is a less serious injury.

Causes of Battle's Sign: Battle's sign is primarily caused by a type of serious head injury called a basilar skull fracture or basal fracture. This type of fracture occurs at the base of your skull. Fractures to the base of your skull can occur behind your ears or nasal cavity, as well as near part of your spine. Skull fractures often occur as the result of a serious injury, fall, or accident.

Summary

The Skull

The skull is a bony structure that forms the head in most vertebrates. It supports the structures of the face and provides a protective cavity for the brain.

The Spinal Column

The spinal column houses and protects the spinal cord. The spinal column is the central supportive bony structure of the body.

The **Cervical Spine** is made up of seven cervical vertebrae. They are named by region:

- **Cervical** (neck) - 7 vertebrae
- **Thoracic** (chest) - 12 vertebrae
- **Lumbar** (lower back) - 5 vertebrae
- **Sacrum** - 5 vertebra
- **Coccyx** (tailbone) - 4 vertebra

Head injuries

A head injury is any sort of injury to your **brain, skull, or scalp**.

Skull Fracture

A skull fracture is a break in one or more of the eight bones that form the cranial portion of the skull, usually occurring as a result of blunt force trauma.

Brain injuries

The brain is enclosed in the bony vault of the skull. If there is a rapid force applied to the skull or rapid deceleration of the head, the brain may strike the inside of the bony vault. Brain tissue may stretch or tear because of the rapid movement. This can injure the nervous tissue of the brain directly. Other causes of head injuries are chemical exposure and alcohol related damage.

Facial fractures: The main danger of facial fractures is the possibility of bone fragments and blood causing airway obstruction. Always check for airway obstruction.

Spinal injury

Spinal injuries are caused by traumatic forces on the body. The spine is a set of vertebrae held together by a series of ligaments. The majority of spinal injuries involve the ligaments in the spine.

Chest injuries

A chest injury can occur as the result of an accidental or deliberate penetration of a foreign object into the chest. This type of injury can also result from a blunt trauma, leading to chest wall injury (causing rib bruises, fracture, and lung or heart contusions).

Rib Fracture

A rib fracture is a crack or break in one of the bones of the rib cage. A break in the thick tissue (cartilage) that connects the ribs to the breastbone may also be called a fractured rib, even if the bone itself is not broken.

Flail Chest

Flail chest is a closed chest injury causing the chest wall to become unstable, due to multiple fractures of the sternum/ribs, cartilage connecting the ribs to the sternum or fractured ribs (the chest between the fractures becomes unstable).

Penetrating Wounds

Penetrating chest injuries are open chest wounds in which the chest wall is torn, typically by a foreign object. Look for possible exit wound (perforating injury).

Sucking Chest Wound

A 'Sucking Chest Wound' occurs when the chest wall is punctured by a penetrating object. Air is then sucked into the chest cavity (Pneumothorax), which may cause the lung to collapse.

Treating a sucking chest wound requires two things:

- Keeping air from going in
- Letting extra air out.

Impaled Objects

Injuries to the chest may result in an object becoming impaled in the chest. Impaled object must be stabilized as soon as possible to minimize further injury to internal structure.

Raccoon Eyes: Raccoon eyes are a condition that refers to bruises around both eyes. These bruises look like the dark patches around the eyes that are characteristic of raccoons. Raccoon eyes signal a serious condition related to a skull or brain injury.

Battle Sign: The sign is named after William Henry Battle.

Causes of Battle's Sign: Battle's sign is primarily caused by a type of serious head injury called a basilar skull fracture or basal fracture. This type of fracture occurs at the base of your skull. Fractures to the base of your skull can occur behind your ears or nasal cavity, as well as near part of your spine. Skull fractures often occur as the result of a serious injury, fall, or accident.

Self- Assessment

Objective Questions

1. Which is NOT a part of the axial skeleton?
   a. Vertebrae
   b. Shoulder girdle
   c. Rib cage
   d. Skull

2. What must be open for an open head injury to exist?
   a. Scalp
   b. Skin
   c. Cranium
   d. Dura

3. How many bones are in what is commonly called the spine?
   a. Twelve
   b. Six
   c. Nine
   d. Seven

4. Where should you place yourself when manually stabilizing a patient's head and neck?
   a. At the patient's feet
   b. Top of the patient's head
   c. Side of the patient's head
   d. Across the patient's chest

5. What should you treat any injury caused by a strong force to the extremities?
   a. Sprain
   b. Dislocation
   c. Strain
   d. Fracture

6. Which of the following should NOT be done when treating for a cranium injury?
   a. Control bleeding
   b. Use the jaw-thrust maneuver
   c. Stop the flow of CSF from the ears
   d. Provide with 100% oxygen

7. Which of the following is NOT a sign of an open head injury?
   a. Clear or yellow fluid leaking from the nose
   b. Feel a crack in the skull
   c. Bleeding from the scalp
   d. Eyelids are swollen and shut

8. What type of injury is seen when the breastbone breaks away from the ribs?
   a. Flail chest
   b. Dislocation
   c. Sucking wound
   d. Pneumothorax
9. Which is a late sign of a head injury?
   a. CSF leakage
   b. Battle's sign
   c. Raccoon eyes
   d. Goose eggs
10. Where will the injury site most often be when the patient is suffering from a flail chest?
    a. Front of the chest
    b. Side of the chest
    c. Back of the chest
    d. Bottom of the chest

Descriptive Question

1. Write down the sign, symptoms and PHT of head/skull injury.
2. What are spinal injuries and write its PHT?
3. Write down the sign, symptoms and PHT of chest injury.
4. What is Flail Chest and write its PHT?
5. Write down the short notes.
   - Battle sign.
   - Impaled Objects.
   - Sucking Chest Wound.
   - Penetrating Wounds.

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- https://en.wikipedia.org/wiki/
- www.healthline.com/health/skull-fracture
- https://www.nlm.nih.gov/medlineplus/ency/article/000028.htm
- https://www.nlm.nih.gov/medlineplus/ency/article/000060.htm
- https://en.wikipedia.org/wiki/Thorax
- www.innerbody.com › Anatomy

LESSON NO. 12

Burns and Environmental Emergencies

Introduction

A burn is a type of injury to skin, or other tissues, caused by heat, cold, electricity, chemicals, friction or radiation. Most burns are due to heat from hot liquids, solids, or fire. Burns can injure the skin, muscles, blood vessels, nerves and bones. The eyes, ears and the respiratory system can also be affected. Apart from the physical damage, the victim suffers psychologically and emotionally.

Medical first responders should consider burns to be complex soft-tissue injuries that can range from a superficial burn to the skin's surface that involves nerves, blood vessels, muscles, and bones.

Outcome

Upon completion of this lesson, you will be able to:

- Identify signs and symptoms for types of burns according to their depth.
- Apply "Rule of Nines" to determine the Total Body Surface area (TBSA) burnt on a patient when given a specific part of the body.
- Steps for pre-hospital treatment of chemical burns.
- Steps for pre-hospital treatment of electrical burns.
- Signs and symptoms of heat cramps, heat exhaustion and heat stroke and describe pre-hospital treatment for each.
- Signs and symptoms of both mild and severe hypothermia and list six steps for pre-hospital treatment.
- Signs and symptoms of frostbite and three steps for pre-hospital treatment.

Terminology

Rule of Nines: - The rule of nines assesses the percentage of burn. You can estimate the body surface area on an adult that has been burned by using multiples of 9.

Radiation burn: - A radiation burn is damage to the skin or other biological tissue/tissues. Burn due to radiation is a major concern because it can happen through thermal radiation, radio frequency energy, ultraviolet light and ionizing radiation. The most common type of radiation burn is a sun burn caused by UV radiation.

JELONET: - JELONET is a paraffin gauze dressing. JELONET is soothing and low-adherent and allows the wound to drain freely into an absorbent secondary dressing and is used after thermal burn.

BURNS

Definition: Burns are injuries to the skin and underlying tissue that result from exposure to excessive heat from Thermal, Chemical, Electrical or Radiation.

Burns can injure the skin, muscles, blood vessels, nerves and bones. The eyes, ears and the respiratory system can also be affected. Apart from the physical damage, the victim suffers psychologically and emotionally.

Causes of Burns:

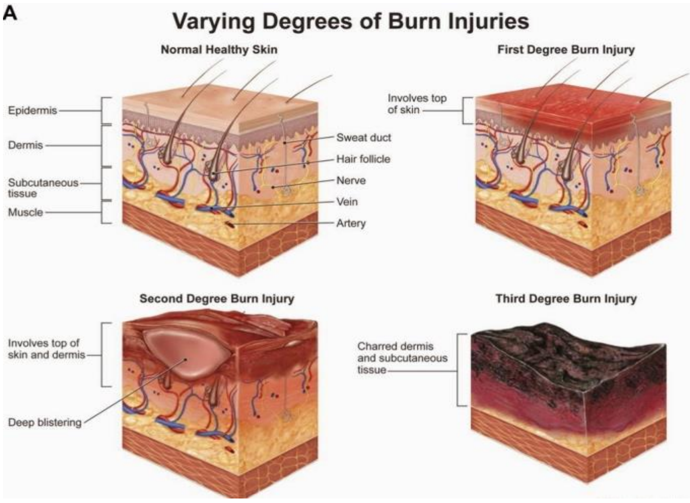
- Thermal
- Chemical
- Cold
- Electrical
- Radiation.

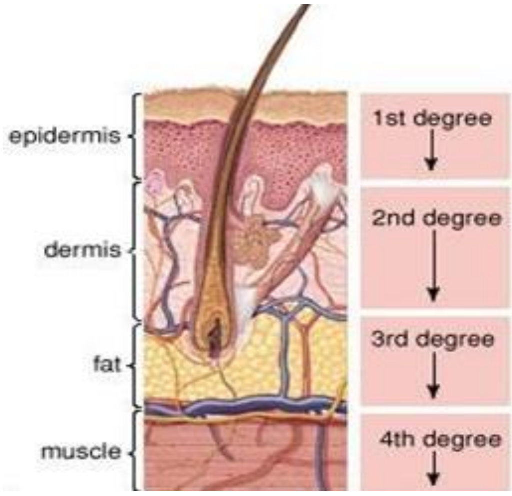
Classification of burns based on source: -

- **Heat (Thermal/Dry) burns**, which may be caused by fire, vapour and hot objects
- **Scald burns:** which may be caused by hot liquids or steam (Ex. Tea, coffee, hot fat)
- **Chemical burns**, which may be caused by caustics, such as acids and alkalis and as chemicals may remain on the skin and continue burning for extended period and/or enter the bloodstream.
- **Electrical burns**, which originate from electricity i.e. house current, outlets, frayed wires and faulty circuits and can cause small surface injury while causing severe internal organs damage.
- **Lightning burns**, which occur during electrical storms

- **Light burns** which occur with intense light, light from the arc of welder or industrial laser can damage unprotected eye.
- **Sun burns:** Which can be caused by intensive exposure to sun light or over exposure to ultraviolet light.
- **Cold/Frost Bite Burns:** Freezing and frozen
- **Radiation burns**, which usually result from radioactive sources.

Classification, Signs & Symptoms of Burns:





Classification by Depth

1st Degree: Superficial – These involve only top layer of skin (epidermis). There is a reddening of the skin and some pain & swelling of the area.

2nd Degree: Partial thickness – the superficial layer of skin is burned through and second layer is damaged. This type of burn is painful.

3rd Degree: Full thickness – all layer of skin is damaged or burned.

4th Degree: Extends through entire skin, and into underlying fat, muscle and bone.

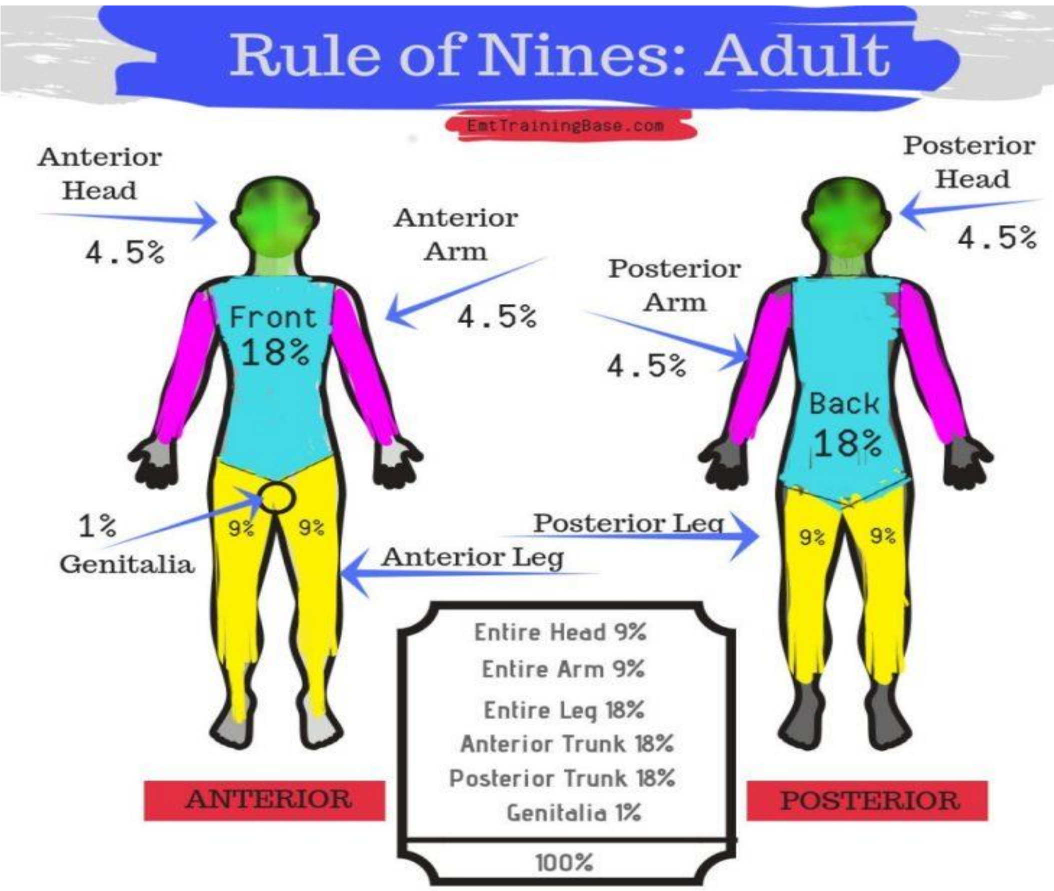
Classification of Burn: Comparison			
Classification	**Affected skin layers**	**Sign & symptoms**	**Recovery/Filling time**
Superficial burn (1ST Degree)	Epidermis (Top layer of skin)	Painful, Redness of skin, swelling.	02 to 05 days
Partial thickness Burn (2ND Degree)	Epidermis and Dermis	Swollen and Painful, Deep Red or white or splotchy skin, Blisters, skin damaged.	05 to 20 days
Full Thickness Burn (3RD Degree)	Epidermis, Dermis and Hypodermis or Subcutaneous tissue, Fatty muscles.	Burned areas may be dry, hard, brown or pale or white or charred. No sensation.	Not fix/ No limit
Full Thickness Burn (4TH Degree)	Epidermis, Dermis, Hypodermis or Subcutaneous tissue, Muscles, Blood Vessels, bones.	No pain, Skin may feel hard to the touch. **There is no sensation in the area since the nerve endings are destroyed.**	Not fix/ No limit

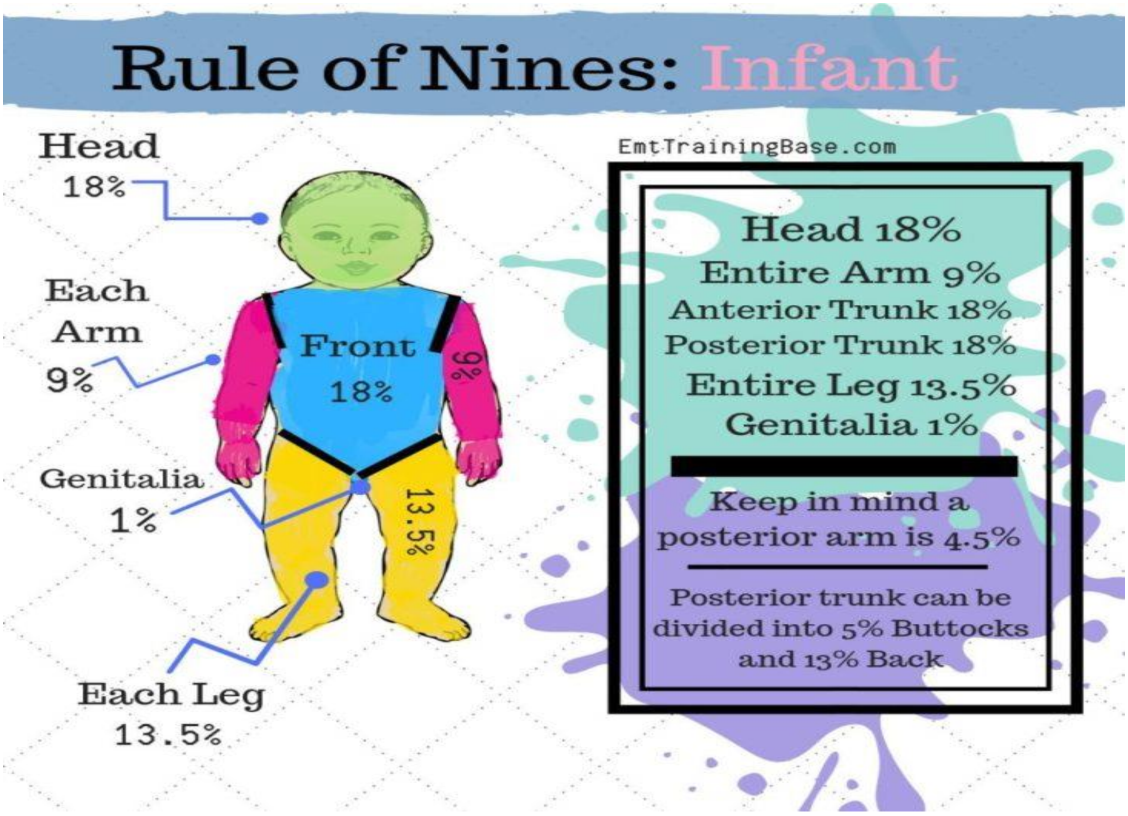
Note: As a MFR it is enough to know that there are **three types of burn, 1st degree, 2nd degree and 3rd degree** because a MFR cannot differentiate between 3rd degree and 4th degree burn.

Extent of Body Surface Burned:

The **Rule of Nines** is a standardized way of estimating the amount of Body Surface Area (BSA) burned: The body is divided into regions for estimating body surface areas as follows.

Body Parts	Adult	Child
Head and Neck	09%	18%
Upper extremities	09% (each)	09% (each)
Anterior trunk	18%	18%
Posterior trunk	18%	18%
Genital	01% (Incl. in ant. trunk)	
Lower extremities	18% (each)	14% (each)
TOTAL	**100%**	**100%**





Total Body Surface Area (TBSA):

Total body surface area (TBSA) is an assessment of injury to or disease of the skin, such as burns. In adults, the rule of nines can be used to determine the total percentage of area burned for each major section of the body.

$$BSA\ (m^2) = \sqrt{\frac{Ht\ (Cm) \times Wt\ (kg)}{3600}}$$

Burn Severity:

The two primary factors considered in rating burn severity are Body Surface Area **(BSA)** and location. Apart from these two it also depends upon depth and complicating factor such as age, illness. Burn severity can be rated as follows:

Minor burn

- ✓ Full-thickness burns of less than 2% BSA, excluding face, hands, feet, genitalia, or respiratory tract.
- ✓ Partial thickness burns of less than 15% BSA.
- ✓ Superficial burns of 50% BSA or less.

Moderate burns

- ✓ Full thickness burns of 2% to 10% BSA, excluding face, hands, feet, genitalia, or respiratory tract.
- ✓ Partial thickness burns of 15% to 30% BSA.
- ✓ Superficial burns over 50% BSA.

Critical/Major burns

- ✓ All burns complicated by injuries of the respiratory tract, other soft-tissue injuries, and injuries of the bones.
- ✓ Partial or full thickness burns involving the face, hands, feet, genitalia, or respiratory tract.
- ✓ Full thickness burns of more than 10% BSA.
- ✓ Partial-thickness burns of more than 30% BSA.
- ✓ Burns complicated by musculoskeletal injuries.
- ✓ Circumferential burns.

Additional consideration:

- ✓ **Source of burn**
  - – Electrical burn
  - – Chemical burn
  - – Radiation burn
- ✓ **Body regions burned**
  - – Face
  - – Hands and feet
  - – Groin, genitalia, buttocks and inner thighs
  - – Burn around joints
- ✓ **Other complicating factors:** - Age, Illness.

	MINOR	MODERATE	MAJOR
CHILDREN			
partial thickness burn	<10% BSA	10-20% BSA	>20%BSA
Full thickness burn	**<2% BSA**	**2-10%BSA**	**>10%BSA**
ADULTS			
partial thickness burn	**<15%BSA**	**15-25%BSA**	**>25%BSA**
Full thickness burn	<2%BSA	2-10%BSA	>10%BSA
AGE		***Patients <2yrs with minor injury***	***Patients <10yrs with major injury***
INVOLVEMENT OF HANDS, FACE, FEET, PERINEUM	(-)	(-)	Moderate injury involvement
ELECTRICAL INJURY	***(-)***	***(-)***	***(+)***
CHEMICAL INJURY	(-)	(-)	(+)
Inhalational Injury	***Not suspected***	***Not suspected***	***(+)***
Major Associated medical Illness	(-)	(-)	(+)
Associated fractures, multiple trauma	***(-)***	***(-)***	***(+)***

Note: - Burns which by the above classification are moderate, should be considered critical in a patient less than 5 or more than 55 years of age.

Pre-Hospital Treatment for burns

Use universal precautions, secure the scene and alert EMS.

- Stop the burning process. Run cold water over the Scald burns. Flush away chemicals with water for 20 minutes or more.

- Remove any smouldering clothing and jewellery. If you meet resistance or if you see pieces melted into the skin, cut around the area. Do not try to remove them.
- Perform initial assessment.
- Administer oxygen. If your patient's breathing is inadequate, provide ventilation with supplemental oxygen.
- Determine the severity of burns, using the rule of nines.
- Cover the burns. Use dry sterile dressings or a disposable sterile burn sheet. Do not use grease or fat, ointment, lotion, antiseptic, or ice on the burns. Do not break any blisters. If a burn involves the eye, be sure to cover both eyes. Fingers with second- or third-degree burns require dressing each finger individually.
- Keep the patient warm and treat for shock.

Chemical burn: Caused by any strong acid or base that comes in direct contact with the skin or any other tissues.

The severity is directly related to:

- Amount of time the chemical was in contact with the skin.
- Concentration of chemical agent.

Pre-Hospital Treatment for Chemical burns:

Caution: If patient is contaminated, wash off the person from a distance to avoid exposing yourself to the chemicals.

Use universal precautions, secure the scene and alert EMS.

1) Brush off dry chemicals, such as lime powder, before flushing with water.
2) Rinse the area with water for at least 20 minutes or more. Remove and set aside clothes and Jewellery while the patient is being washed off.
3) Apply a sterile dressing to the affected area
4) Treat for shock.

Pre-hospital treatment for Chemical burns to the eyes:

Rinse the eyes immediately with water for at least 20 minutes. Maintain a flow of water on the affected eye from a faucet (low pressure), bottle, glass or other source. Keep the patient's eyelid(s) open.

Electric burn:

- Occurs when the electrical energy is converted into thermal energy.
- Causes minimal destruction to skin
- The extent of damage depends upon the resistance exerted by the deeper tissue.

- Burn injury occurs when electrical voltage is > 1000 V.
- Children can get injury after exposure to 200-1000 V.

Pre-Hospital Treatment for Electrical burns:

The more serious problems related to electrical burns are respiratory and/or cardiac arrest, damage to the nervous system and injury to internal organs. Use universal precautions, secure the scene and alert EMS. **Prolonged CPR should be performed on electrical injury victims as they can remain viable for a longer period than with other types of injuries.**

Care for electrical burns the same as any other type of burn, also using the following specific guidelines for electrical burns.

- Perform initial assessment. The electrical current passing through the body often causes cardiac arrest. Partial airway obstruction can also be present due to inflammation of airway tissues. Be prepared to resuscitate.
- Evaluate burns and look for at least two burn areas: one will be in the place where the patient made contact with the energy source (often the hand). The other will be where the patient made contact to ground, where the electricity exited the body (often a foot or a hand).
- Apply a dry, sterile dressing to the burns.
- Treat for shock

Inhalation Injury

This type of injury occurs when a patient inhales super-heated air, smoke and/or toxic products. Symptoms for these injuries may appear mild initially, and then become more severe.

Signs and symptoms of inhalation injury

- Singed nasal hair
- Burns to the face
- Specks of soot in the sputum
- Sooty or smoky smell on the breath.
- Respiratory distress
- Hoarseness, cough, or difficulty speaking
- Restricted chest movement
- Cyanosis

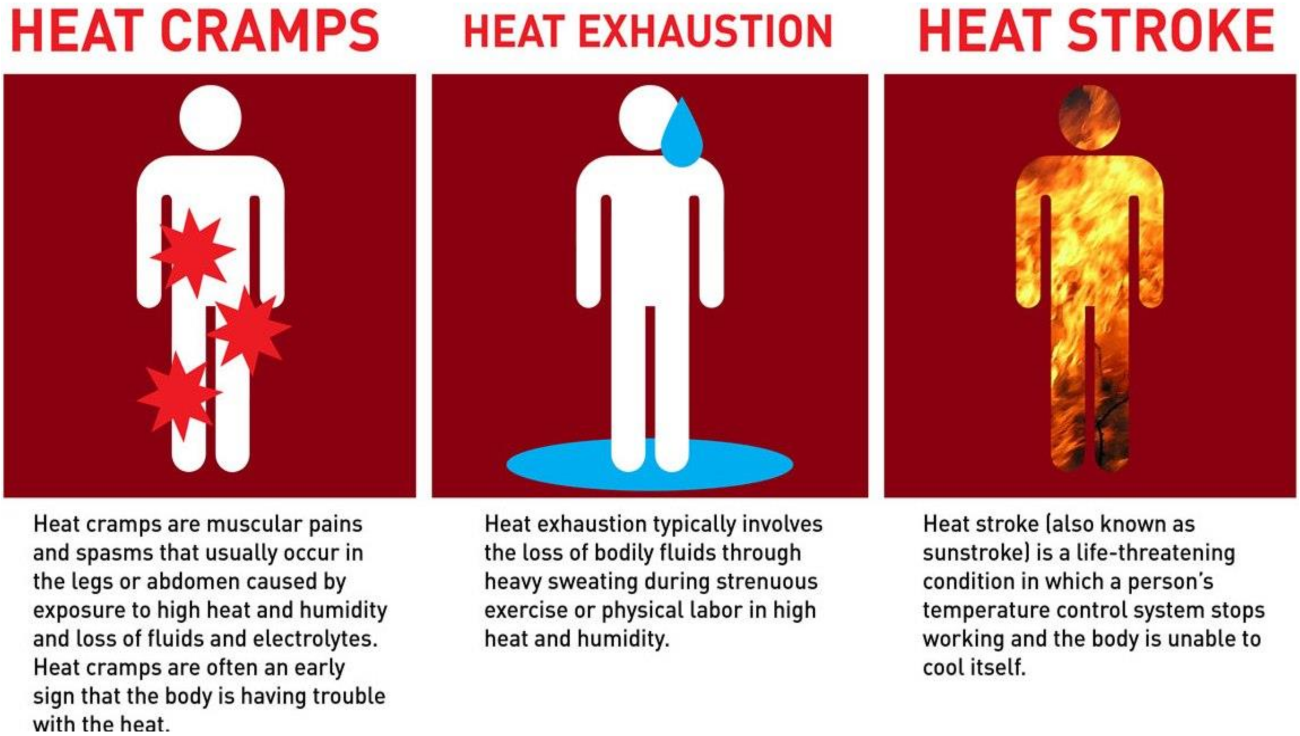
Pre-Hospital Treatment for inhalation injury

- Administer oxygen if needed.
- Monitor patient‘s airway and breathing.
- Be prepared to ventilate.

Environmental Emergencies

Heat Exposure: The exposure to excessive heat can produce serious health conditions. There are three common emergencies brought about by exposure to excessive heat:

- Heat cramps
- Heat exhaustion
- Heat stroke



Heat Cramps: Heat cramps consist of pains and muscle spasms that occur when the body loses a large quantity of **salt** through excessive sweating.

Signs and symptoms of Heat cramps

- Severe muscle cramps, usually in the legs and abdomen.
- Exhaustion
- Nausea
- Periods of fainting
- Normal to pale skin colour
- Weak pulse and rapid, shallow breathing.

Pre-Hospital Treatment for Heat cramps

- Move the patient to a cool area.
- Loosen or remove clothing. Don't chill. Watch for shivering.
- Give water to the responsive patient.

- Apply moist towels over cramped muscles or, if the patient has no history of circulatory problems, apply gentle but firm pressure on the cramped muscle.
- The muscle cramp should be alleviated after drinking water.

Note: The patient needs the water more than the salt; do not delay giving water to look for salt. Commercial electrolytes or Oral Rehydration Solution (ORS) can also be used.

condition exerts himself or herself during physical activity in a very hot environment, causing blood flow to be affected.

Signs and symptoms of Heat exhaustion

- Rapid, shallow breathing
- Weak pulse
- Cold, clammy, pale skin and mucous membranes, with a lot of sweating
- Weakness
- Dizziness, sometimes leading to fainting

Pre-Hospital Treatment for Heat exhaustion:

- Move the patient to a cool place to rest.
- Remove or loosen clothing as necessary to cool the patient without causing chills
- Place the patient in a supine position with legs elevated 20 to 30 cm.
- Administer oxygen per local protocol.
- Give water, but not to an unconscious patient.

Heat Stroke: Heat stroke is a very serious life-threatening condition. The body becomes overheated and, in many cases, the patient stops sweating. If left untreated, brain cells will begin to die.

Signs and symptoms

- Deep, rapid breathing
- Rapid, strong pulse followed by a rapid, weak pulse
- Dry, hot skin, sometimes red
- Dilated pupils
- Loss of consciousness
- Convulsions or muscular tremors

Pre-Hospital Treatment for Heat stroke

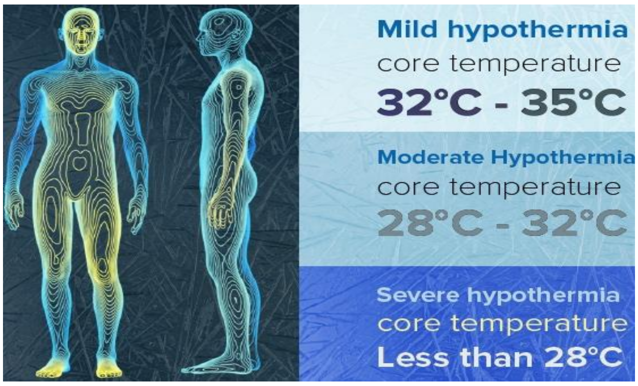
Use universal precautions, secure the safety, and alert EMS.

- Cool the patient quickly in any way possible. Move the patient far from the source of heat. Remove his or her garments and wrap the patient with wet sheets. Pour cold water on the sheets. This should normalize the patient‘s core temperature and help prevent brain cells from dying.

- Place cold bags or ice packs below each armpit, behind the knees and around the ankles, and one on each side of the neck.
- Look for a large container or bathtub and submerge the patient in cold water up to the neck. Use ice to cool the water.
- Continue to monitor vital sign.
- Provide oxygen at 15 litre per minute via NRB mask if allowed.

Cold Emergencies: Exposure to excessive cold can cause two kinds of emergencies:

1. Hypothermia
2. Frostbite or local cold injuries



Hypothermia: When cooling affects the entire body, this causes a condition known as Hypothermia, or generalized cooling. Hypothermia can develop in temperatures well above freezing.

Signs and symptoms of Mild Hypothermia

- Chills
- Drowsiness
- Rapid breathing, slow pulse
- Loss of vision
- Sluggish pupils
- Uncontrollable shivering

Signs and symptoms of Severe Hypothermia

- Extremely slow breathing rate
- Extremely slow pulse rate
- Unresponsiveness
- Fixed and dilated pupils
- Rigid extremities
- Absence of shivering

Pre-Hospital Treatment for Hypothermia: Handle patient very gently and offer comfort and reassurance.

Use universal precautions, secure the scene and alert EMS.

- Conduct initial assessment and physical exam.
- Remove the patient from the cold environment.
- Maintain open airway and administer Oxygen if needed.
- Remove any wet clothing and cover patient with a blanket. Keep the patient dry.

- If the patient is alert, offer warm liquids (non-stimulant) slowly.
- Constantly assess vital signs.

Frostbite	First degree	Second degree	Third degree	Fourth degree
Image				
Layers involved	• Epidermis	• Epidermis • Dermis	• Hypodermis	• Skin, muscles, tendons, and bones
Signs and symptoms	Erythema and edema	Hard edema and clear blisters	Hemorrhagic bullae, pale grey extremity	Insensate, black/grey
Rewarming	Minimal pain with rewarming	Mild to moderate pain with rewarming	Severe pain with rewarming	Painless during rewarming

Frostbite or Local cold injuries: This type of injury consists of the freezing or near-freezing of a Body part. Usually the Toes, Fingers, Face, Nose, and Ears are at most risk. Onset is slow.

Signs and symptoms Frostbite or Local Cold Injuries

- Loss of sensation to the affected area.
- Affected area of skin becomes white and waxen. Dark skin will turn pale. This color change can be very quick
- Sometimes the area becomes swollen, blistered, and white.
- Never rub or massage the affected area of a local cold injury. Ice crystals under the skin could damage the fragile capillaries and tissues, making the injury worse.

Pre-Hospital Treatment for Frostbite/Local Cold Injuries

If you suspect hypothermia, treat that condition before treating for frostbite (life before limb).
Use universal precautions, secure the scene and alert EMS.

- Remove the patient from the cold environment.
- Do not allow the patient to walk on a frozen limb.
- Protect the frozen area from further injury and re-freezing. For an injured extremity, stabilize.

- Dry the affected area and apply a clean bandage. Place dressings between the fingers if they are affected. If superficial, cover and keep warm. If deep, apply dry, sterile dressings. If transport will be delayed, consider re-warming the affected area.

Difference between Hypothermia and Frostbite	
Hypothermia is when the body core temperature cools below 96° F.	Frostbite occurs when cells or the area between cells form ice crystals and freeze.

Late or Deep-Cold Injury: Later stages of frostbite are referred to as late or deep-cold injury. In this condition, the skin may appear to be waxy and may be firm to the touch. As freezing continues, it becomes mottled and blotchy. Finally, the area becomes swollen, blistered and white. This type of injury can appear similar to partial thickness (second-degree) burns.

Signs and symptoms of Late or Deep-Cold Injury:

- Blotches in the skin (spotted). White colour appears first, then greyish yellow and finally greyish blue.
- The surface of the skin will feel frozen in the affected area and the layers of skin below the surface will feel hard to the touch.

Pre-Hospital Treatment for Late or Deep-Cold Injury

Use universal precautions, secure the scene, and alert EMS. Administer the same treatment as for frostbite; however, never re-warm an area with Deep-Cold Injury. Follow local protocol.

Unit Summary

Burn- Injury caused by exposure to excessive heat from Thermal, Chemical, Electrical or Radiation.

Causes of Burns

1) Thermal
2) Cold
3) Chemical
4) Electrical
5) Radiation

Classification of Burns

1) Superficial (first degree) burns
2) Partial thickness (second degree burn)
3) Full thickness (third degree burn)

Burn Severity

1) Minor burns
2) Moderate burns
3) Critical burns

Environmental Emergencies

Heat Exposure: The exposure to excessive heat can produce serious health condition. There are three common emergencies brought about by exposure to excessive heat:

1) Heat Cramp
2) Heat Exhaustion
3) Heat Stroke

Heat Cramps: Heat cramps consist of pains and muscle spasms that occur when the body loses a large quantity of salt through excessive sweating.

Heat Exhaustion: Heat exhaustion can occur when a person in poor physical condition exerts himself or herself during physical activity in a very hot environment, causing blood flow to be affected.

Heat Stroke: Heat stroke is a very serious life-threatening condition. The body becomes overheated and, in many cases, the patient stops sweating. If left untreated, brain cells will begin to die.

Cold Emergencies: Exposure to excessive cold can cause two kinds of emergencies:

1) Hypothermia
2) Frostbite or local cold injuries

Hypothermia: When cooling affects the entire body, this causes a condition known as Hypothermia, or generalized cooling. Hypothermia can develop in temperatures well above freezing.

Frostbite or Local cold injuries: This type of injury consists of the freezing or near-freezing of a Body part. Usually the Toes, Fingers, Face, Nose, and Ears are at most risk. Onset is slow, but can occur quickly under high-wind conditions.

Self-Assessment

Objective Questions

1. What are the two primary factors that should be considered while rating the burn severity?
    a. Body surface area & location
    b. Source & time
    c. Thickness and method
    d. Severity and process
2. You are on a scene where a Victim is scorched by fire. After preliminary assessment you find that the Victim's right-hand skin is burnt and dark red as well as blisters are visible. What problem will you identify by this situation of patient?
    a. 1^{ST} Degree burn
    b. 3^{rd} Degree burn
    c. 2^{nd} Degree burn
    d. None of these
3. Which degree of burn is not painful due to nerve destruction?
    a. 1^{ST}
    b. 3^{RD}
    c. 4^{TH}
    d. 2^{ND}
4. What is more serious?
    a. Heat Exhaustion
    b. Heat Cramps
    c. Heat Stroke
    d. Heat Rash
5. ___________ generally, involves intense pain, white to red skin that is moist and mottled, and blisters affecting the top two layers of skin.
    a. Superficial burns
    b. Partial thickness burns
    c. Neither a nor b
    d. Third degree burns

Descriptive Questions

1. Define Rule of Nine.
2. Explain the classification of burn by depth.

3. Write down the pre-hospital treatment of Chemical burn.

4. Define the causes of burn.

5. Write down the sign & symptoms and pre-hospital treatment of Stroke.

Reference

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- Burn and environmental
- emergency:www.augusta>clerkships>documents
- Heat cramp, heat exhaustion, heat :
- Stroke:https://www.osha.gov>SLTC>heat_illn...
- Hypothermia: https://en.m.wikipedia.org>wiki>hypo...
- Frostbite:en.wikipedia.org/wiki/frostbite

LESSON-13

Poisoning

Introduction

Poisoning is a condition or a process in which an organism becomes chemically harmed (poisoned) by a toxic substance or venom of an animal. Poisoning occurs when a toxic substance is swallowed, inhaled, or absorbed by the skin, eyes, or mucous membranes.

OUTCOMES

Upon completion of this lesson, you will be able to:

- Signs and symptoms of poisoning, and steps for pre-hospital treatment.
- The four specific signs and symptoms of ingested, inhaled and absorbed poisons.
- Signs and symptoms of injected poisons, including snakebites, and pre-hospital treatment.
- Signs and symptoms for alcohol and drug abuse and the steps for pre-hospital treatment.

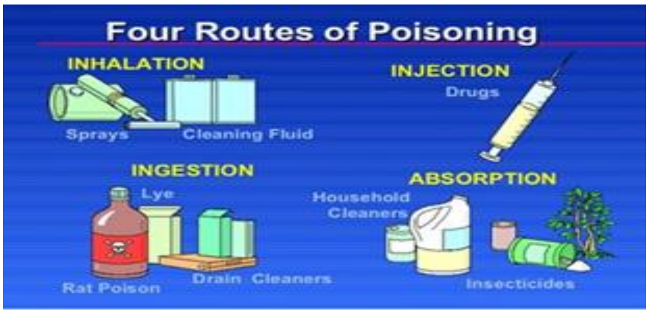
Terminology

POISONS: Any substance that can impair or cause death of cell's structure or function. A poison is any substance that is harmful to your body. You might swallow it, inhale it, inject it, or absorb it through your skin. Any substance can be poisonous if too much is taken. Poisons can include as: -

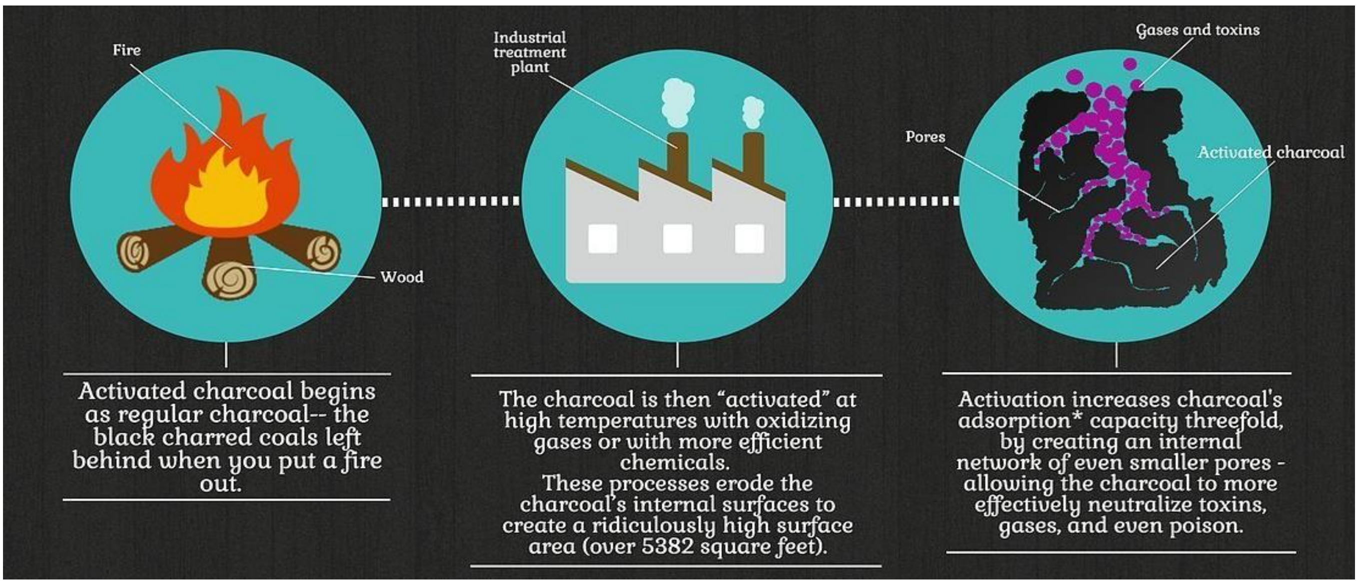
- Prescription or over-the-counter medicines taken in doses that are too high
- Overdoses of illegal drugs, Carbon monoxide from gas appliances
- Household products, such as laundry powder or furniture polish
- Pesticides
- Indoor or outdoor plants
- Metals such as lead and mercury

Treatment for poisoning depends on the type of poisons. There are four routes of poisoning.

- ✓ **Ingestion**
- ✓ **Inhalation**
- ✓ **Absorption**
- ✓ **Injection**



Activated charcoal: - Activated charcoal is a fine black odourless and tasteless powder made from wood or other materials that have been exposed to very high temperatures in an airless environment. Activated charcoal is highly absorbent of particles and gases in the body's digestive system.



Scene Assessment

Always perform a scene assessment – safety first. Protect yourself, your team persons and others from the poison. Use universal precautions. Try to identify the source or substance involved. Get all information, as quickly as possible. Perform the initial assessment and obtain the patient's history. Signs and symptoms of poisoning will vary depending on the type of poison.

General signs and symptoms of poisoning

- Nausea and/or vomiting
- Headache
- Abdominal pain
- Altered mental status or coma
- Seizures
- Rapid or slow heart rate
- High, normal or low blood pressure
- Possible dilation or constriction of pupils
- Shortness of breath
- Injury to skin (discoloration, burns, injection marks, swelling)
- Diarrhea

Pre-hospital Treatment for Poisoning

Use universal precautions and secure the scene. Use special protective equipment when necessary.

- Move the patient away from the source of the poisoning, especially in inhalation and absorbed poisoning
- For absorbed poisons:
  - Remove the patient's clothing
  - Blot the poison from the skin with a dry cloth. If the poison is a dry powder, brush it off.
  - Wash the affected area with ample amount of water until EMS arrives.
- Maintain open airway. Administer oxygen if needed.
- Perform initial assessment. Do not perform mouth to mouth ventilation in case of inhaled or ingested poison. Use the BVM.
- Call your local poison control Centre, if available.
- Perform physical exam.
- For ingested poisons:
  - Give the patient one or two glasses of water to dilute the poison.
  - Induced vomiting may be harmful in case of poisoning with hydrocarbons, strong acids, alkalis, and corrosives.
  - Give the patient activated charcoal – 2 or 3 spoonful in 250 ml (Approx) of water.
- Bring the suspected source; container, labels, or other evidence of the

poison to the hospital.

- Treat for shock.
- Continually monitor the patient. Transport the patient.
- When available, provide first aid as advised in the container of the poison taken.

Ingested poisons


An ingested poison is one that is introduced into the digestive tract by way of the mouth. In cases of ingested poison, all information should be obtained as quickly as possible while the initial assessment is performed. Look for signs of spilled liquids, tablets, capsules, poisonous substances or any container that can help you to identify the substance or source of poisoning. Signs and symptoms of ingested poisoning may be related to the digestive system.

Specific signs and symptoms of ingested poisons

- ✓ Burns, swelling or stains around the mouth
- ✓ Abnormal breathing
- ✓ Diaphoresis
- ✓ Excessive salivation or foaming from the mouth

Organophosphorus poisoning: Organophosphate poisoning is poisoning due to organophosphates (OPs). Organophosphates are used as insecticides, medications, and nerve agents. Symptoms include increased saliva and tear production, diarrhea, vomiting, small pupils, sweating, muscle tremors, and confusion. While onset of symptoms is often within minutes to hours, some symptoms can take weeks to appear. Symptoms can last for days to weeks.

Organophosphate poisoning occurs most commonly as a suicide attempt in farming areas of the developing world and less commonly by accident. Exposure can be from drinking, breathing in the vapors, or skin exposure.

Pre Hospital Treatment:

Airway control and adequate oxygenation are paramount in Organophosphate (OP) poisonings. Intubation may be necessary in case of respiratory distress due to laryngospasm, bronchospasm, bronchorrhea or seizures.

- Transfer the patient to safe area (away from exposure)
- Remove all clothing and gently clean the patient suspected of organophosphate exposure with soap and water because organophosphates are hydrolyzed readily in aqueous solutions with a high pH. Consider the clothing as hazardous waste and discard accordingly. Irrigate the eyes of patient who has had ocular exposure using isotonic sodium chloride solution

or lactated Ringer's solution.

- Administer oxygen if necessary.
- Transfer to hospital immediately.

Inhaled poisons

Poisoning caused by fumes and vapors can be swift. The body absorbs inhaled poisons very rapidly. The longer the exposure's worse the victim's condition. Use appropriate mask to gain access to the patient in a hazardous environment. Additional expertise may be required. Signs and symptoms of inhaled poisoning are more related to the respiratory system.

Though it is important to give care immediately, do not enter the scene unless you are sure it is safe.

Scene Assessment

Assessment of inhaled poisons can be dangerous. To ensure your safety, be wary of peculiar odours or visible vapours. If you are not properly equipped or trained, take the help of trained personnel to bring the patient to you. Do not enter the scene unless it is safe. Search for other victims. Try to get specific information on the poison and the patient's medical information as soon as possible.

Carbon mono oxide Poisoning:

Carbon monoxide is a poisonous gas. When inhaled, the gas directly prevents the red blood cells from carrying oxygen to the body tissues and organs. Carbon monoxide binds very strongly to the iron atoms in hemoglobin, the principal oxygen-carrying compound in blood. The affinity between CO and hemoglobin is 200 times stronger than the affinity between hemoglobin and oxygen. When CO binds to the hemoglobin it cannot be released nearly as readily as oxygen would be.

It can fatal if inhaled in large amount, for example from vehicle exhaust fumes or smoke within a confined space, or even in small amount. **Detection of Carbon monoxide is difficult as it has no taste or smell.** Generally victims having CO poisoning may not be aware by the exposure.

What to look for?

If the victim has had exposure to low level of carbon monoxide for prolonged period of time, they may complain of:

- Headache
- Confusion
- Feeling aggressive
- Nausea and vomiting and Diarrhoea

Severe symptoms may include:

- Grey-blue skin colorations
- Rapid, difficult breathing
- Impaired level of response, leading to unresponsiveness

Common inhaled poisons include

- Carbon monoxide
- Carbon dioxide from industrial sites, sewers and wells
- Chlorine gas (common around swimming pools)
- Fumes from liquid chemicals and sprays
- Ammonia
- Sulphur dioxide (used to make ice)
- Anesthetics gases (ether, nitrous oxide, chloroform)
- Dry cleaning solvents, degreasing agents or fire extinguishers
- Industrial gases
- Incomplete combustion of natural gas
- Hydrogen sulphide (Sewer gas)

Specific signs and symptoms for inhaled poisons

- History of inhalation abuse
- Chest pain or chest tightness
- Burning sensation in chest or throat
- Coughing, wheezing

Absorbed poisons

Poisons that can be absorbed through the skin come from many sources including plants, such as poison ivy, poison oak, and poison sumac, fertilizers and pesticides. Absorbed poisons are harmful substances that are introduced to the system via unbroken skin and mucous membranes.

Specific signs and symptoms of absorbed poisons

- History of exposures
- Liquid or residue on the skin
- Itching or irritation
- Rash or blisters

First aid for absorbed poisons:

- Start by doing ESM (Emergency Scene Management) – Complete a scene survey.
- Complete a primary survey, making sure to treat any life-threatening issues and conditions.
- Carefully remove the poison, taking care not to touch the affected area with bare skin. A filter mask should be worn to prevent inhalation as well as at least one pair of gloves should be worn as the affected area is flushed with

cool water or, if the substance is a powder, begin by brushing away any extra amount with a dry cloth.

- Remove any clothing that has been in contact with the poison and make sure not to come into contact with the clothing until it has been thoroughly cleaned.
- Wash the affected skin thoroughly with soap and water, making sure not to let the affected area(s) touch any other part of the body. Particular attention should be paid to hidden areas such as beneath the finger nails, behind the ears and in the hairs.
- Get medical help, provide ongoing casualty care and monitor the casualty closely.

Injected poisons

An injected poison enters the body through a break in the skin. The break can be caused by a needle (drugs), an insect bite or sting, or puncture.

Scene Assessment

During scene assessment, look for clues such as syringes and drug paraphernalia. Inspect surroundings for animals, insects or marine life. Conduct initial assessment, paying close attention to airway breathing. Monitor mental status and prioritize patients for transport. Obtain a focused history and perform physical exam. Get information on the suspected poison or its origin. Try to find answers to the following questions.

- Is there a history of drug abuse?
- Any history of allergic reaction to bites or stings?
- How long from time of injection to onset of signs or symptoms?

Specific signs and symptoms of injected poisons

- Needle track
- Pain, swelling, or redness at the injection site
- History of bites or stings
- Bite mark or stinger embedded in the skin
- Numbness at the injury site after a few hours
- Other symptoms similar to ingested poisons

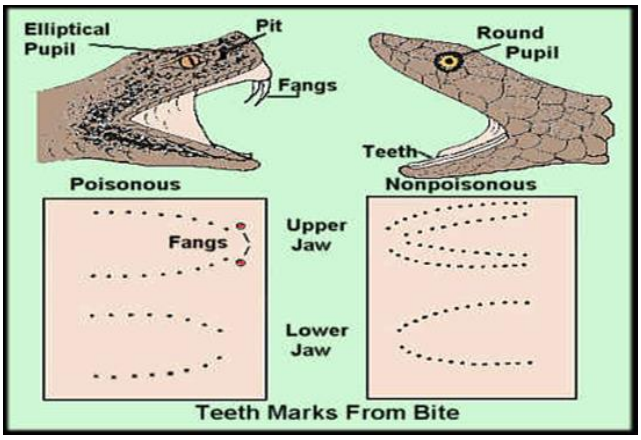
Pre-hospital treatment for injected poisons

Use universal precautions and secure the scene.

- Maintain open airway
- Administer oxygen. Be alert for possible vomiting.
- Protect yourself and the patient from repeated injections. Cut off patient's clothing to protect from possible repeated insect stings or bites

- For **Bee stings:**
    - Remove the stinger together with the poison sac.
    - Use a plastic card and scrape the skin's surface to keep the sac from breaking inside the patient's skin.
    - Place a bag of ice or cold pack on the sting.
- Bring all containers, labels or other evidence of poisoning to the hospital.
- Conduct a physical exam.
- Treat for shock.
- Continually monitor the patient during transport.

Snake Bite



A bite from a snake should always be treated as a medical emergency. Even a bite from a harmless snake can be serious, leading to an allergic reaction or an infection. Venomous snake bites can produce an array of symptoms, including localized pain and swelling, convulsions, nausea, and even paralysis.

Treat all snakebites as poisonous.

Specific signs and symptoms of poisonous snake bites

- Nausea and vomiting
- Weakness, paralysis
- Seizures, decreased level of consciousness
- Puncture wound
- Pain and/or burning sensation around the bite mark
- Blood oozing from the bite mark
- Discoloration and swelling

Pre-hospital treatment for snake bites

Use universal precautions and secure the scene.

- Move the patient to a safe place.
- Calm the patient and try to place him/her in a comfortable position.
- Locate the bite marks and clean it with water.
- Remove rings, bracelets and any restrictive garments from the affected extremity. Do not apply tourniquets, do not make incisions around the bite marks, and do not suction the venom from the wound.
- Apply compressive bandage and stablise affected part through splinting.
- Treat for shock and provide basic life support as needed.
- Do not give the patient any food or drink.

- Identify the snake.
- Administer oxygen if needed.
- Continually monitor the patient during transport

Antivenom:

Antivenom, also known as antivenin, venom antiserum and antivenom immunoglobulin, is a medication made from antibodies which is used to treat certain venomous bites and stings.

First aid myths

There are also several outdated first aid techniques that are now believed to be unhelpful or even harmful:

- Do not use a tourniquet.
- Do not cut into the snakebite.
- Do not use a cold compress on the bite.
- Do not give the person any medications unless directed by a doctor.
- Do not raise the area of the bite above the victim's heart.
- Do not attempt to suck the venom out by mouth.
- Do not use a pump suction device. These devices were formerly recommended for pumping out snake venom, but it's now believed that such devices are not helpful.

Alcohol abuse

Alcohol poisoning happens when someone take a dangerous amount of alcohol, normally in a short period of time. Drinking too much alcohol stops the nervous system from working properly, particularly in the brain. It can weaken the difference function of the body like sight, speech, coordination and memory. Alcohol has impact all across your brain, the parts that control muscles, speech, coordination, judgment and so on. Alcohol poisoning can also send a person into deep unresponsiveness and, at worst, can slow or even shut down their breathing, causing death.

What to look for - Alcohol poisoning?

If you think someone may have alcohol poisoning, these are the key things to look for:

- A strong smell of alcohol and you may see empty bottles or cans around
- Confusion and slurred speech
- Vomiting
- Reddened and moist face
- Deep, noisy breathing
- A strong, bounding pulse
- Unresponsiveness

If they are unresponsive, you also need to look for:

- Shallow breathing
- Weak, rapid pulse
- Widened pupils that react poorly to light

What to do in case of Alcohol poisoning?

- Reassure victim and cover with a coat or blanket to keep warm.
- Check victim for any injuries, especially head injuries, or any other medical conditions.
- If victim is breathing normally but not fully responsive, place victim in recovery position.
- Monitor breathing, level of response and pulse.
- If you're not sure about seriousness of victim condition then call EMS.
- In case of unresponsiveness open airway & assess breathing. Administer oxygen if needed.

Sign and Symptoms of Alcohol withdrawal (*DELIRIUM TREMENS*)

- Confusion and restlessness
- Altered behaviour
- Hallucinations
- Trembling hands
- Spasms or convulsions

Pre hospital Treatment for DELIRIUM TREMENS

- Perform initial assessment
- If patient is aggressive, then take care that the patient does not injure himself or others.
- Reassure patient
- Be prepared to administer PHT for convulsions
- Transport the patient to the hospital as early as possible.

Drug Abuse

Drugs contain chemicals that can affect brain's communication system and disrupt the functioning of nerve cells like sending, receiving and processing of information. There are at least two ways that drugs cause this disruption:
(1) By imitating the brain's natural chemical messengers.
(2) By over stimulating the "reward circuit" of the brain.

Some drugs (e.g., marijuana and heroin) have a similar structure of chemical messengers called neurotransmitters, which are naturally produced by the brain. This similarity allows the drugs to "fool" the brain's receptors and activate nerve cells to send abnormal messages.

It is not necessary for the rescuer to know the specific names and the effects of each one of the drugs. But the medical first responder should have the ability to identify a possible case of drug abuse. The five types of frequently abused drugs are:

1. **Stimulants**: These drugs stimulate the central nervous system, causing the user to become excited. This group of drugs includes amphetamines, cocaine, caffeine, asthmatic drugs and vasoconstrictive drugs.

2. **Depressants**: These drugs depress the central nervous system and include non- barbiturate sedatives. These reduce pulse and breathing, cause drowsiness and slow the reflexes.
3. **Analgesic narcotics (Opium-derivatives):** Their use produces an intense state of relaxation. Some are easily obtainable, such as codeine found in cough syrups. Morphine, heroin, and Demerol belong to this group of drugs. These drugs reduce body temperature, slow the pulse and breathing, relax the muscles, and cause pupil dilation, drowsiness, and sluggishness.
4. **Hallucinogens**: These drugs alter personality and distort perception. They include LSD, PCP, STP, mescaline, peyote, and psilocybin. Marijuana also has some hallucinogenic properties. Patients often imagine hearing unusual sounds and seeing strange colours. Persons using hallucinogens can become aggressive and pose a threat to you, others, and themselves.
5. **Volatile chemicals**: The vapours of certain chemical substances cause excitement, euphoria or the sensation of flying. In general, these chemicals are solvents, cleaning fluids, glues and gasoline. The effects are temporary loss of reality, loss of the sense of smell, accelerated pulse and breathing and possible coma.

General signs and symptoms of drug abuse

The following list is a combination of the various signs and symptoms for the different drugs described above.

- Excitability
- Drowsiness and slow reflexes
- Reduced pulse and breathing

- Accelerated pulse and breathing
- Relaxed muscles
- Constricted or dilated pupils
- Distorted perception
- Aggressive behavior
- Euphoria

Pre-hospital treatment for drug abuse

Use universal precautions and secure the scene. When speaking with the patient, be tactful and ask directly if he/she is taking any —medication.

- Provide basic life support.
- Induce vomiting if the patient is conscious and if the overdose was taken orally within the last 30minutes.
- If the patient is hyperactive, apply restraints to prevent self-injury and injury to others.
- Speak with the patient to win his/her trust and to monitor level of consciousness.
- Monitor the patient‘s breathing carefully because sedatives can cause slow breathing and lead to possible respiratory arrest.
- Comfort the patient and provide emotional support.
- Watch for allergic reactions.
- Keep all evidence of drug abuse.
- Call your local poison control Centre, if available.
- Administer oxygen if needed. Transport the patient.

What is the difference among venom, poison, and toxin?

Toxin - A toxin is a poisonous substance, produces within living cells or organisms. Toxins can be small molecules, peptides or proteins that are capable of causing immune reaction.

Poison – Poison are substances that cause disturbances to organisms, usually by chemical reaction or other activity on the molecular scale, when a sufficient quantity is absorbed by an organism. Poison is any chemical substance that causes injury or harm to the body or any organism for that matter.

Venom - Venom is a substance produced by an organism for its self-defense. It mainly targets one of the organ systems. Snake venom is either myotoxic(muscle), neurotoxic(central nervous system) or hematotoxic (blood) etc. Venom is harmful only when it enters into systemic circulation.

Unit Summary

Definition: A poison is any substance that is harmful to your body. You might swallow it, inhale it, inject it or absorb it through your skin. Any substance can be poisonous if too much is taken.

Signs and symptoms of poisoning

- Nausea and/or vomiting
- Headache
- Abdominal pain
- Altered mental status or coma
- Seizures
- Rapid or slow heart rate
- High, normal or low blood pressure

Steps for Pre-Hospital Treatment;

Use universal precautions and secure the scene. Use special protective equipment when necessary.

- Move the patient away from the source of the poisoning, especially in inhalation and absorbed poisoning
- For absorbed poisons:
    - Remove the patient's clothing
    - Blot the poison from the skin with a dry cloth. If the poison is a dry powder, brush it off.
    - Wash the affected area with ample amount of water until EMS arrives.
- Maintain open airway. Administer oxygen if needed.
- Perform initial assessment. Do not perform mouth to mouth ventilation in case of inhaled or ingested poison. Use the BVM.
- Call your local poison control center, if available.
- Perform physical exam.
- For ingested poisons:
    - Give the patient one or two glasses of water to dilute the poison.
    - Induced vomiting may be harmful in case of poisoning with hydrocarbons, strong acids, alkalis, and corrosives.
    - Give the patient activated charcoal – 2 or 3 spoon in 250 ml (Approx) of water.
- Bring the suspected source; container, labels, or other evidence of the poison to the hospital.
- Treat for shock.
- Continually monitor the patient. Transport the patient.

Signs and Symptoms for alcohol abuse

- A strong smell of alcohol and you may see empty bottles or cans around
- Confusion and slurred speech
- Vomiting

- Reddened and moist face
- Deep & noisy breathing
- A strong, bounding pulse
- Unresponsiveness

Steps for pre-hospital treatment of alcohol abuse

Reassure the victim and cover with a coat or blanket to keep warm.

- Check the victim for any injury, especially head injuries or any other medical conditions.
- If victim is breathing normally but not responsive, place into the recovery position.
- Monitor the breathing, level of response and pulse.

Signs and symptoms for drug abuse

- Drowsiness and slow reflexes
- Reduced pulse and breathing
- Accelerated pulse and breathing
- Relaxed muscles
- Constricted or dilated pupils
- Distorted perception

Steps for pre-hospital treatment for drugs abuse

- Provide Basic Life Support.
- Induce vomiting if the patient is conscious and if the overdose was taken orally within the last 30 minutes.
- If the patient is hyperactive, apply restraints to prevent self-injury and injury to others.
- Speak with the patient to win his/her trust and to monitor level of consciousness.
- Monitor the patient's breathing carefully because sedatives can cause slow breathing and lead to possible respiratory arrest.

Self-Assessment

Objective Questions

1. Sooty or smoky smell on breath and singed nasal hair is the signs of ________________.
    a. Ingested poison
    b. Absorbed poison
    c. Inhalation of poison
    d. Injection of poison
2. Snakebites can be very serious. When caring for a snakebite victim, which should you do not do?
    a. Wash wounds.
    b. Apply ice.
    c. Keep bitten part still and below the heart.
    d. Get professional medical care as early as possible.
3. A poison can enter the human body by four ways. Which one of the following is not included?
    a. Ingestion
    b. Absorption
    c. Inhalation
    d. Infection

Descriptive Questions

1. Write down the pre-hospital treatment of snake bite.
2. Write down the sign & symptoms & pre-hospital treatment of Injected poison.
3. Write down the pre-hospital treatment of Ingested poison.
4. Define the stimulants.
5. Write down the pre-hospital treatment of absorbed poison.

Reference

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- Identify patient priorityhttps://www.health.ny.gov
- Steps to follow:http://emt-training.org/scene-size-up.php

LESSON No- 14

Medical Emergency, Part 1: Cardiovascular Emergencies

Introduction

A medical emergency is an acute injury or illness that possesses an immediate risk to a person's life or health. Medical emergencies may require assistance from another person, who should be qualified to do so, such as cardiovascular (heart), respiratory, and gastrointestinal.

Any response to a medical emergency will depend on the situation, the patient involved and availability of resources to help them. It will also vary depending on whether the emergency occurs in hospital under medical care, or outside of medical care.

Medical emergency generally found to have related to cardio vascular system. The most common complaint is chest pain. The history of a person complaining chest pain should include question covering OPQRST. A SAMPLE history should also be obtained followed by baseline vitals.

Outcomes

Upon completion of this lesson, you will be able to:

- Medical emergency.
- Myocardial infarction, signs and symptoms, and steps for pre-hospital treatment.
- Angina pectoris, signs and symptoms, and pre- hospital treatment.
- Congestive heart failure, signs and symptoms, and steps for pre-hospital treatment.
- Hypertension, signs and symptoms and steps for pre- hospital treatment.
- Signs and symptoms of abdominal distress and steps for pre-hospital treatment.

Terminology

Coronary Artery: The coronary arteries are the arteries that transport blood to the cardiac muscle. These are mainly composed of the left and right coronary arteries both of which give off branches.

Edema: Edema (or Odema) is the abnormal accumulation of fluid in certain tissues within the body which causes the affected tissue to become swollen. The accumulation of fluid may be under the skin.

Pulmonary Edema: Pulmonary edema is fluid accumulation in the tissue and air spaces of the lungs. It leads to impaired gas exchange and may cause respiratory failure.

Cardiac Arrest: A cardiac arrest occurs when the heart suddenly stops pumping blood around the body, often because of a problem with the electrical signals to the heart muscle. Someone who is having a cardiac arrest will suddenly collapse and will stop breathing.

Arteriosclerosis: Arteriosclerosis is a progressive narrowing of the arteries, in which fat deposits to the internal walls of the arteries, reducing their diameter.

Plaque: Plaque is made up of fat, cholesterol, calcium, and other substances found in the blood, which attach to the internal walls of the arteries and reducing their diameter.

Atheroma: A fatty deposit in the inner lining (intima) of an artery, resulting from atherosclerosis also called an atherosclerotic plaque, an arterial plaque, or a plaque.

Medical emergency: A critical state caused by a wide variety of illnesses whose cause does not include trauma to the patient. Such a state can be caused by pathogens (microorganisms), alteration in the functioning of organ, or foreign substances, such as poisons. In most cases, the problem is not a consequence of trauma.

If a patient presents with atypical vital signs, assume that the patient has a medical emergency.

Emergency Services

For emergencies starting outside of medical care, a key component of providing proper care is to summon the emergency medical services (usually an ambulance), by calling for help using the appropriate local emergency telephone number, such as 108.

Difference between 'trauma' and medical' patients

"Mechanism of Injury" is a term used in the emergency services to help determine the level of care a person needs based on how they were injured. Trauma refers to something "traumatic" such as a fall, vehicle accident, and fight. Injuries can be broken bones, lacerations, dislocations, etc. Trauma means the person has had an accident, or traumatic injury of some sort. Things like breaking your leg, being in a car accident, being knifed or shot- those are types of trauma.

Medical patients have medical problems due to disease, rather than injury. Medical patients have things like appendicitis, pneumonia, diabetic crisis, etc. Medical patients would be non-trauma related say, colds, cardiac, respiratory, etc.

Signs of Medical Emergency

If the patient presents with atypical vital signs, assume that the patient has a medical emergency. Changes in any of the following can indicate a medical emergency:

- Mental status (unconscious, confused, comatose)
- Heart rate, rhythm and/or quality
- Breathing rate, rhythm, and/or quality
- Skin temperature, colour and/or condition
- Pupil size, symmetry, and reactivity to light
- Condition and colour of the mucous membranes (dryness, paleness, cyanosis)
- Breath scent (alcohol, acetone)
- Muscular activities (spasms and paralysis)
- Vomiting

In an adult patient, the following conditions may indicate a possible medical emergency:

- Heart rate above 100 or less than 60 bpm.
- Respiratory rate less than 12 or more than 20 rpm.

Symptoms of Medical Emergency

Consider all patients' complaints as valid. If the patient complains of not feeling well, assume that he/she is having a medical emergency.

- Pain
- Fever
- Stomach discomfort, nausea, atypical bowel or bladder activity
- Vertigo, fainting sensation, feeling of impending doom
- Shortness of breath or difficulty breathing
- Chest or abdominal pain
- Excessive thirst, hunger or strange taste in the mouth
- Sensation of numbness and tingling

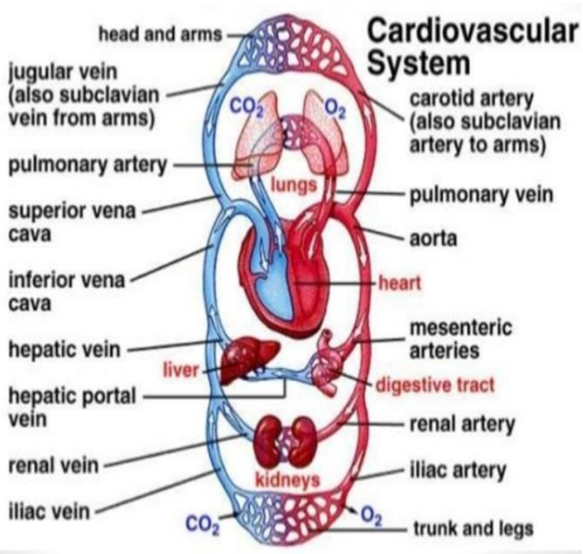
Detection:

- **Medical emergencies can create a situation leading to trauma and may remain unnoticed.** Example: A person that has a myocardial infarction can lose consciousness and fall, suffering a traumatic injury. Always consider the possibility that an underlying medical emergency may lead to the traumatic event.
- **Trauma can induce a medical emergency.** Example: the stress of an accident can produce a myocardial infarction, cerebral vascular accident or a seizure. Conduct an initial assessment and physical exam and continue monitoring the patient closely.

Cardiovascular Emergencies

Cardio – Related to the heart. Vascular- Relates to the veins and arteries

Cardiovascular emergencies are life-threatening disorders that must be recognized immediately to avoid delay in treatment and to minimize morbidity and mortality. Patients may present with severe hypertension, chest pain, or cardiopulmonary arrest



A heart attack is a medical emergency. A heart attack usually occurs when a blood clot blocks blood flow to the heart. Without blood, tissue loses oxygen and dies. Symptoms include tightness or pain in the chest, neck, back or arms, as well as fatigue, lightheadedness, abnormal heartbeat and anxiety. **Women are more likely to have atypical symptoms than men.**

Treatment ranges from lifestyle changes and cardiac rehabilitation to medications, stents and bypass surgery.

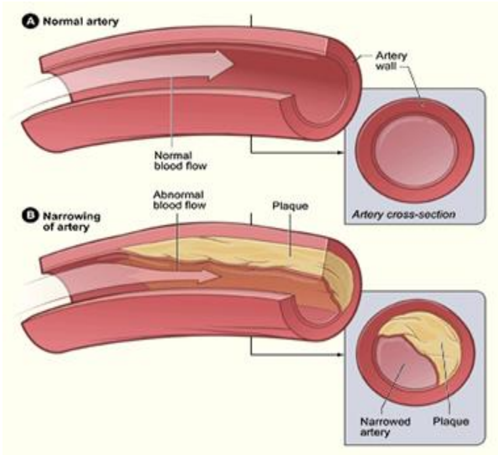
The most common cardiovascular medical emergencies are:

- Angina pectoris.
- Myocardial infarction (heart attack).
- Congestive heart failure.
- Hypertension.

Angina Pectoris (Chest pain):

Chest pain, this condition is the result of reduced oxygen supply to the heart muscle (myocardium). It can be caused by diseased or narrowed arteries which reduce blood flow. Angina is often brought on by exertion or stress, and rarely lasts longer than 3 to 5 minutes. Angina is chest pain or discomfort that occurs if an area of your heart muscle doesn't get enough oxygen-rich blood. Angina is a symptom of coronary artery disease.

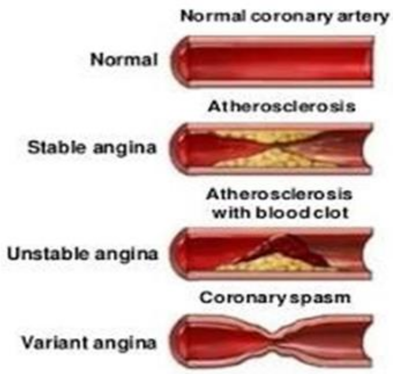
Angina is not a disease; it's a symptom of an underlying heart problem. Angina usually is a symptom of coronary heart disease (CHD). CHD is the most common type of heart disease in adults. It occurs if a waxy substance **called plaque** builds up on the inner walls of your coronary arteries.



Plaque narrows and stiffens the coronary arteries. This reduces the flow of oxygen-rich blood to the heart muscle, causing chest pain. Plaque buildup also makes it more likely that blood clots will form in your arteries. Blood clots can partially or completely block blood flow, which can cause a Heart Attack.

Types of angina Pectoris

Stable Angina is the medical term for chest pain or discomfort due to coronary heart disease. It occurs when the heart muscle doesn't get as much blood as it needs. This usually happens because one or more of the heart's arteries is narrowed or blocked, also called ischemia.



Unstable Angina or sometimes referred to as acute coronary syndrome causes unexpected chest pain, and usually occurs while resting, sleeping, or with little physical exertion. The most common cause is reduced blood flow to the heart muscle because the coronary arteries are narrowed by fatty buildups (atherosclerosis) which can rupture causing injury to the coronary blood vessel resulting in blood clotting which blocks the flow of blood to the heart muscle.

Signs and Symptoms of Angina Pectoris

- Chest pain
- Shortness of breath
- Profuse sweating
- Light-headedness
- Palpitations (sensation of throbbing or fluttering of the heart)
- Nausea, vomiting
- Pale, cool, moist skin

Pain and discomfort are the main symptoms of angina. Angina often is described as pressure, squeezing, burning, or tightness in the chest. The pain or discomfort usually starts behind the breastbone.

Pain from angina also can occur in the arms, shoulders, neck, jaw, throat, or back. The pain may feel like indigestion. Some people say that angina pain is hard to describe or that they can't tell exactly where the pain is coming from.

Pre-Hospital Treatment of Angina Pectoris

Use universal precautions and secure the scene.

- Instruct the patient to stop all movement.
- Place the responsive patient in a comfortable position, usually semi-reclining or sitting.
- Maintain open airway.
- Administer oxygen. If needed, provide artificial ventilation or CPR.
- Loosen restrictive clothing.
- Maintain body temperature as close to normal as possible.
- Comfort and reassure the patient.
- Continue to monitor the patient's vital signs.

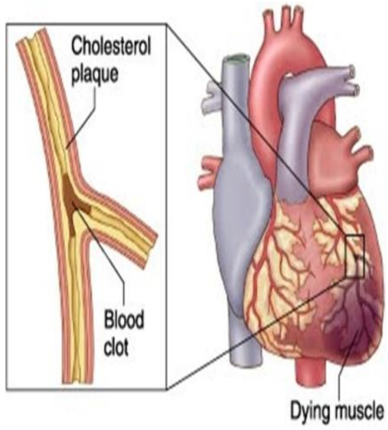
Transport the patient as soon as possible.

Myocardial infarction (MI)

Definition: Literally meaning—death of the heart," caused by partial or total blockage of blood flow to the heart, leading to death of cardiac muscle tissue.

Myocardial Infarction (MI) commonly known as a **"Heart Attack"** occurs when blood flow stops to a part of the heart causing damage to the heart muscle.

The myocardium (heart muscle) receives its blood supply from the two large coronary arteries and their branches. Occlusion of one or more of these blood vessels (coronary occlusion) is one of the major causes of myocardial infarction.



The occlusion may result from the formation of a clot that develops suddenly when an atheromatous plaque ruptures through the sub layers of a blood vessel, or when the narrow, roughened inner lining of a scleroses artery leads to complete thrombosis. The risk rises rapidly with age, women tending to develop the disease 15 to 20 years later than men.

Signs and Symptoms of Myocardial Infarction

- Chest discomfort, such as pain or heaviness.
- The common location Sub-sternal, radiating to the neck, jaw, left shoulder and/or left arm, rarely to abdomen abnormal pulse nausea or vomiting.
- Shortness of breath

- Difficulty breathing or rapid,
- shallow respirations
- Sudden weakness
- Anxiety Syncope (fainting)
- Profuse sweating

Pre-Hospital Treatment of Myocardial Infarction

Use universal precautions and secure the scene.

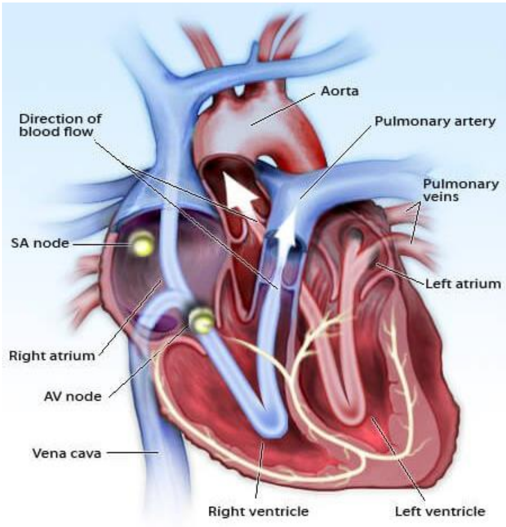
- Instruct the patient to stop all movement.
- Place the responsive patient in a comfortable position, usually semi-reclining or sitting.
- Maintain open airway.
- Administer oxygen. If needed, provide artificial ventilation or CPR.
- Loosen restrictive clothing.
- Maintain body temperature as close to normal as possible.
- Comfort and reassure the patient.
- Continue to monitor the patient's vital signs.

Transport the patient as soon as possible.

Congestive Heart Failure (CHF)

Definition: A condition of excessive fluid build-up in the lungs and/or other organs due to inadequate pumping of the heart. Heart failure can occur if the heart cannot pump (systolic) or fill (diastolic) adequately.

Congestive Heart Failure(CHF), occurs when the heart is unable to pump sufficient blood to meet the body's needs in Certain conditions, such as narrowed arteries in your heart (coronary artery disease) or high blood pressure, gradually leave your heart too weak or stiff to fill and pump efficiently.



Signs and Symptoms of Congestive Heart Failure

- Shortness of breath, made worse by lying flat
- Rapid heart rate
- Anxiety
- Increased respiratory rate
- Normal to high blood pressure
- Jugular vein distension

- Swollen ankles
- Cyanosis

Pre-hospital treatment for Congestive Heart Failure

Use universal precautions and secure the scene.

- Maintain open airway and monitor breathing. Provide artificial ventilation if needed.
- Place the responsive patient in a comfortable position, usually sitting upright.
- Give oxygen if needed.
- Continuously monitor the patient and provide emotional support.

Transport the patient as soon as possible.

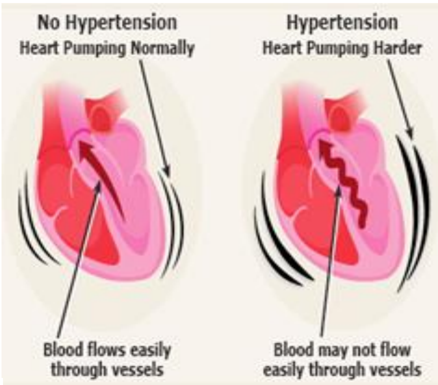
Hypertension

Definition: Blood pressure that remains consistently above the normal values.

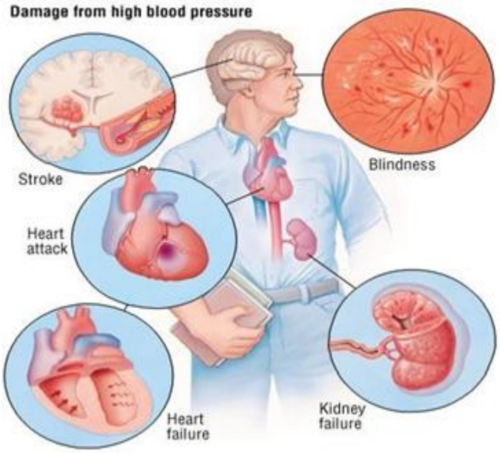
Hypertension, also known as **high blood pressure (HBP**), is a long term medical condition in which the blood pressure in the arteries is persistently elevated. High blood pressure usually does not cause symptoms.

Long term high blood pressure, however, is a major risk factor for coronary artery disease, stroke, heart failure, peripheral vascular disease, vision loss, and chronic kidney disease.

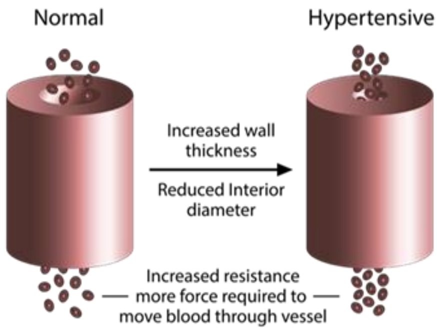
How blood pressure and circulatory system work?



In order to survive and function properly, tissues and organs need the oxygenated blood that your circulatory system carries throughout the body. When the heart beats, it creates pressure that pushes blood through a network of tube-shaped blood vessels, which include arteries, veins and capillaries.



The damage starts in arteries and heart: The primary way that high blood pressure causes harm is by increasing the workload of the heart and blood vessels making them work harder and less efficiently. Over time, the force and friction of high blood pressure damages the delicate tissues inside the arteries. In turn, LDL (bad) cholesterol forms plaque along tiny tears in the artery walls, signifying the start of atherosclerosis.



The more the plaque and damage increases, the narrower (smaller) the insides of the arteries become raising blood pressure and starting a vicious circle that further harms your arteries, heart and the rest of your body. This can ultimately lead to other conditions ranging from arrhythmia to heart attack and stroke.

Signs and Symptoms of hypertension

- Headache
- Feeling of sickness
- Anxiety
- Ringing in the ears
- Seeing —stars
- Nosebleed
- Diastolic blood pressure above 90 mmHg.
- Tingling in the face or extremities.

This blood pressure is the result of two forces:

Systolic Blood Pressures (the upper number) — Indicates how much pressure your blood is exerting against your artery walls when the heart beats. Systolic pressure occurs as blood pumps out of the heart and into the arteries that are part of the circulatory system.

Diastolic blood pressures (the lower number) — indicates how much pressure your blood is exerting against your artery walls while the heart is resting between beats. Diastolic pressure is created as the heart rests between heart beats. (These two forces are each represented by numbers in a blood pressure reading.)

Blood pressure categories:-

The five blood pressure ranges as recognized by the American Heart Association are:

BLOOD PRESSURE CATEGORY	**SYSTOLIC MM HG** (UPPER NO.)		**DIASTOLIC MM HG** (LOWER NO.)
Normal	Less than 120	And	Less than 80
Pre hypertension/ Elevated	120 – 129	And	Less than 80
High Blood Pressure (Hypertension) Stage 1	130 – 139	Or	80 – 89
High Blood Pressure (Hypertension) Stage 2	140 or higher	Or	90 or higher
Hypertensive Crisis (Emergency Care Needed)	Higher than 180	And/or	Higher than 120

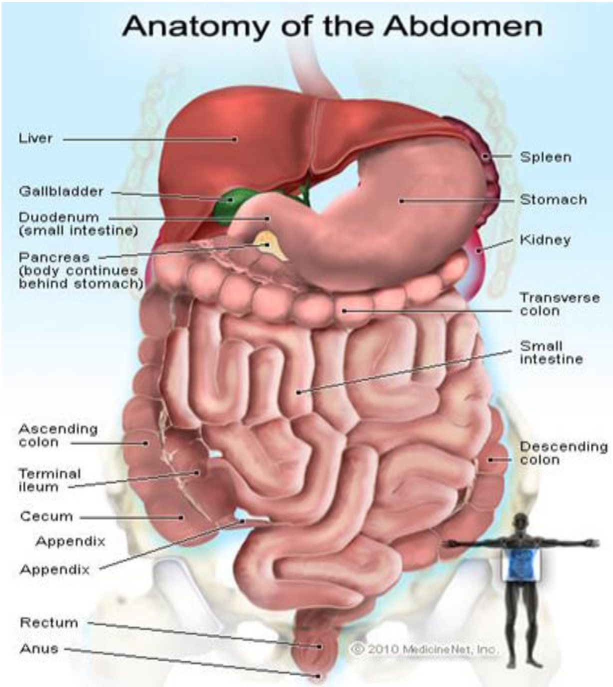
Pre-Hospital treatment for Hypertension:

Use universal precautions and secure the scene.

- Maintain open airway.
- Place the responsive patient in a comfortable position, usually sitting upright.
- Provide emotional support.
- Control nosebleed, if applicable.

Transport the patient as soon as possible.

Abdominal Distress (Sharp, severe abdominal pain)



Definition: Abdominal pain can have sudden onset or build up gradually over a period of time. Severe abdominal pain may not always reflect a serious condition, but must always be treated as serious by the MFR until a full diagnosis is made by a doctor.

Abdominal distress is any pain or discomfort in the abdomen. The abdominal area is the area between your chest and groin, often referred to as the stomach region or belly.

Causes of abdominal distress

There are multiple causes of abdominal pain, all requiring immediate attention. These disorders have four general causes: inflammation, infection, obstruction and haemorrhage. These conditions can be brought on by, but are not limited to, the following:

- Acute appendicitis
- Perforated ulcer
- Intestinal obstruction
- Ectopic pregnancy or other gynecological emergencies
- Closed abdominal trauma (ruptures, haemorrhages)

This list does not include all causes of abdominal pain.

Signs and symptoms of abdominal distress

- Abdominal pain, local or diffuse.
- Colicky pain (cramps that occur in waves).
- Abdominal tenderness, local or diffuse.
- Anxiety, reluctance to move.
- Loss of appetite, nausea, vomiting.
- Fever.
- Rigid, tense, or distended abdomen.
- Signs of shock.
- Vomiting blood, bright red or like coffee grounds.
- Blood in stool, bright red or tarry black.

Pre-Hospital Treatment of Abdominal Distress

Use universal precautions and secure the scene.

- Maintain open airway and prevent aspiration of vomit. Have patient lie in comfortable position, preferably the left side if nauseated.
- Administer oxygen if needed.
- Treat for shock.
- Do not give anything by mouth.
- Keep a vomit sample for analysis (take precautions to prevent contamination).
- Continually monitor vital signs while transporting the patient.

Unit summary

Medical emergency: A critical state caused by a wide variety of illnesses whose cause does not include trauma to the patient. Such a state can be caused by pathogens (microorganisms), alteration in the functioning of organ, or foreign substances, such as poisons. In most cases, the problem is not a consequence of trauma.

Cardiovascular Emergencies

Cardio – Related to the heart.   Vascular-Relates to the veins and arteries

The most common cardiovascular medical emergencies are:

- Angina pectoris.
- Myocardial infarction (heart attack).
- Congestive heart failure.
- Hypertension.

Angina Pectoris (Chest pain):

Chest pain, this condition is the result of reduced oxygen supply to the heart muscle (myocardium). It can be caused by diseased or narrowed arteries which reduce blood flow. Angina is often brought on by exertion or stress, and rarely lasts longer than 3 to 5 minutes.

Myocardial infarction (MI)

Definition: Literally meaning ―death of the heart," caused by partial or total blockage of blood flow to the heart, leading to death of cardiac muscle tissue.

Myocardial infarction (MI) commonly known as a **"Heart Attack"** occurs when blood flow stops to a part of the heart causing damage to the heart muscle.

Congestive Heart Failure (CHF)

Definition: A condition of excessive fluid build-up in the lungs and/or other organs due to inadequate pumping of the heart. Heart failure can occur if the heart cannot pump (systolic) or fill (diastolic) adequately.

Hypertension

Definition: Blood pressure that remains consistently above the normal values.

High blood pressure is a silent killer

Abdominal Distress (Sharp, severe abdominal pain)

Definition: Abdominal pain can have sudden onset or build up gradually over a period of time. Severe abdominal pain may not always reflect a serious condition, but must always be treated as serious by the MFR until a full diagnosis is made by a doctor.

Self-Assessment

Objective Questions

1. Meaning of infraction is
    a. Aorta death
    b. Artery death
    c. Tissue death
    d. Muscle death
2. Heart attack occurs when there is blood clotting in
    a. Renal arteries
    b. Mesenteric arteries
    c. Hepatic arteries
    d. Coronary arteries
3. Heart day is celebrated worldwide every year on
    a. 28th March
    b. 28th July
    c. 28th August
    d. 28th September
4. Meaning of myocardium is
    a. Skeletal muscle
    b. Connective muscle
    c. Cardiac muscle
    d. Heart muscle
5. Pulmonary veins are veins from
    a. Lungs
    b. Ankles and knees
    c. Liver and kidneys
    d. Stomach and kidneys
6. Veins that comes from pancreas, spleen, stomach and intestine drains into
    a. Superior dorsal vein
    b. Inferior portal vein
    c. Hepatic portal vein
    d. Superior portal vein

7. Oxygenated blood is brought to left atrium from lungs through
    a. Pulmonary veins
    b. Pericardial veins
    c. Pericardium veins
    d. Semi lunar veins

8. Myocardium receives blood supply from
    a. Coronary arteries
    b. Myocardial arteries
    c. The conduction pathway
    d. The aorta

9. Blood that is returning to the heart from the lungs enters the heart at the;
    a. Right atrium
    b. Left atrium
    c. Right ventricle
    d. Left ventricle

10. You are caring for a 59 year old female with a chief complaint of nausea and general fatigue. She is pale and sweaty and has a history of diabetes. You should;
    a. Administer oxygen
    b. Administer oral glucose
    c. Obtain vital signs
    d. Perform a secondary assessment

Descriptive Questions

1. Define a medical emergency.
2. Define myocardial infarction, list nine signs and symptoms, and list eight steps for pre-hospital treatment.
3. Define angina pectoris, list six signs and symptoms, and describe pre-hospital treatment.
4. Define congestive heart failure, list eight signs and symptoms, and list four steps for pre-hospital treatment.
5. Define hypertension, list five signs and symptoms and list five steps for pre-hospital treatment.

Reference:

- Peer instructor’s guide for medical first responder course
- Brady: first responder book 8th edition
- New ACC/AHA high blood pressure guideline 13 Nov 2017
- https://en.wikipedia.org/wiki/
- www.webmd.com
- American health association journals
- Mayo clinic Emedicine.medscape.com

LESSON NO -15

Medical Emergencies, Part 2: Respiratory Emergencies

Introduction

The respiratory system allows for the exchange of gases between the body and the environment. The Respiratory system includes the following: nasopharynx, oropharynx, pharynx, larynx, trachea, vocal cords, the main stem bronchi, bronchioles, alveoli, which make up the lungs, the visceral and parietal pleura, diaphragm and intercostal muscles. Common signs of the breathing problem are difficulties in breathing or not getting enough oxygen.

Outcomes

Upon completion of this lesson you will be able to;

- Respiratory distress.
- Bronchial asthma, Chronic Obstructive Pulmonary Disease.
- Anaphylaxis and Anaphylactic shock.
- Hyperventilation.
- Identify signs and symptoms of respiratory distress & PHT.

Terminology

Asthma:- A condition in which a person's airways become inflamed, narrow & swell and produces extra mucus, which makes it difficult to breathe.

Alveoli: - The tiny air sacs of the lungs which allow for gaseous exchange.

Bronchus:- The major air passages of the lungs which diverge from the windpipe.

Mucus:- A slimy substance, typically not miscible with water, secreted by the mucous membranes and glands of animals for lubrication, protection, etc.

Hyperventilation:- abnormal breathing at the rapid rate, that increase the rate of loss of carbon dioxide that gives the bad effect on human body.

Hypocapnia:- It is also known as hypocapnia or hypocarbia, is a state of reduced carbon dioxide in the blood. Hypocapnia usually results from deep or rapid breathing, known as hyperventilation.

Respiratory Distress

Definition: Shortness of breath or feeling of air hunger with labored breathing. Respiratory distress affects one's ability to exchange oxygen and carbon dioxide.

Signs and symptoms of respiratory distress

- Inability to speak full sentences without pausing to breathe
- Noisy breathing
- Use of accessory muscles to breathe
- Tripod positioning, leaning forward, sitting upright
- Abnormal breathing rate or pattern
- Increased pulse rate
- Poor skin colour (cyanotic, pale or ashen)

PHT for Respiratory distress

Use universal precautions and secure the scene.

- Move the patient away from the contaminated area (if the cause is toxic product inhalation).
- Assess patient's breathing to determine if adequate. Provide artificial ventilation if needed. Maintain open airway.
- Position the responsive patient in a comfortable position, usually sitting upright.
- Administer oxygen if needed.
- Comfort and reassure the patient by providing emotional support
- Transport the patient as soon as possible.

Causes of medical respiratory distress: The following conditions are among the more common respiratory problems you will encounter in the field. It is not necessary to diagnose a patient's condition; in fact, the care for all respiratory conditions is essentially the same for the medical first responder.

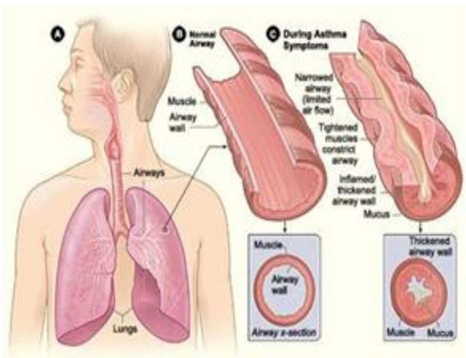
Bronchial Asthma

- A condition in which a person's airways become inflamed, narrow and swell and produce extra mucus. Bronchial asthma is an episodic illness characterized by the narrowing of the large air passages called the bronchi.
- The patient experiences difficulty in exhaling air out of the lungs. This is usually due to spasm of thin muscle that lines the bronchial walls.
- Asthma is generally triggered by allergens, strong scents, irritating gases, smoke, medications, emotions, stress, occupational infection, physical exertion and weather changes.
- The use of accessory muscles is noticeable, as the narrowing airways make it more difficult to move air out of the lungs. Dry, nonproductive cough is also frequently seen in asthma.
- You may see a hyper inflated chest with an increased anterior/posterior diameter. Wheezing becomes worse and increases in pitch.
- In severe attacks, wheezing will diminish or disappear.
- If the patient has frequent attacks and/or increased inflammation, the cycle continues with mucus plugs and increasing edema in the airways. This, in turn, causes more frequent and severe attacks.

Factors that may trigger Bronchial asthma:

- Smoking and passive smoke
- Infections such as colds, flu or Pneumonia
- Allergens such as food, pollen, mold, dust mites and pet dander
- Air pollution and toxins
- Weather, especially extreme changes in temperature
- Drugs (such as aspirin, NSAIDs and beta-blockers)
- Food additives (such as Mono
- Sodium Glutamate (MSG))
- Emotional stress and anxiety
- Singing, laughing or crying
- Perfumes and fragrances
- Acid reflux

Signs and Symptoms of Bronchial Asthma: With bronchial asthma, you may have one or more of the following signs and symptoms:



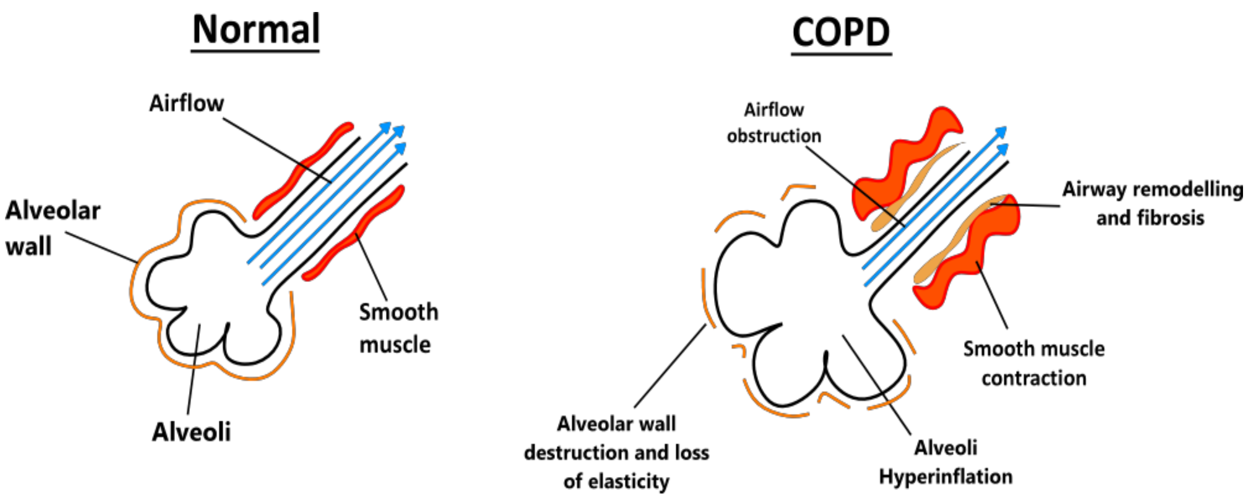
- Shortness of breath
- Tightness of chest
- Wheezing
- Excessive coughing or cough that keep you awake at night.

Pre-hospital treatment

Use universal precautions and secure the scene.

- Move the patient away from the contaminated area (if the cause is toxic product inhalation).
- Assess patient's breathing to determine if adequate, Provide artificial ventilation if needed. Maintain open airway.
- Position the responsive patient in a comfortable position, usually sitting upright.
- Administer oxygen if needed.
- Comfort and reassure the patient by providing emotional support.
- Transport the patient as soon as possible.

Chronic Obstructive Pulmonary Disease (COPD)

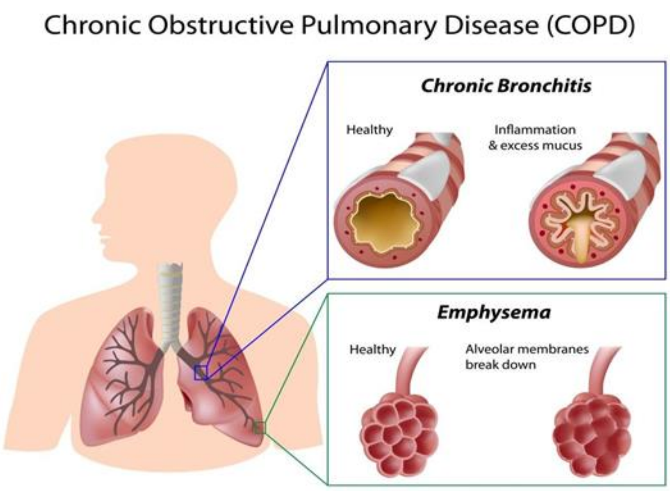


Chronic Obstructive Pulmonary Disease (COPD) is a type of obstructive lung disease characterized by long-term poor airflow. The main symptoms include shortness of breath and cough with sputum production. COPD typically worsens over the time. Eventually walking upstairs or carrying things will be difficult. Emphysema and Chronic Bronchitis are the most common forms of COPD. COPD is also known as COAD (Chronic Obstructive Air Disease) & COLD (Chronic Obstructive Lung Disease).

EMPHYSEMA causes the alveoli to lose their elastic properties and become distended. This traps air and prevents the alveoli from working correctly.

COPD usually have a history of smoking; however, it is also common among people who live in areas of high air pollution.

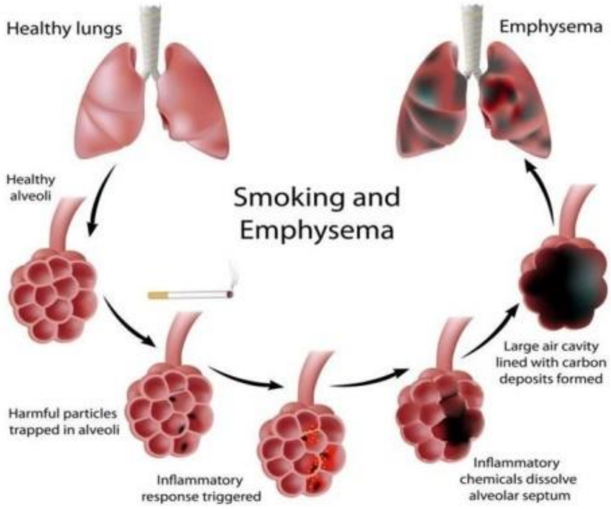
Chronic Bronchitis and



Emphysema are older terms used for different types of COPD. The term "**Chronic Bronchitis**" is still used to define a productive cough that is present for at least three months each year for two years. Most cases of COPD can be prevented by reducing exposure to risk factors.

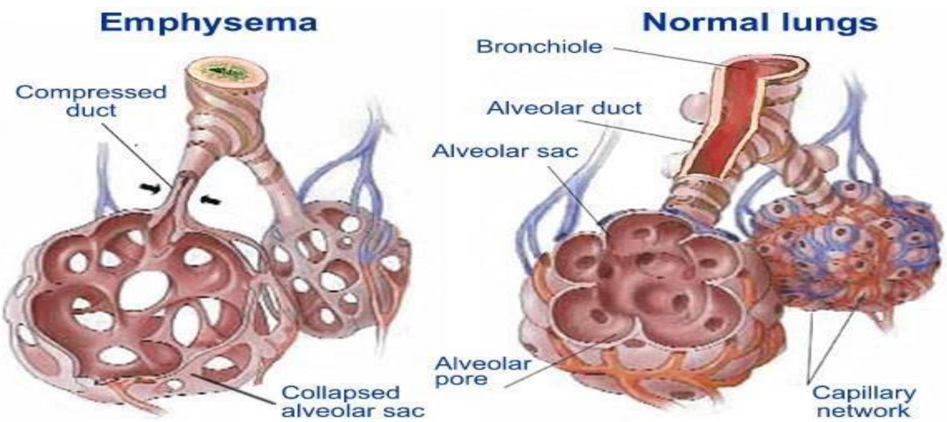
Chronic Bronchitis-signs and symptoms:

- Constant productive cough
- Shortness of breath
- Thick purulent secretion
- Severe cough
- Airway obstruction
- Hypoxia, Cyanosis
- Pulmonary



Emphysema:

- Emphysema is a long-term, progressive disease of the lungs that primarily causes shortness of breath due to over-inflation of the alveoli (air sacs in the lung).
- In Emphysema, the lung tissue involved in exchange of gases (Oxygen and Carbon Dioxide) is impaired or destroyed.
- Emphysema is called an obstructive lung disease because airflow on exhalation is slow or stopped because over-inflated alveoli do not exchange gases when a person breaths due to little or no movement of gases out of the alveoli.
- Emphysema changes the anatomy of the lung in several important ways.
- This happens due to destruction of lung tissue around smaller airways. This tissue normally holds these small airways, called bronchioles, open, allowing air to leave the lungs on exhalation.
- When this tissue is damaged, these airways collapse, making it difficult for the lungs to empty and the air (gases) becomes trapped in the alveoli.

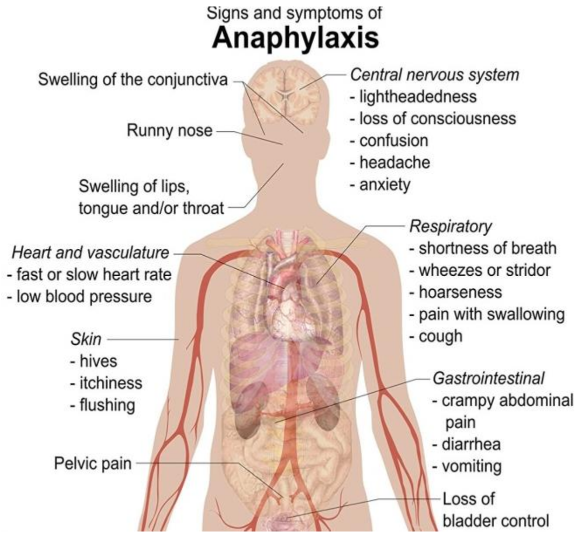


Anaphylaxis:

- Anaphylaxis is a severe, potentially life-threatening allergic reaction.
- It can occur within seconds or minutes of exposure to something you're allergic to, such as a peanut or the venom from a bee sting.
- The flood of chemicals released by your immune system during anaphylaxis can cause you to go into shock; your blood pressure may drops suddenly.
- Signs and symptoms of anaphylaxis include a rapid, weak pulse, a skin rash, and nausea and vomiting. Common triggers of anaphylaxis include certain foods, some medications, insect venom and latex.
- Anaphylaxis requires an immediate trip to the emergency department and an injection of epinephrine. If anaphylaxis isn't treated right away, it can lead to unconsciousness or even death.

Anaphylaxis symptoms include:

- Skin reactions, including hives along with itching and flushed or pale skin (almost always present with anaphylaxis).
- A feeling of warmth
- The sensation of lump in your throat.
- Constriction of the airways and a swollen tongue or throat, which can cause wheezing and trouble breathing.
- A weak and rapid pulse
- Nausea, vomiting or diarrhea
- Dizziness or fainting



A number of allergens can trigger anaphylaxis, depending on what you're allergic to.

Common anaphylaxis triggers include:

- Certainmedications, especially penicillin.
- Foods, such as peanuts, tree nuts (walnuts, pecans, almonds, cashews) wheat (in children), fish, shellfish, milk and eggs.

Insect stings from bees, yellow jackets, wasps, hornets.

Causes of Anaphylaxis include:

- Latex
- Medications used in anesthesia
- Exercise

There aren't many known risk factors for anaphylaxis, but some things that may increase your risk include:

Personal history of anaphylaxis: If you've experienced anaphylaxis once, your risk of having this serious reaction increases. Future reactions may be more severe than the first reaction.

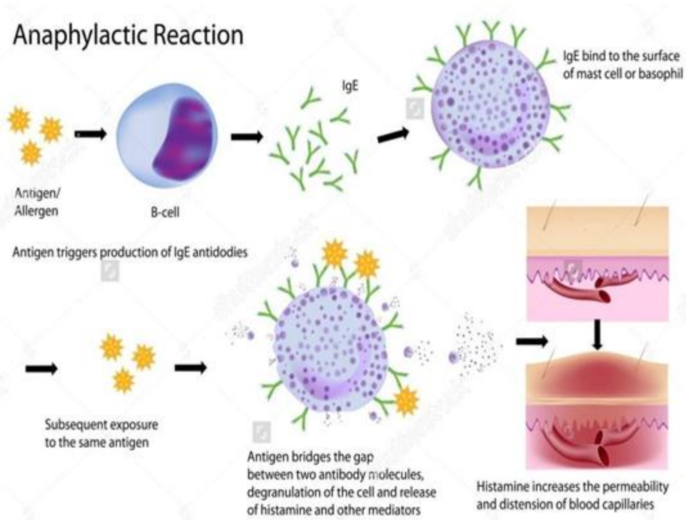
A family history: If you have family members who've experienced exercise-induced anaphylaxis, your risk of developing this type of anaphylaxis is higher than it is for someone without a family history.

An anaphylactic reaction can be life-threatening when a severe attack occurs; it can stop breathing or stop your heartbeat. In this case, you'll need Cardio-Pulmonary Resuscitation (CPR) and other emergency treatment right away.

Anaphylactic Shock

Definition: A life-threatening reaction of the body caused by something to which the patient is extremely allergic.

This condition represents a true emergency where immediate transportation to a medical Centre is imperative. Anaphylactic reactions (anaphylaxis) are sudden, widespread, potentially severe and life- threatening allergic reaction.



Causes of anaphylactic shock:

- Insect stings, including wasps, bees and ant bites
- Foods and spices (especially shellfish)
- Food allergy is the most common cause of anaphylaxis although several other allergens may also trigger the problem like – insect stings, medications or latex – are other potential triggers
- Inhaled substances, including dust and pollen
- Chemicals inhaled or in contact with the skin
- Medications injected or taken by mouth, such as penicillin

Signs of anaphylactic shock:

- ***Skin**:* May be swollen with burning and itching. Face and tongue may also be swollen (Odema).
- ***Breathing:*** Difficult and rapid breathing with possible wheezing.
- ***Pulse:*** Rapid, weak or not detected.
- ***State of consciousness:*** The patient may be restless and often becomes unconscious

How long does it take to go into anaphylactic shock?

If air ways narrow and throat swells, which can block breathing. Victim's blood vessels widen, making the blood pressure fall, sometimes to dangerous level. Anaphylactic reactions usually happen fast. Symptoms often get the most severe within **three to 30 minutes** after the exposure.

Anaphylactic shock is a term that specifically refers to an episode of anaphylaxis where the person goes into a state of shock due to poor blood circulation that deprives the body of oxygen and nutrients.

Pre-Hospital Treatment for Anaphylactic shock:

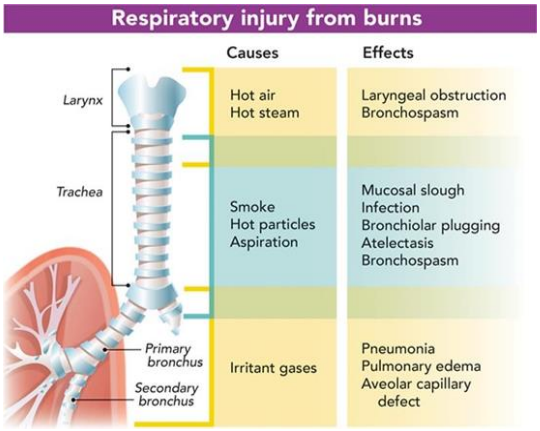
- When interviewing the patient, ask about allergies to anything and if he or she was in contact with that substance.
- As with any type of shock treat the patient with total care (see pre-hospital treatment for shock).
- The patient needs medications to combat the allergic reaction.
- Transport the patient immediately.

Hyperventilation

- Hyperventilation is a condition characterized by breathing too fast. It is normal for most people, such as when they are frightened, as long as the rate of breathing quickly returns to normal.
- Hyperventilation syndrome is an abnormal state in which rapid breathing persists.
- It is commonly associated with anxiety.
- Symptoms include rapid and deep breathing, chest pain, dizziness, faintness and numbness around the mouth, hands and feet.
- Not every patient who is breathing rapidly or deeply is hyperventilating. Several serious conditions may be the cause, including fever, infections, trauma, diabetes or overdose.
- **Hyperventilation is a relatively common respiratory emergency that can often be corrected by reassuring the patient and providing emotional support.**
- If the patient does not respond immediately, administer oxygen if needed; this will not make hyperventilation worse.

Hyperventilation signs and symptoms:

- Tingling and numbness in the hands and around the mouth
- Deep, rapid respiration with rapid pulse
- Anxiety, escalating to panic
- Dizziness, syncope
- Fingers and hands down into a claw like spasm



First aid

- Try to calm and reassure
- Provide emotional support
- Administer oxygen if required

Signs and symptoms of toxic product inhalation:

- Irritation and inflammation of air passages, eyes and nose.
- Altered frequency and depth of breathing
- Possible cardio- respiratory arrest
- Singed nasal hairs
- Dusty grey spittle
- Wheezing and noisy breathing
- Coughing
- Hoarseness

Pre-Hospital Treatment for toxic product inhalation

Use universal precautions and secure the scene.

- Remove the patient from the contaminated area.
- Conduct initial assessment and apply Basic Life Support as necessary.
- If the patient is breathing and does not have any signs of neck or spinal trauma, place the patient in a comfortable seated position.
- Administer oxygen as per local protocol.
- Treat for shock.

  Transport the patient as soon as possible.

Unit Summary

Bronchial Asthma

In which a person's airways become inflamed, narrow and swell, and produce extra mucus. Bronchial asthma is an episodic illness characterised by the narrowing of the large air passages called the bronchi. Asthma has many known "triggers," including physical exertion, allergens, medications, occupational infection, emotions and stress.

Chronic Obstructive Pulmonary Disease (COPD)

It is a type of obstructive lung disease characterized by long-term poor airflow. The main symptoms include shortness of breath and cough with sputum production. COPD typically worsens over the time. Eventually walking up stairs or carrying things will be difficult.

Emphysema

Emphysema is a long-term, progressive disease of the lungs that primarily causes shortness of breath due to over-inflation of the alveoli and loosing of elasticity (air sacs in the lung). In people with Emphysema, the lung tissue involved in exchange of gases (Oxygen and Carbon Dioxide) is impaired or destroyed. **Emphysema is called an obstructive lung disease**.

Anaphylaxis

Anaphylaxis is a severe, potentially life-threatening allergic reaction. It can occur within seconds or minutes of exposure to something you are allergic such as a peanut or the venom from a bee sting.

Anaphylactic Shock

A life-threatening reaction of the body caused by something to which the patient is extremely allergic. This condition represents a true emergency where immediate transportation to a medical Centre is imperative. Anaphylactic reactions (anaphylaxis) are sudden, widespread, potentially severe and life-threatening allergic reaction.

Hyperventilation

Hyperventilation is a condition characterized by breathing too fast. It is normal for most people, such as when they are frightened, as long as the rate of breathing quickly returns to normal. Hyperventilation syndrome is an abnormal state in which rapid breathing persists.

Self-Assessment

Objective Questions:

1. Which is not a cause of Respiratory distress?
   a. Bronchial asthma
   b. Chronic Obstructive Pulmonary Disorders (COPD)
   c. Anaphylaxis
   d. CVA
2. Hot air or gases more than may cause thermal inhalation injury.
   a. 45°C
   b. 55°C
   c. 50°C
   d. 60°C

3. In anaphylactic shock the condition of the victim may be most severe within.
   a. 3 to 30 minutes
   b. 5 to 50 minutes
   c. 4 to 40 minutes
   d. 2 to 20 minutes
4. ----------is an episodic illness characterised by the narrowing of the large air passages called the bronchi.
   a. Heart attack
   b. Asthma
   c. Allergy
   d. Anaphylactic
5. COPD is known as….
   a. COAD
   b. COLD
   c. Both a and b
   d. None of these
6. Bronchial asthma is an …..
   a. Nasal disease
   a. Alveolar disease
   b. Both a and b
   c. Bronchus disease

Descriptive Questions:

1. Define respiratory distress. List four causes, Sign and symptoms and PHT of respiratory distress.
2. List eight signs and symptoms and PHT of toxic product inhalation.
3. Write down the sign and symptoms of Bronchial Asthma.
4. Write down the difference between Bronchial Asthma and COPD.
5. Write down the difference between Anaphylaxis and Anaphylactic shock.

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- Wikipedia: the free encyclopedia & Mayo clinic

LESSON-16

Medical Emergencies Part: 3
(Seizures, Diabetic Emergencies and Cerebral Vascular Accidents)

Introduction

This lesson deals with conditions which cause altered mental status in which patients are found to be confused or disoriented. Altered mental status is most commonly associated with Seizures, Diabetic Emergencies and Cerebral Vascular Accidents (CVA).

Epilepsy is the tendency to have seizures that start in the brain. The brain uses electrical signals to pass messages between brain cells. If these signals are disrupted, this can lead to a seizure. Epilepsy is usually diagnosed when someone has had more than one seizure.

Outcomes

Upon completion of this lesson, you will be able to:

- Seizure.
- Steps for the Pre-Hospital Treatment for seizures when arriving while the patient is still having a seizure.
- Additional steps for the Pre-Hospital Treatment for seizures to take after the seizure is over.
- Seven signs and symptoms of Hyperglycemia and list three steps for Pre-Hospital Treatment.
- Signs and symptoms of Hypoglycemia and describe Pre-Hospital Treatment.
- Signs and symptoms for a Cerebral-Vascular Accident (CVA).

Terminology

Convulsion: - A sudden, violent, irregular movement of the body, caused by involuntary contraction of muscles and associated especially with brain disorders such as epilepsy, the presence of certain toxins or other agents in the blood, or fever in children.

Status-Epilepticus: - A dangerous condition in which epileptic fits follows one another without recovery of consciousness between them.

Neurotransmitter:- A chemical substance which is released at the end of a nerve fiber by the arrival of a nerve impulse and, by diffusing across the synapse or junction, effects the transfer of the impulse to another nerve fibre, a muscle fiber, or some other structure.

Brain Tumor: - A brain tumor is a collection, or mass, of abnormal cells in your brain. Your skull, which encloses your brain, is very rigid. Any growth inside such a restricted space can cause problems. Brain tumors can be cancerous.

Ischemia: - It is a restriction in blood supply to tissues, causing a shortage of oxygen that is needed for cellular metabolism (to keep tissue alive). **Ischemia** is generally caused by problems with blood vessels, with resultant damage to or dysfunction of tissue.

SEIZURES: Seizures are caused by a nervous system malfunction. If the normal functions of the brain are upset, its electrical activity can become irregular. A seizure can cause a sudden change in a person's sensations, behaviour and/or movements.

Some seizures involve uncontrolled muscular movements called convulsions. Having seizures is not a disease in itself, but rather a sign of some underlying defect, injury or disease.

A seizure can be defined as abnormal, uncontrolled electrical activity in brain cells. Nerve cells transmit signals to and from the brain in two ways by altering the concentrations of salts (Sodium, Potassium, Calcium) within the cell.

Causes of seizures

- Failure to take anti-seizure medication
- Chronic medical conditions
- Epilepsy
- Hypoglycemia
- Poisoning, including alcohol and drug poisoning
- Cerebral Vascular Accident (CVA)
- Fever (most common in children under the age 6)

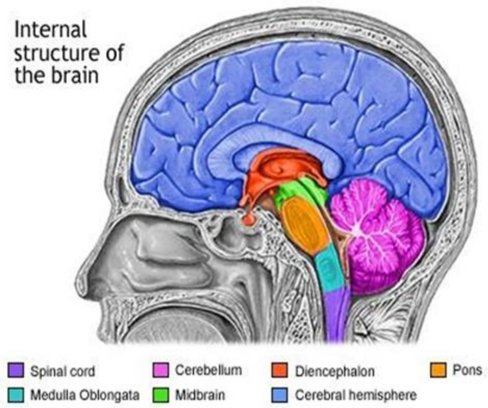
- Infection
- Head injury or brain tumours
- Hypoxia (decreased levels of Oxygen in the blood)
- Eclampsia (a severe complication of pregnancy)

Epilepsy

- Epilepsy is an organic neurological illness, perhaps the best known of the conditions that causes seizures.
- Some people are born with it and others develop it after a head injury or surgery.
- Continuous use of medication allows most epileptics to live normal lives without seizures.
- Epilepsy is an organic illness that can present itself in different forms.
- Some episodes of convulsions are very pronounced (grand mal) and some convulsions are almost undetectable (absence or petit mal).
- An epileptic convulsive episode can repeat itself an indefinite number of times.

Causes: Epilepsy occurs when permanent changes in the brain cause it to be too excitable or irritable. As a result, the brain sends out abnormal signals. This leads to repeated, unpredictable seizures. (A single seizure that does not happen again is not epilepsy.)

Epileptic seizures usually begin between ages 5 and 20. There is also a higher chance of seizures in adults older than 60. But epileptic seizures can happen at any age. There may be a family history of seizures or epilepsy Epilepsy may be due to a medical condition or injury that affects the brain. Or the cause may be unknown (idiopathic)



Repeated seizures in which consciousness or normal behavior is not regained between them (Status Epilepticus)

Febrile Seizure: - A febrile seizure is a convulsion in a child triggered by a fever. Fever is a common cause of seizures in children less than 6 years of age. It is the rapid rise in body temperature, rather than the temperature itself, that causes the seizure. It can repeat itself many times. All children who have suffered a seizure require medical evaluation.

Causes: A temperature of 100.4°F (38°C) or above may cause febrile seizures in children. A febrile seizure can be frightening for any parent or caregiver. Most of the time, a febrile seizure does not cause any harm. The child usually does not have a more serious long-term health problem.

Febrile seizures occur most often in otherwise healthy children between ages 6 months and 5 years. Infants are most commonly affected. Febrile seizures often run in families.

Most febrile seizures occur in the first 24 hours of an illness. It may not occur when the fever is highest. A cold or viral illness may trigger a febrile seizure.

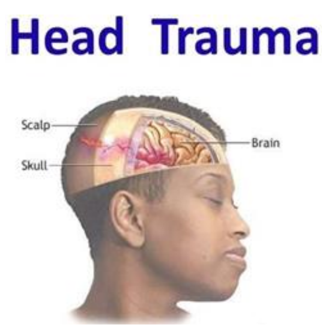
Symptoms: A febrile seizure may be as mild as the child's eyes rolling or limbs stiffening. A simple febrile seizure stops by itself within a few seconds to 10 minutes. It is often followed by a brief period of drowsiness or confusion.

Symptoms may include any of the following:

- Sudden tightening (contraction) of muscles on both sides of a child's body. The muscle tightening may last for several seconds or longer.
- The child may cry or moan.
- If standing, the child will fall.
- The child may vomit or bite their tongue.
- Sometimes, children do not breathe and may begin to turn blue.
- The child's body may then begin to jerk rhythmically. The child will not respond to the parent's voice.
- Urine may be passed.

A seizure lasting longer than 15 minutes, is in just one part of the body, or occurs again during the same illness is not a normal febrile seizure.

Head Trauma



✓ A head injury is any sort of injury to your brain, skull, or scalp.
✓ This can range from a mild bump or bruise to a traumatic brain injury.
✓ Common head injuries include concussions, skull fractures, and scalp wounds.
✓ Head injuries may be either closed or open.
✓ An open, or penetrating, head injury is one in which something breaks your skull and enters your brain.
✓ It can be hard to assess how serious a head injury is just by looking. Some minor head injuries bleed a lot,
✓ While some major injuries don‘t bleed at all.

It‘s important to treat all head injuries seriously and get them assessed by a doctor. Patient with a brain injury may have a seizure immediately or it might be delayed. A hematoma may form inside the skull, causing increased pressure and resulting in a seizure. It is very important to obtain a thorough patient history to determine whether the patient has fallen or received any type of head trauma.

Signs and symptoms of a seizure:

The most common type of seizure you will respond to is a Grand Mal, or Generalized seizure. There are four phases in this type of seizure:

1) **Aura Phase:** The patient becomes aware that the seizure is coming on, usually described as an unusual smell or flash of light, usually lasting only seconds.
2) **Tonic Phase:** Patient become unresponsive and collapse. All the muscles of the body contracts. The body becomes rigid and the patient may stop breathing. May become incontinent.
3) **Clonic Phase:** The patient convulses violently. May foam at the mouth or droll and may become cyanotic.
4) **Postical Phase:** Begins when convulsion stops. A patient gradually regains consciousness. Headache is common.

Pre-Hospital Treatment for Seizures:

Use universal precautions and secure the scene. If you arrive while the patient is still having a seizure, begin at

Step 1: Place patient gently on the floor and move any objects that patient might strike.
Step 2: Stay calm and wait. Do not force anything into the patient‘s mouth. The seizure should be over in a few minutes.
Step 3: Loosen restrictive clothing. Do not restrain patient.
Step 4: Place the patient on his/her side to prevent aspiration.

If you arrive after the seizure is over, begin at Step 5:

Step 5: Assess and monitor airway and breathing.
Step 6: Treat any injuries the patient may have sustained during convulsions.
Step 7: Place the patient in recovery position (if you do not suspect spinal injury).
Step 8: Administer oxygen if needed.
Step 9: Comfort and reassure the patient.

For febrile seizures in children, lower the patient‘s temperature with tepid water with a bath sponge or washcloth. Transport the patient.

Diabetic Emergencies

Diabetics may experience life-threatening emergencies from too much or too little Insulin in their bodies. Too much Insulin can cause a low sugar level (hypoglycemia), which can lead to insulin shock. Not enough insulin can cause a high level of sugar (hyperglycemia), which can cause a diabetic coma roughly half of the energy required by the body is supplied by glucose and a stored carbohydrate called Glycogen

Insulin: Insulin is a hormone made by the pancreas that helps the body store and use glucose. Insulin is responsible for delivering that glucose (sugar) from the bloodstream into muscle, fat, liver, and most other cells so that your body can use it for fuel. Insulin helps keeps your blood sugar level from getting too high (Hyperglycemia) or too low (Hypoglycemia)

Secretion of insulin: Insulin is synthesized in significant quantities only in beta cells in the pancreas. It is secreted primarily in response to elevated blood concentrations of glucose. Insulin thus can regulate blood glucose and the body senses and responds to rise in blood glucose by secreting insulin.

DIABETES

Diabetes is a disease in which blood glucose levels are above normal. Most of the food we eat is turned into glucose, or sugar, for our bodies to use for energy. The pancreas, an organ that lies near the stomach, makes a hormone called Insulin to help glucose get into the cells of our bodies. When you have diabetes, your body either doesn't make enough insulin or can't use its own insulin as well as it should. This causes sugar to build up in your blood.

Types of Diabetes:-

1. **Type 1 diabetes**
2. **Type 2 diabetes**
3. **Type 3 Gestational diabetes**

Type 1 Diabetes occurs when there is no or very low production of Insulin from the pancreatic beta cells. Patients with Type 1 Diabetes Mellitus depend on external Insulin (most commonly injected subcutaneously) for their survival.

Type 2 Diabetes Mellitus the demands of Insulin are not met by the amount produced by the pancreatic beta cells. This is termed Insulin resistance or "relative" Insulin deficiency.

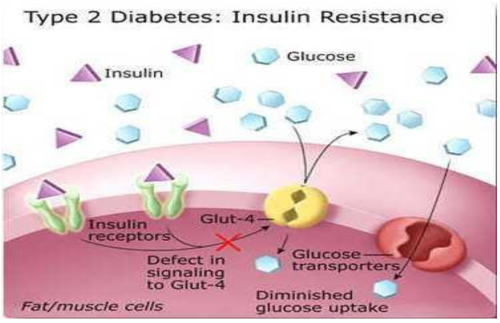
Type 3 Gestational diabetes is a type of diabetes that only pregnant women get. If not treated, it can cause problems for mothers and babies. Gestational diabetes develops in 2% to 10% of all pregnancies but usually disappears when a pregnancy is over.

TYPE 2 DIABETES: Type 2 diabetes is the most common form of diabetes.

Signs and Symptoms of Type 2 diabetes often develop slowly. In fact, you can have type 2 diabetes for years and not know it. Look for:

- **Increased thirst and frequent urination.**

Excess sugar building up in your bloodstream causes fluid to be pulled from the tissues. This may leave you thirsty. As a result, you may drink — and urinate — more than usual.



- **Increased hunger.** Without enough insulin to move sugar into your cells, your muscles and organs become depleted of energy. This triggers intense hunger.
- **Weight loss.** Despite eating more than usual to relieve hunger, you may lose weight. Without the ability to metabolize glucose, the body uses alternative fuels stored in muscle and fat. Calories are lost as excess glucose is released in the urine.
- **Fatigue.** If your cells are deprived of sugar, you may become tired and irritable.
- **Blurred vision.** If your blood sugar is too high, fluid may be pulled from the lenses of your eyes. This may affect your ability to focus.
- **Slow-healing sores or frequent infections.** Type 2 diabetes affects your ability to heal and resist infections.
- **Areas of darkened skin.** Some people with Type 2 diabetes have patches of dark, velvety skin in the folds and creases of their bodies — usually in the armpits and neck. This condition, called acanthosis nigricans, may be a sign of Insulin resistance.

Long-Term Effects: Over time, high blood sugar can damage and cause problems with your:

- Heart and blood vessels
- Kidneys
- Eyes
- Nerves, which can lead to trouble with digestion, the feeling in your feet, and your sexual response
- Wound healing
- Pregnancy

Hyperglycemia

High blood sugar (Hyperglycemia) affects people who have diabetes. Several factors can contribute to hyperglycemia in people with diabetes, including food and physical activity choices, illness, non-diabetes medications, or skipping or not taking enough glucose-lowering medication. It's important to treat Hyperglycemia, because if left untreated, Hyperglycemia can become severe and lead to serious complications requiring emergency care, such as a diabetic coma. In the long term, persistent Hyperglycemia, even if not severe, can lead to complications affecting your eyes, kidneys, nerves and heart.

Diabetics may suffer from increased blood sugar, or Hyperglycemia. This condition is basically one of too much sugar and too little Insulin.

Common causes of Hyperglycemia include:

- Infection
- Failure of patient to take insulin, or takes insufficient amount
- Eating excessive sugar
- Increased or prolonged stress

Signs and symptoms of Hyperglycemia:

- Gradual onset
- Sweet, fruity breath
- Flushed, dry skin
- Hunger or thirst
- Rapid weak pulse
- Frequent urination
- Intoxicated appearance, staggering, slurred speech

The onset of severe hyperglycaemia is gradual. In most cases it develops over a period of **12 to 48** hours. At first, the patient experiences excessive hunger, thirst, and urination. The patient appears extremely ill, becoming weaker and worsen in gas the condition progresses.

If left untreated, the patient may die. Even with treatment, recovery is also gradual, occurring 6 to 12 hours after insulin and intravenous fluid are administered. A hyperglycaemic emergency is also called a diabetic coma, although the patient is not usually found in a coma.

Pre-Hospital Treatment for Hyperglycemia:

Use universal precautions, secure the scene and alert local EMS. Never give patients who cannot control their airways anything to eat or drink.

- Perform initial assessment and obtain patient history.
- Administer glucose. When in doubt, give sugar.
- Reassess and transport the patient. Position the patient appropriately.

This condition consists of low blood sugar, and can be the result of one or two conditions. One is too much insulin in the bloodstream. The other is too little sugar in the bloodstream. People with diabetes are not the only ones who can suffer from low blood sugar. Alcoholics, anyone having ingested certain poisons, and people who are ill are also at risk.

Some common causes of low blood sugar are:

- Skipped meals, particularly for diabetics
- Vomiting, especially with illness
- Strenuous exercise
- Physical stress from extreme heat or cold
- Emotional stress
- Accidental overdose of insulin

The onset of severe hypoglycaemia is sudden. The most recognised cause of hypoglycaemia is the accidental overdose of insulin by a patient with diabetes. After time, diabetes cause visual impairment in patients. This can make it very hard for patients to give themselves the proper amount of insulin. The result is an insulin overdose and hypoglycaemia.

Signs and symptoms of Hypoglycemia

- Rapid onset of altered mental status
- Intoxicated appearance, staggering, slurred speech
- Atypical behavior
- Combativeness and/or anxiety
- Rapid pulse rate
- Cool, clammy skin
- Hunger
- Headache
- Seizures

Pre-Hospital Treatment for Hypoglycemia:

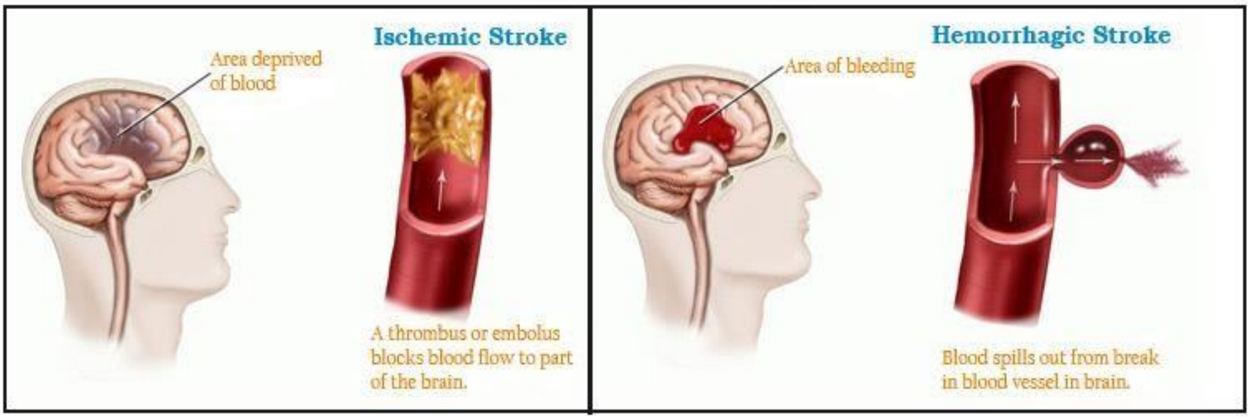
Use universal precautions, secure the scene and alert local EMS. Never give patients who cannot control their airways anything to eat or drink.

- Perform initial assessment and obtain patient history.
- Administer glucose. When in doubt, give sugar.
- Reassess and transport the patient. Position the patient appropriately.

COMPARISON CHART		
	HYPERGLYCAEMIA	**HYPOGLYCAEMIA**
ONSET	Gradual, over a period of days	Sudden, within minutes.
CAUSES	Insulin insufficiency due to failure to take any or enough insulin	Too much insulin, or inability to adjust to new dosage Inadequate food intake
	Eating too much food that Contains or produces sugar Infection Stress	Vomiting, Excessive exercise, Emotional excitement

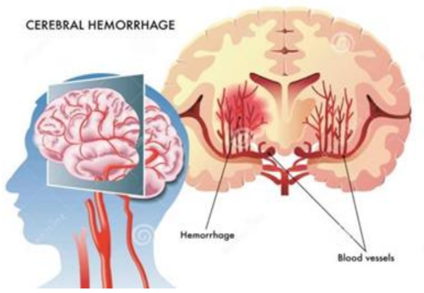
Cerebral Vascular Accident (CVA): ***Cerebrovascular Accident****: The sudden death of some brain cells due to lack of oxygen when the blood flow to the brain is impaired by blockage or rupture of an artery to the brain. Cerebrovascular accident (CVA) is the medical term for a stroke.*

Types of Stroke



A **stroke** occurs when the blood supply to your brain is interrupted or reduced. This deprives your brain of oxygen and nutrients, which can **cause** your brain cells to die. A stroke may be caused by a blocked artery (**Ischemic stroke**) or the leaking or bursting of a blood vessel (**Hemorrhagic stroke**).

Cerebral Thrombosis: Result of a clot obstructing a cerebral artery, preventing the flow of oxygenated blood to a portion of brain.



Cerebral Hemorrhage: The result of a cerebral artery breaking, leaving an area of the brain without blood supply The blood that comes out of this artery creates intracranial pressure to the brain and interferes in the brain's functions.

Signs and symptoms of CVA:

These vary depending on the location and extent of damage:

- Headache – may be the first and only symptom
- Fainting (syncope)
- Altered mental status
- Tingling or paralysis of the extremities or face
- Difficulty in speaking
- Blurred vision
- Convulsions and/or seizures
- Unequal pupils
- Loss of bladder or bowel control

Note :- The risk of having a CVA increases with age.

Pre-Hospital Treatment for CVA

Use universal precautions and secure the scene.

- Instruct the patient to stop all movement.
- Place the responsive patient in a comfortable position, usually semi- reclining or sitting.
- Maintain open airway.
- Administer oxygen. If needed, provide artificial ventilation or CPR.
- Loosen restrictive clothing.
- Maintain body temperature as close to normal as possible.
- Comfort and reassure the patient.
- Continue to monitor the patient's vital signs.

Note:- When immobilising the patient, protect the paralysed part.

Unit Summary

Seizure

Seizures are caused by a nervous system malfunction. If the normal functions of the brain are upset, its electrical activity can become irregular. A seizure can cause a sudden change in a person's sensations, behaviour and/or movements.

Phases of seizure

1) Aura Phase
2) Tonic Phase
3) Clonic Phase
4) Postical Phase

Epilepsy

Epilepsy is an organic neurological illness, perhaps the best known of the conditions that causes seizures. Some people are born with it and others develop it after a head injury or surgery. Epilepsy occurs when permanent changes in the brain cause it to be too excitable or irritable. As a result, the brain sends out abnormal signals.

Diabetic Emergencies

Diabetics may experience life-threatening emergencies from too much or too little insulin in their bodies. Too much Insulin can cause a low sugar level (hypoglycemia), which can lead to insulin shock. Not enough insulin can cause a high level of sugar (hyperglycemia), which can cause a diabetic coma roughly half of the energy required by the body is supplied by glucose and a stored carbohydrate called Glycogen.

Cerebrovascular accident: The sudden death of some brain cells due to lack of oxygen when the blood flow to the brain is impaired by blockage or rupture of an artery to the brain. Cerebrovascular accident (CVA) is the medical term for a stroke.

Pre-Hospital Treatment for CVA

Use universal precautions and secure the scene.

- Instruct the patient to stop all movement.
- Place the responsive patient in a comfortable position, usually semi- reclining or sitting.
- Maintain open airway.
- Administer oxygen. If needed, provide artificial ventilation or CPR.
- Loosen restrictive clothing.
- Maintain body temperature as close to normal as possible.
- Comfort and reassure the patient.
- Continue to monitor the patient‘s vital signs.

Note:- *When immobilising the patient, protect the paralysed part.*

Self-Assessment

Objective Questions:

1. Insulin is a....
   a. Virus
   b. Hormone
   c. Enzyme
   d. Hormone

2. Onset of____is sudden
   a. Hyperglycemia
   b. Hypoglycemia
   c. Diabetes
   d. AIDS

3. Temperature of .... or above may cause febrile seizures in children.
   a. 100.4°f (38°c)
   b. 101°f
   c. 102°f
   d. 99°f

4. One of the best techniques for dealing with a patient experiencing a behavioral emergency is to;
    a. Not let the patient what you are doing
    b. Not believe a thing the patient say
    c. Speak in a calm and reassuring voice
    d. Acknowledge the voices he is hearing

5. What is caused by either a clot or a rapture:
    a. Diabetic coma
    b. Narcotics overdose
    c. Stroke
    d. Hallucination

6. Seizure is…..
    a. Mass electric discharge in peripheral neuron
    b. Central neuron
    c. Central neuron situated in brain only
    d. None of these

7. Status Epileptics occurred after which phase seizure continue.
    a. Aura phase
    b. Tonic phase
    c. Clonic phase
    d. Postictal phase

8. Epilepsy is..
    a. Disease
    b. Allergy
    c. Chronic disease
    d. None of these.

9. Motor Cortex control the..
    a. Movement
    b. Vision
    c. Memory
    d. None of these

10. Type one Diabetic occurred…
    a. By Accident
    b. By birth
    c. Gradually
    d. None of these

Descriptive Questions

1. Write down the difference between Seizure and Epilepsy? What is the cause of Seizure?
2. How you will identify that a person is suffering from diabetes also write down its PHT.
3. Write down the difference between diabetic type one and diabetic type two? How will you treat the patient of CVA?
4. List the first four steps for the pre-hospital treatment for seizures when arriving while the patient is still having a seizure.
5. List seven signs and symptoms for hyperglycaemia and list three steps for pre-hospital treatment.

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- Wikipedia: the free encyclopedia
- Mayo clinic

LESSON -17

Childbirth Emergencies

Introduction

Each year more than 250,000 women around the world die from complications due to childbirth or pregnancy, with bleeding and hypertension as the leading causes. Many of these deaths are preventable by Emergency care but, the knowledge about complications of pregnancy and delivery is also playing very important role to prevent death of pregnant lady.

Sometimes complications do occur. At the scene of a birth away from a medical facility, an Emergency Medical First Responder can be the key factor in a baby's survival if something should go wrong. The mother may need his or her (First Responder) skills during the birth process to ensure safe delivery if there are complications.

Outcomes

Upon completion of this lesson, you will be able to:

- Understand the eight steps for assessment of the mother.
- Perform the seven steps for pre-hospital preparation of the mother.
- Know about the ten steps for delivery of a baby.
- The three complications of pregnancy.
- The six complications of delivery.
- Pre-hospital treatment for a breech presentation and a wrapped umbilical cord around the neck.

Terminology

Amniotic sac: It is a sac of fluid in which the foetus develops during pregnancy.

Cervix: It is the opening of the uterus in which the unborn infant passes into the vagina.

Foetus: The unborn developing baby in the uterus.

Placenta: A disk shaped organ on the inner lining of the uterus. Rich in blood vessels, it supplies nourishment and oxygen to the foetus during pregnancy. It also absorbs waste from the foetus into the mother‘s blood stream.

Or

It is the organ of pregnancy that serves as the filter between the mother and developing fetus.

Umbilical cord: An extension of the placenta through which the foetus receives nourishment while in the uterus.

Or

The structure that connects the baby to the placenta.

Uterus: The organ that contains the developing foetus or unborn infant. A special arrangement of smooth muscles and blood vessels in the uterus allow for great expansion during pregnancy and forcible contraction during labour and delivery.

Or

The muscular structure that holds the baby during pregnancy.

Vagina: Channel through which the infant passes to reach the outside **or** the birth canal.

Ovum: The unfertilized egg produced by the mother.

Birth canal: It is the interior aspect of the vagina.

Crowning: It is the bulging out of the vagina caused by the baby’s head during delivery.

Pregnancy: Sequence of events that begins with fertilization; proceeds to implantation, embryonic development and fetal development; and ideally ends with birth about 38 weeks later.

What is labor and delivery?

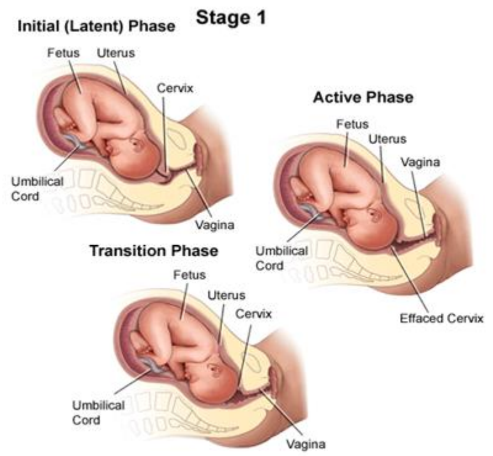
At the end of the third **trimester** (three month of pregnancy), the body will begin to show signs that it is time for the baby is to be born. The process that leads to the birth of the baby is called labor and delivery. Every labor and delivery includes certain stages, but each birth is unique. Even if you have had a baby before, the next time will be different.

Giving birth to a baby is hard work. It can also be scary, thrilling, and unpredictable. Learning all you can ahead of time will help you be ready when your time comes.

What are the stages of labor?

There are three stages of labor. The first stage includes early labor and active labor. The second stage lasts through the birth, with the baby traveling down and out of the birth canal. The third stage is after the birth, when the placenta is delivered.

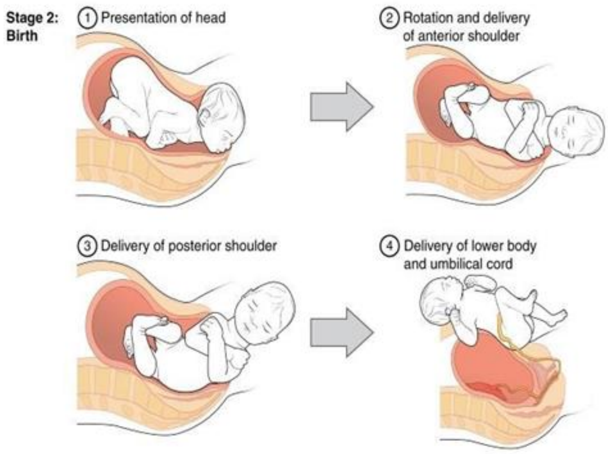
Stage one: The muscles of the uterus start to tighten (contract) and then relax. These contractions help to thin (efface) and open (dilate) the cervix so the baby can pass through the birth canal.



Stage one has three phases:

Early: Early contractions are usually irregular, and they usually last less than a minute. The early phase of labor can be uncomfortable and may last from a few hours to days.

Active: Contractions become strong and regular and last about a minute. This is the time to go to the hospital or birthing center. The pain of contractions may be moderate or intense.

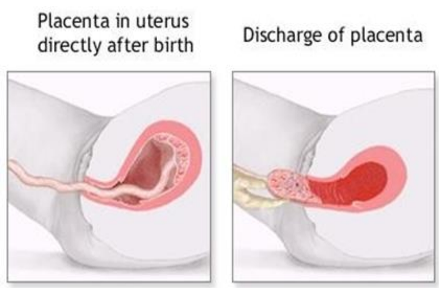


Transition: The cervix will open completely. If there are no problems, the baby should be in position to be born.

Stage two: The second stage of labor begins when the baby enters the birth canal and ends when he/she is born.

Stage three:

- This stage occurs after the baby is born.
- You have contractions until the placenta is delivered.



- But, under normal circumstances, a woman's water breaks toward the end of the dilation stage.
- When this happens, or if contractions start to come every five minutes or less, is it recommended that the mother get to the hospital as soon as possible because from here on out she will enter the next stage of labor.

Assessment of the Mother

Use universal precautions and secure the scene.

- Conduct initial assessment.

- Ask if the patient has received prenatal care (by a doctor). If patient is under the care of a doctor, get the doctor's name and telephone number. Ask the patient if the doctor has informed her of any difficulties with the pregnancy and if the delivery is to be normal. Ask when her due date is.
- Ask the patient if it is her first pregnancy. If so, the labor process will usually last close to 18 hours. The duration of labor is considerably shorter with each subsequent birth (approximately 2-3hours).
- Determine when contractions began and if the amniotic sac (water bag) has ruptured.
- Ask the patient if she feels any pressure being applied to pelvis or the urge for a bowel movement. Do not allow patient to sit on toilet.
- Determine the frequency and duration of contractions. Place a gloved hand on the patient's abdomen above the navel; feel for the involuntary tightening of the uterine muscles. Time for **duration** of contractions, from the moment the muscles tighten until they are completely relaxed. Then, time for frequency from the start of one contraction to the start of the next.
- Visual evaluation: Check for crowning or bulging in the vaginal area. If no crowning, move to next step. If the head or other part of the body is visible, prepare to deliver at the scene.
- Determine if delivery will on-site or if there is time for transport:
- If contractions are less than 2 minutes apart, prepare to deliver the baby at the scene.
  - If contractions are between 2 and 5 minutes apart, make a decision on several factors, such as whether this is the first pregnancy, if the patient feels an urge for bowel movement, traffic and weather conditions or other complications.
  - If contractions are 5 minutes or more apart, the mother usually has time for transport.

CAUTION: Do not allow the mother cross or hold her legs together to delay delivery. Death or permanent injury to the infant may result.

Pre-hospital preparation of the mother

Use universal precautions and secure the scene. Make sure to use full personal protective equipment.

- Ensure privacy for the patient (select an appropriate area).
- Have the mother lie on her back with knees bent and legs spread. Elevate the buttocks slightly by placing a blanket or towel underneath. Inspect the vaginal area but do not touch it except during delivery of the baby.
- Have an O.B. (obstetrical) kit ready and opened.
- Place a sheet or clean towel under the patient's buttocks, another under the vaginal area and another covering the legs and abdomen.
- Evaluate frequency and duration of contractions.

- Check for crowing.
- Comfort and reassure the mother. Encourage her to keep breathing slowly and comfortably. Stress the importance of relaxing between each contraction.

Delivery of the Baby:

- Place the palm of your hand against the top of the baby's head. As it emerges, apply very gentle pressure to prevent an explosive delivery. ***Do not pull the infant from the vaginal opening.***
- If the amniotic sac (water bag) has not broken, tear it or pinch it open with your fingers and pull it away from the infant's mouth and head. Do not delay this process. Never use a sharp instrument.
- If the umbilical cord is wrapped around the infant's neck, use two gloved fingers to slip the cord over the head. Only if you cannot dislodge the umbilical cord, attach two clamps three inches apart and cut between the clamps.
- Support the baby's head. The infant's head generally comes out face down and then a rotation begins toward either side. As soon as the baby's head presents, wipe the mouth and nose with sterile gauze pads. Suction the baby's mouth first, then the nose, using a rubber bulb syringe. Be sure to compress the syringe every time before inserting it.
- Support the baby with both hands as the rest of the body presents. Gently guide the baby's head downward to assist the mother in delivering the baby's upper shoulder. If the lower shoulder is slow to deliver, assist the delivery by gently guiding the baby's head upward.
- Support the baby throughout the entire delivery. Grasp the feet as they emerge. Once fully delivered, position the baby level with the mother's vagina until the umbilical cord is cut; otherwise the baby's blood could return to the placenta. The newborn is very slippery- never lift the baby by the feet. Note the exact time of delivery.
- Position, dry and wrap the baby. Place the baby on his/her side with the head slightly lower than the body. This will allow the blood and other fluids to drain from the baby's mouth and nose. Gently dry the baby with clean towels and wrap him/her in a clean warm blanket. Only the face should be exposed. Discuss and cover the use of the **APGAR** Scoring
- Assess the baby's breathing. Suction the baby's mouth and nose again, in that order. Usually the baby will start breathing on its own within 30 seconds of being birth. If not, encourage breathing by providing tactile stimulation, rubbing the back gently but vigorously, or by snapping a finger against the sole of the baby's foot. Do not lift the baby by its feet to slap its bottom! If assessment reveals shallow, slow or absent respiration, start artificial ventilation.
- Clamp and cut the umbilical cord when it stops pulsating. Palpate the cord to make sure it is no longer pulsating before clamping; do not clamp or cut the cord if it si still pulsating. Position the first clamp approximately 25 cm, from

the baby; then position the second clamp 8 cm, away from the first clamp towards the baby, then cut the cord using surgical scissors. Cord stop pulsing 5-20 minutes after the birth. After pulsating, most of this blood transfers to the baby.

Delivery of the placenta

Keep in mind that you have two patients in your care; the mother as well as the baby. Care for the mother includes helping her deliver the placenta, controlling vaginal bleeding, and making her as comfortable as possible. The third stage of labor includes the delivery of the placenta with its section of umbilical cord, membranes of the amniotic sac, and some tissues lining the uterus. All of these together are known as the afterbirth.

- Observe for delivery of placenta. This begins with a brief return of labor pains that stopped when the baby was born. You may notice a lengthening of the cord.
- Feel for contractions. Encourage the mother to bear down as the uterus contracts.
- As the placenta appears, slowly and gently guide it from the vagina, but never pull. Save the placenta in a plastic bag. In most cases, the placenta is expelled within a few minutes of delivery, but could take up to 30 minutes. Take the placenta to the hospital for examination by the physician.
- Controlling vaginal bleeding after delivery.
    - Place sanitary napkin or towel on vaginal opening. Do not place anything inside the vagina.
    - Have the mother lower her legs and keep them together without squeezing. Elevate her feet.
    - Feel the mother‘s abdomen below the navel until you feel a hard object the size of a grapefruit. This is the mother‘s uterus. If bleeding appears to be excessive, massage the uterus using circular motions; this will cause the uterus to contract and control bleeding.
    - Consider initiating breast-feeding to stimulate uterine contractions.
- Conduct ongoing assessment.

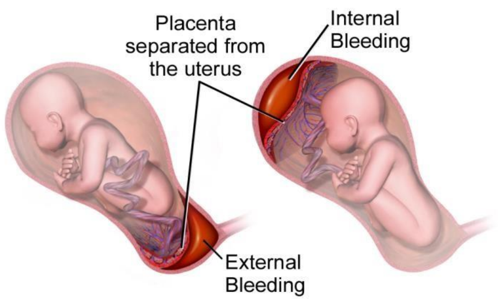
Complications of pregnancy:

There are several types of pre-delivery emergencies that may arise in the pregnant patient prior to labor or childbirth that can threaten the life of both the mother and the baby. In most cases, definitive treatment is beyond the MFR‘s level of training and immediate transport is required

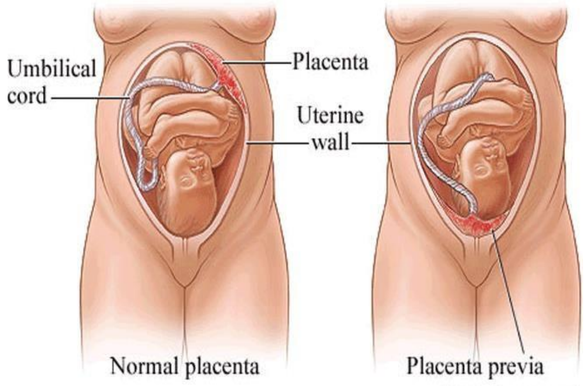
Excessive pre-birth bleeding:

A number of conditions can cause excessive pre –birth bleeding. One such condition is **placenta previa**, in which the placenta is formed in an abnormal location (low in the uterus and close to or over the cervical opening) that will not allow for a normal delivery. As the cervix dilates, it causes the placenta to tear.

Another condition is **abruptio placentae**, in which the placenta separates from the uterine wall, either partially or entirely. Both type of complication may occur in the third trimester, and both are potentially life threatening to the mother and foetus



Abruptio Placenta (Placental Abruption)



Pre- hospital treatment for pre-birth bleeding:

- Place the patient on her left side.
- Treat for shock. Elevate the patient‘s legs.
- Place a sanitary napkin or towel at vagina opening but do not place anything inside the vagina. Replace any blood soaked napkins but do not discard them. All blood soaked items should be taken to hospital for examination.
- Monitor all vital signs.
- Transport the patient.

Spontaneous abortion:

For a number of reasons, the foetus and placenta may deliver before the 28th week of pregnancy, generally before the baby can live on its own. This occurrence is called an **Abortion**. When it happens naturally it is called a spontaneous abortion, or **miscarriage**. An induced abortion results from deliberate termination of the pregnancy, in either a legal or criminal setting.

Miscarriage: It is the spontaneous natural loss of the Embryo or Fetus before the 28th week of pregnancy.

Signs and symptoms of Spontaneous abortion

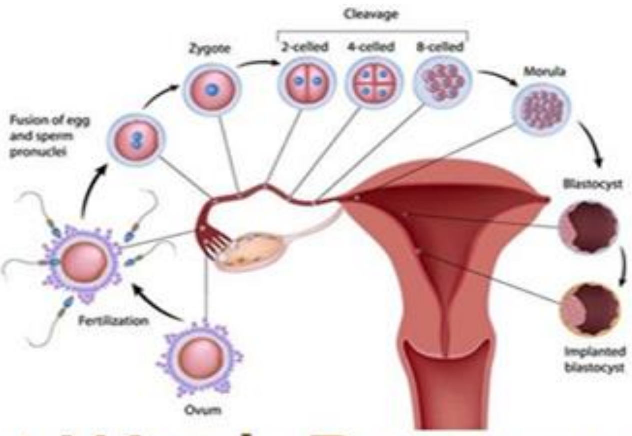
- Vaginal bleeding, ranging from moderate to severe.
- Pain in the lower abdomen, similar to menstrual cramps/first stage labor pain.
- Noticeable discharge of tissue from the vagina.

Pre- hospital treatment for spontaneous abortion:

- Treat for shock. Provide oxygen per local protocol.
- Place a sanitary towel or something similar on the opening of the vagina. Do not place anything inside the vagina.
- Keep all the blood stained towels and any expelled tissues for examination.
- Transport the patient.

Ectopic pregnancy:

In normal pregnancy, the fertilized egg will eventually implant on the wall of the uterus. In an ectopic pregnancy, the fertilized egg implants in an oviduct, in the abdominal cavity, or outside the uterus. Most commonly, Ectopic pregnancies occur within a **Fallopian tube**. These areas are not able to contain or support the growing embryo.



Or

A condition that occurs when the fertilized egg implants somewhere other than the uterus.

Fallopian tube:

It is the tube like structure that connects the ovary to the uterus.

Signs and symptoms of spontaneous abortion:

- Acute abdominal pain, usually on one side.
- Vaginal spotting or bleeding.
- Signs of shock.

Pre- hospital treatment for spontaneous abortion:

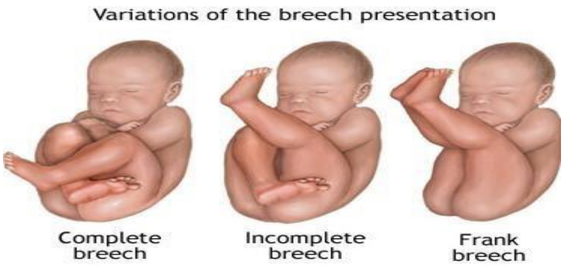
- Treat for shock. Provide oxygen per local protocol.
- Keep all the blood stained towels and any expelled tissues for examination.
- Transport the patient.

Complications of delivery:

Although most babies are born without difficulty, complications may also occur during delivery. As with complications of pregnancy, these can also threaten the life of both the mother and the baby and in many cases definitive treatment is beyond the MFR's level of training.

Unbroken amniotic sac (water bag): If the amniotic sac (water bag) has not broken, tear it or pinch it open with your fingers and pull it away from the newborn‘s mouth and head. Do not delay this process. Never use a sharp instrument!

Breech birth: This type is the most common abnormal delivery. A breech birth involves buttocks-first or both-feet-first delivery. In addition, there is an increased risk for a prolapsed umbilical cord. Whenever possible, the mother should be transported to a hospital immediately for birth.



Pre-hospital treatment for breech birth:

- Position and prepare the mother for normal delivery.
- Allow the buttocks or legs to deliver on their own- never pull.
- Support the baby with the palm of your hand. The head should follow within three minutes.
- If the head fails to deliver, maintain infant airway and transport immediately. Place the middle and index fingers of your gloved hand alongside the infant‘s face. With a finger, hold the baby‘s mouth open a little so that the baby can breathe.

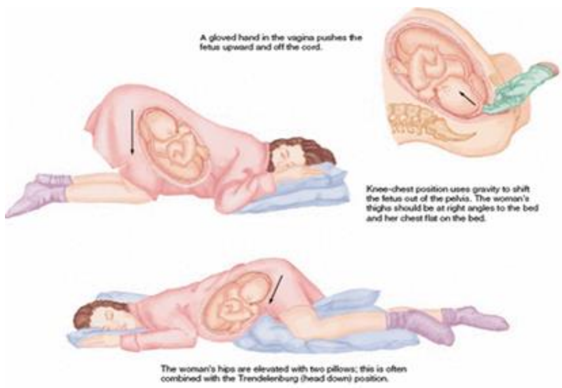
Prolapsed umbilical cord:

This is a situation in which the umbilical cord presents first (common in breech births) and is squeezed between the vaginal wall and the head of the baby. This may cause oxygen supply to the baby to be totally interrupted.

If, upon viewing the vaginal area, you see the umbilical cord presenting, the cord is prolapsed.

Pre-hospital treatment for prolapsed umbilical cord:

- Do not try to push the cord inside the vagina.
- Position the mother. Have the mother lie down on her back, tilted to the left side (if possible). Elevate her hips, using a pillow or blankets under the buttocks.
- Provide oxygen if needed.
- Wrap the exposed cord with a clean moistened towel.



- Insert a gloved hand into the vagina far enough to gently push on the baby‘s head (or buttocks), to keep pressure off the cord. You may feel the cord pulsating when the pressure is released. Prepare to stay in this position throughout transport. Transport the patient immediately.

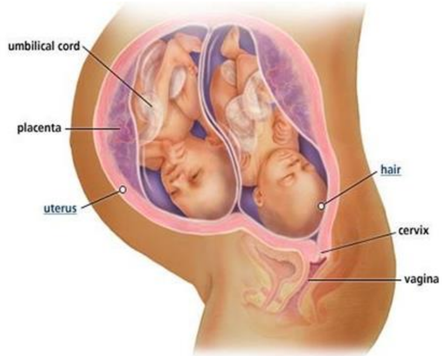
Limb presentation:

A limb presentation is a situation in which a single leg, an arm and a leg together. Or an arm and shoulder, present first. This is often accompanied by a prolapsed umbilical cord. Limb presentations cannot be delivered in the pre-hospital setting. Position the mother on her back with pelvis elevated, provide oxygen per local protocol and transport immediately. If prolapsed cord is present, apply treatment as discussed previously.

Occurs when a limb of the infant protrudes from the birth canal. Is more commonly a foot when infant is in breech presentation.

Multiple Births:

Twins are delivered the same way as single babies; in fact, since twins are smaller, delivery is often easier. Multiple birth may occur if the mother‘s abdomen is unusually large before, or remains large after, delivery. If labor contractions continue (usually within 10 minutes) after the first birth, the next delivery may be imminent.



Pre-hospital treatment for multiple births:

- Clamp or tie the cord of the first baby before the second baby is born.
- The second baby may be born before or after the placenta is delivered.
- Provide care for the babies, umbilical cords, placenta(s) and the mother as in a normal delivery.

Premature Birth:

By definition, a premature infant is one who weighs less than 2.5 kilos (5.5 lbs) or is born before the 36th week of pregnancy. Since you will probably not be able to weigh the baby, make a determination regarding prematurity based on the mother‘s information and the baby‘s appearance. The head of a premature baby is proportionately much larger, and the body is smaller and more reddish than a normal baby.

Pre-hospital treatment for a premature baby:

- Keep the baby warm.
- Maintain open airway.
- Watch the umbilical cord for bleeding.
- Provide oxygen if needed.
- Avoid contamination. Keep the baby away from people and avoid breathing directly onto the baby.

Still birth:

This is a situation in which the baby dies in the womb hours, days, or even weeks before birth. Signs of obvious death include the presence of blisters, foul odour, skin or tissue deterioration and discoloration, and a softened head. At other times, the baby may be born in cardiac or pulmonary arrest but may survive with resuscitation.

Managing a still birth:

- Do not attempt to revive the baby if it appears to have been dead for an extended period of time. Offer emotional support for the mother and relatives that might be present.
- A baby born in cardiac or pulmonary arrest should receive basic life support.
- Do not lie to the mother regarding the baby's condition, and do not prevent her from seeing the baby.
- Comply with the mother's religious beliefs and follow locals customs, laws and protocols.

Maternal complications:

Complications of emergency childbirth include the complications that occur during normal childbirth. Maternal complications include perineal tearing during delivery, excessive bleeding (postpartum hemorrhage), retained products of conception in the uterus, hypertension, and seizures.

- Vaginal Bleeding and Shock
- First trimester bleeding
- Bleeding after the first trimester and during delivery
- Bleeding after delivery (postpartum hemorrhage)
- Severe blood loss leading to shock
- Convulsions (Seizures)

Managing of baby after delivery:

- Dry, stimulate by tactile stimulation, wrap and keep warm.
- Monitor baby's vital signs, respiratory and heart rate, initiate CPR if heart rate below 60 or inadequate breathing.
- If heart rate above 100 and respiration not adequate assist with ventilations.
- Keep warm.
- Continuous monitoring any cardiovascular and or respiratory distress.
- Transport to nearest hospital

APGAR Score System

		Points	1 min	5 mins
A	**APPEARANCE (SKIN COLOUR)**			
Blue or pale extremities		0		
Pink trunk & blue extremities		1		
Completely pink		2		
P	**PULSE**			
Absent		0		
100 or less		1		
more than 100		2		
G	**GRIMACE (IRRITABILITY)**			
No response		0		
Grimace or whispers		1		
Actively cries		2		
A	**ACTIVITY (MUSCLE TONE)**			
Flaccid, limp		0		
Some flexion of extremities		1		
Active extremity motion		2		
R	**RESPIRATORY EFFORT**			
Absent		0		
Slow and irregular		1		
Strong cry		2		
TOTAL SCORE				

Ideally, scores are taken at one minute and five minutes after birth. If the neonate is not breathing, do not with hold resuscitation for an **APGAR** score.

Total score indicates the following:

- 7-10- indicates an active and vigorous newborn that requires routine care.
- 4-6- indicates a moderately depressed newborn that requires oxygen and stimulation.
- 0-3- indicates a severely depressed newborn that requires immediate resuscitation efforts.

Unit summary

Stages of labor

There are three stages of labor. The first stage includes early labor and active labor. The second stage lasts through the birth, with the baby traveling down and out of the birth canal. The third stage is after the birth, when the placenta is delivered.

Assessment and pre-hospital preparation of the mother

Use universal precautions and secure the scene.

- Conduct initial assessment.
- Ask if the patient has received prenatal care (by a doctor). If patient is under the care of a doctor, get the doctor‘s name and telephone number. Ask the patient if the doctor has informed her of any difficulties with the pregnancy and if the delivery is to be normal. Ask when her due date is.
- Ask the patient if it is her first pregnancy. If so, the labor process will usually last close to 18 hours. The duration of labor is considerably shorter with each subsequent birth (approximately 2-3hours).
- Determine when contractions began and if the amniotic sac (water bag) has ruptured.
- Ask the patient if she feels any pressure being applied to pelvis or the urge for a bowel movement. Do not allow patient to sit on toilet.
- Determine the frequency and duration of contractions. Place a gloved hand on the patient‘s abdomen above the navel; feel for the involuntary tightening of the uterine muscles. Time the **duration** of contractions, from the moment the muscles tighten until they are completely relaxed. Then, time the **frequency**, from the start of one contraction to the start of the next.
- Visual evaluation: Check for crowning or bulging in the vaginal area. If no crowning, move to next step. If the head or other part of the body is visible, prepare to deliver at the scene.

Complication of pregnancy

- Excessive pre-birth bleeding.
- Spontaneous abortion.
- Ectopic pregnancy.

Complications of delivery

- Unbroken amniotic sac (water bag).
- Breech birth.
- Prolapsed umbilical cord.
- Limb presentation.

- Multiple births.
- Premature birth.

Self-Assessment

Multiple Choice Questions:

1- What day of a typical 28-day menstrual cycle is a woman likely to ovulate?
   a. 20
   b. 14
   c. 22
   d. 28

2- The egg can be fertilized until about____after ovulation.
   a. 72 hours
   b. 24 hours
   c. 01 week
   d. 28 hours

3- How many centimeters must the cervix dilute to before a baby can be born?
   a. 05 centimeter
   b. 10 centimeter
   c. 15 centimeter
   d. 20 centimeter

4- The placenta does all of the following except:
   a. Supplies oxygen to the fetus
   b. Supplies nutrients to the fetus
   c. Supplies blood to the fetus
   d. Secretes hormones

5- During delivery of a baby, the process during which the cervix becomes nearly fully dilated and the head of the fetus begins to move in to the birth canal is called:
   a. Transition
   b. Labor
   c. Breech
   d. Crowning

6- What happens during the first stage of labor?
   a. The cervix becomes fully dilated.
   b. The baby shifts in a head-down position
   c. The junction of the pubic bones loosens to permit expansion of the pelvic girth
   d. All of the above occur during the first stage of labor.

7- Which one is not the complication of pregnancy?
  a. Excessive pre-birth bleeding
  b. Spontaneous abortion.
  c. Ectopic pregnancy.
  d. Still birth.

8- This is usually the first sign of pregnancy.
  a. Thinning hair
  b. Immediate weight gain
  c. A missed menstrual period
  d. Nausea

9- How many stages of labor
  a. One.
  b. Two.
  c. Three.
  d. Four.

10- Where will you clamp the umbilical cord.
  a. Clamp approx 25 cm from baby.
  b. Clamp approx 08 cm toward baby.
  c. First clamp approx 25 cm from baby and second clamp approx 08 cm away from 1st clamp toward the baby.
  d. None of the above.

Descriptive Question:

1. What is pregnancy? Write the stages of labor and explain.
2. Write the steps for assessment of the mother?
3. Write the pre-hospital preparation of the mother?
4. Write the steps for delivery of the baby.
5. Write the steps for delivery of the placenta. Write the complication of pregnancy?

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- First Responder, Bergeron, Le Baudour, 8th Edition, Brady
- Tortora G., Derrickson B. Principles of Anatomy and Physiology; Wiley 2011; Ch 29, p1181.
- Wikipedia

LESSON-18

Lifting and Moving Patients

Introduction

The proper and efficient use of body mechanics for a rescuer during lifting and moving of the patient/victim from the incident sites or operational sites for better cureness and immediate proper treatment. Before lift or move a patient or an object, it is very important to make plan that what and how we have to do for successful completion. Before lift and move to a patient or object we will have to ensure or estimate the load or weight, if required then can take additional help also. But never try to lift or move which is beyond in your level.

Outcomes

Upon completion of this lesson, you will be able to:

- Define Body Mechanics.
- Explain three Emergency Moves and two Non-Emergency Moves for lifting and moving a patient.
- Demonstrate the techniques for immobilizing and transporting a patient, using a backboard
- Explain five examples of situations that might require you to make an Emergency Move with a patient.

Terminology

Principle of moving patient

When to move a patient: In general, an Emergency Medical Responder should only move a patient when absolutely necessary. Your primary role is to assess the patient, provide Basic Emergency Care, and continue to monitor the patient' condition until more advanced personnel arrives. Situations in which it may be necessary to move a patient include the presence of a dangerous environment where the patient is at risk for further injury; when you cannot adequately assess Circulation, Airway & Breathing (CABs) or Bleeding; or when you are unable to gain access to other patients who need life-saving care. You may also be called on to assist other EMS responders in lifting and moving patient.

Whenever possible, keep the patient at rest, even when the patient appears to be able to move. Remember that not all signs of an illness or injury show themselves immediately. Sometime patients do not realize how sick or injured they are. So patients may not be straight forward in answering your questions or may even deny or hide the existence of an illness or injury.

Body Mechanics

Definition: Body mechanics **(**the use of the body to facilitate lifting and moving to minimize injury**)** involves standing and moving one's body correctly as well as making the best use of one's strength to prevent injury. When you learn how to control and balance your body, you can safely move another person. When lifting something or someone heavy, the proper body mechanics will help you prevent back injuries

General rules: When you are ready to lift, these rules minimize the chance of injury.

1. Position your feet properly. He should be on firm, leveled surface and positioned a comfortable width apart.
2. Take extra care if the surface is slippery or unstable.
3. Lift with your legs. Keep your back as straight as possible and bend at your knees. Don't try to bend the waist and keep eyes on your partner. This technique is known as a **power lift.**
4. When lifting an object with in one hand, avoid leaning to either side. Bend your knees to grasp the object and keep your back straight.
5. Minimize twisting during a lift.
6. Keep the weight as close to your body as possible. It can reduce the greater chance of injury.

7. When carrying a patient on a stairway, use a stair chair instead of a wheeled stretcher whenever possible have rescuer spot you as you walk backward down stairs.

DO NOT:

- Lift from a twisted / sideways position.
- Lift from a forward stooped / imbalanced position

Apply these principles to lifting, pulling, pushing, carrying, moving or reaching of an object. The key to preventing injury is **correct alignment** of the spine. Keep a normal inward curve of the lower back. Keep wrist and knees in normal alignment. Teamwork is essential. Communicate during a task, clearly and frequently. Use commands that are easy for team members to understand. Verbally coordinate moves from beginning to end. A proactive, well-balanced physical fitness program should include training in flexibility, cardiovascular exercise, strength and nutrition.

Moving Patients:

Safely lifting patients requires you to use good posture and good body mechanics. You should consider the weight of the patient and call for additional help if needed. Plan how you will move the patient and where you will move him. It is also important to remember to lift with your legs and not your back. When lifting with other EMS professionals, communication and planning are keys.

Patient-moving techniques can be classified as **Emergency Moves** and **Non-Emergency Moves**.

Emergency Moves:

A patient move that is carried out quickly when the scene is hazardous, care of the patient requires immediate responding, or you must reach another patient who needs life-saving care, or in order to reach critical patients. These situations call for an emergency move.

Characteristics of emergency moves:

- Fastest
- No spinal stabilization
- Performed when the scene is not safe, and there is an immediate danger to both the patient and the rescuer.

Examples of situations which might require you to make an Emergency move:

- **Fire or threat of fire** – always considered a great threat to patients and rescuers.
- **Explosion or threat of explosion** (hazardous scene)
- **Inability to protect the patient from hazards at the scene**
    - Unstable building
    - Rolled over car

- Hostile crowd
- Hazardous materials (Hazard-Mat)
- Spilled gasoline
- Extreme weather

- **To gain access to other patients who need care.**
- **When life-saving care cannot be given due to patient‘s location or position.**

The greatest danger in making an emergency move is the possibility of **aggravating a spinal injury.** Provide as much protection to the spine as possible – pull the patient in the direction of the **long axis** of the body.

Try not to move the head away from the neck and shoulders and secure the hands and arms. Moving patients away from a vehicle quickly and safely may be impossible. Move the patient only under conditions mentioned above.

Types of Emergency Moves:

- **Shirt drag**
- **Shoulder** or **forearm drag**
- **Blanket drag**

Other Types of Emergency Move:

- Piggy Bag Carry
- Cradle Carry
- Firefighter‘s Drag
- One Rescuer Crutch
- Two Rescuer Assist

Fore arm drag:

- Place your hands under the patient‘s armpits from the back and grasp the patient‘s forearms.
- Used to move a heavy patient.
- Offers some protection for the head and neck.

Blanket drag: Gather half of the blanket material up against patient‘s side. Roll patient toward your knees so that you can place the blanket under him. Gently roll patient back onto the blanket. During the drag, keep patient‘s head as low as possible.

Piggy back carry:

Assist the patient to stand. Place her arms over your shoulder so they cross your chest. Bend over and lift her. While she holds on with her arms, crouch and grasp each thigh. Use a lifting motion to move her onto your back. Pass your forearms under her knees and grasp her wrists.

Cradle carry: Place one arm across patient's back with your hand under her arm. Place your other arm under her knees and lift. If your patient is conscious, have her place her near arm over your shoulder.

Fire fighter drag: Place patient on his back and secure his hands together with tape or roller gauze. Straddle the patient, facing his head. Crouch; pass your hands and knees. Keep patient's head as low as possible.

One-rescuer assist:

Place patient's arm around your neck, grasping her hand in yours. Place your other arm around patient's waist. Help her work to safety. Be prepared to change technique if level of danger increases. Be sure to communicate with patient about obstacles, uneven terrain, and so on.

Two-Rescuer Assist:

Patient's arms are placed around shoulders of both rescuers. Each rescuer grips on of the patient's hands, places a free arm around the patient's waist, and helps him walk to safety.

Non–Emergency Moves: A non-emergency move is the preferred choice when the situation is not urgent, the patient is stable, and you have adequate time and personnel for a move. Non-emergency moves should be carried out with the help of other trained personnel or bystanders. Take care to prevent additional injury to the patient, as well as to avoid patient discomfort and pain.

Characteristics of Non-Emergency moves:

Scene safe, patient stable:

- Use a minimum of three rescuers whenever possible.
- If possible, and when in doubt, always suspect spinal injury and provide full spinal immobilization on a backboard before moving.
- For example, a patient out of a car crash should always be immobilized even if he or she appears well.
- Where there is no immediate threat to life, the patient should be moved only when ready for transport, using a Non-Emergency move.

Examples of Non-Emergency Moves:

Direct-ground/bed lift:

The direct ground lift is a three-rescuer non-emergency move that can be used to move a patient from the ground or floor to a bed or stretcher. This move is not recommended for use on patient s with possible neck or spine injuries. Although it can be carried by two people, three are recommended.

To perform a direct ground lift, the patient should be lying face up (supine), and the arms should be placed on the chest. You and your helpers should line up on one side of the patient. One rescuer should be at the patient‘s head, another at her midsection, and another at the lower legs. Each of you should drop to the knee closer to the patient‘s feet.

The rescuer at the head should place one arm under the patient‘s neck and grasp the far shoulder in order to cradle the head. The other arm should be placed under the back, just above the waist. The rescuer at her midsection should place one arm above and one arm below the buttocks. The rescuer at the patient‘s lower legs should place one arm under her knees and the other arm under the ankles.

First, on the signal of the rescuer at the head, everyone should lift the patient up to the level knees of their.

Then, on signal, the rescuers should roll the patient toward their chests. Finally, on signal, everyone should stand while holding the patient. You can now move her, reversing the process when it is time to place her in a supine position.

Extremity lift:

An extremity lift requires to people. This lift is ideal for moving a patient from the ground to a chair or the stretcher. It can be also used to move a patient from a chair to the stretcher. It should not be performed, however, if there is a possibility of head, neck, spine, shoulder, hip, or knee injury, or any suspected fractures to the extremities that have not been immobilized.

The patient should be placed face up, with the knees flexed. You should kneel at the head of the patient, placing your hands under her shoulders. Have your helper stand at the patient‘s feet and grasp her waists. Direct your helper to pull the patient into a sitting position, while you push the patient from the shoulders. (Do not have your helper pull the patient by the arms if there are any signs of suspected fractures). Slip your arms under the patient‘s armpits and grasp the wrists. Once the patient is in a semi sitting position, have your helper crouch down and grasp the patient‘s legs behind the knees.



Positioning the Patient:

How you position a patient depends on the patient’s condition.

Examples:

- Patient showing signs of shock may be placed in the shock position – elevate legs or foot end of long spine board 20-30 cm.
- Patient with respiratory problems may get into a more comfortable position, unless injuries prevent it. These patients generally want to sit up.
- Patients with abdominal pain generally want to be on one side with legs drawn up.
- A responsive patient, who is nauseated or vomiting, should be allowed to remain in a position of comfort, unless injuries prevent it. Always be ready to manage patient airway.
- Trauma patients, especially suspected with spinal injury, should be appropriately immobilized on long spine board.
- Place patient in recovery position if unconscious and not contraindicated.

Obviously it is not possible to address every situation. Conditions at the scene and the patient‘s condition will dictate a good position for the patient.

Patient-Carrying Equipment:

EMTs and advanced life support (ALS) personnel will often ask Emergency Medical Responders to assist with preparing the patient for transport and with lifting, and loading patients into the ambulance. To help with these tasks, you must be familiar with various carrying and packaging devices that are used. Many Emergency Medical Responder courses do not include information and practice on immobilization devices.

Such equipment includes stretchers and other devices designed to carry patients safely to their destination. You should become completely familiar with the use of these devices. They must also know the limitations of the equipment. It is very import to regularly maintain and inspect these devices.

Typical equipment used to move patients includes:

Light weight portable stretchers:

This type of stretcher is also known as a folding or flat stretcher. It is much lighter than standard wheeled stretcher and makes the task of moving a patient down stairs or out of tight spaces much easier. Portable stretchers may be canvas, aluminum, or heavy plastic, and they usually fold, roll up, or collapse for easy storage. Aluminum and plastic stretchers are now commonly used because it is easy to disinfect them.

Wheeled stretchers:

For ambulances, a collapsible wheeled stretcher, or gurney, is a type of stretcher on a variable-height wheeled frame. Normally, an integral lug on the stretcher locks into a sprung latch within the ambulance in order to prevent movement during transport. It is usually covered with a disposable sheet and cleaned after each patient in order to prevent the spread of infection. Its key value is to facilitate moving the patient and sheet onto a fixed bed or table on arrival at the emergency department. Both types may have straps to secure the patient.

Scoop Stretcher:

The **scoop stretcher** (or clamshell, Roberson orthopedic **stretcher**, or just **scoop**) is a device used specifically for moving injured people. It is most frequently used to lift people who may have a spinal cord injury from the ground, either due to unconsciousness or in order to maintain stability in the case of trauma.

Vest-type extrication devices: This device facilitates the extrication of a seated patient, while stabilizing the patient‘s head, neck and spine. Commonly used in vehicle extrication.

Stair chair: The stair chair helps rescuers move seated medical patients down stairways and through right places where a traditional stretcher will not fit.

Newer brands are made of study folding frames with either canvas or head plastic seats and are easy to store. They have wheels that allow rescuers to roll them over flat surfaces. Some models have a tractor tread mechanism that allows them to easily slide down stairways just by tilting them.

Basket stretcher: A stretcher made of metal or strong synthetic material in which a patient is placed so he or she can be securely extracted by Emergency Medical Service from an accident or otherwise inaccessible site. The stretcher may also be lifted by ropes. The basket stretcher is also known as **STROKE** stretcher.

Flexible stretcher: This stretchered is made of made of rubberized canvas or other flexible material such as heavy plastic, often with wooden slats sewn into pockets. The flexible stretcher usually has three carrying handles on each side. Because of its flexibility, it can be useful in restricted areas or narrow hallways.

Draw sheet: A **draw sheet** is a small bed sheet placed crosswise over the middle of the bottom sheet of a mattress to cover the area between the person's upper back and thighs, often used by medical professionals to move patients. It can be made of plastic, rubber, or cotton, and is about half the size of a regular sheet. It can be used in place of a mattress pad if a rubber mattress is used. The draw sheet may or may not be tucked into the sides of the bed. When a draw sheet is used to move patients, it is sometimes known as a lift sheet. Nursing manuals recommend that, when a plastic or rubber draw sheet is used, a cotton draw sheet is placed over it. If a folded sheet is used as a draw sheet, the folded edge of the sheet is positioned at the person's upper body. Draw sheets used as lift sheets are generally not tucked in, though sometimes after the move, they are.

Backboards:

- A stiff board on which an injured person and especially one with neck or spinal injuries is placed and immobilized in order to prevent further injury during transport.
- These devices are usually made of splinter resistant wood or synthetic material that will not absorb blood. They usually have handholds or carrying straps.

There are two types:

- **Long backboard:** 6–7 feet long, used for patients found lying down or standing and who must be immobilized.

- **Short backboard:** 3-4 feet long, used primary to remove patients from vehicles when neck or spinal injuries are suspected. The backboard is slid between the patient‘s back and the seat. Once secured to the short board and wearing a rigid cervical collar, the patient can be removed from his sitting position in the vehicle to a supine position on the long board. Vest-type devices are often used as a short backboard.

UNIT SUMMARY

Body Mechanics

- Plan your move
- Use your legs
- Close to your body
- Stack
- Reduce the height or distance
- Reposition and lift in stages

Emergency Move

- Fire or threat of fire
- Explosion or threat of explosion
- In ability to protect the patient from hazards at the scene
- To gain access to other patients who need care
- Life-saving care cannot be given patient‘s location

Types of Emergency Move

- Shirt drag
- Shoulder or forearm drag
- Blanket drag

Other Types

- Sheet drag
- Piggy bag carry
- One rescue crutch

- Cradle carry
- Firefighter drag
- Fire man lift

Non-Emergency Move

- Direct-ground/ bed lift
- Extremity lift

Patient-Carrying Equipment

- Wheeled stretcher
- Light weight portable stretcher
- Scoop stretcher
- Vest-type extrication device
- Stair chair
- Basket stretcher
- Flexible stretcher
- Draw sheet

Backboards

- Long backboard
- Short backboard

Self-Assessment

Objective Question

1. The team ―body mechanics is best defined as:
   a. Properly using your body to facilitate a lift or move.
   b. Using a minimum of three people for any lift.
   c. Contracting the body‘s muscles to lift and move.
   d. Lifting with your back and not your legs.

2. The load on your back is minimized if you can keep the weight you are carrying.
   a. As close to your body as possible.
   b. At least six inches in front of you.
   c. At least 18 inches in front of you
   d. As low as possible.

3. What type of move is used when there is no immediate threat to the patient life?
   a. Emergency
   b. Non-emergency move
   c. Non-rapid
   d. Rapid

4. Which one of the following would be the BEST choice for a stable patient with a suspected spine injury?
   a. Shoulder drag
   b. Two-rescuer assist
   c. One-rescuer assist
   d. Cradle carry

5. How many types of Emergency move?
   a. 2
   b. 3
   c. 4
   d. 5

6. How many types of Non-emergency move?
   a. 2
   b. 3
   c. 4
   d. 5

7. The length of the long back board----------
   a. 3-4
   b. 6-7
   c. 6-8
   d. 4-5

8. In which place use the flexible stretcher?
   a. Narrow hallways
   b. Over through terrain
   c. Down stairs
   d. Heavy lifting

9. In direct-ground/bed lift move is difficult if the patient weight is ------k.g.
   a. 70
   b. 90
   c. 80
   d. 75

10. When lifting a patient, feet should be placed.
   a. One in front of the other.
   b. Shoulder width apart.
   c. A comfortable distance apart.
   d. As close together as possible.

Descriptive Questions

1. Define the term Body Mechanics. Then describe several principles of Body mechanics related to safe lifting and moving.
2. Define three Emergency moves and two Non-emergency moves for lifting and moving a patient.
3. Describe several lifts and drags.
4. Define a long-axis drag and explain its importance.
5. Name five examples of situations that might require you to make an Emergency move with a patient.
6. Define steps of Direct ground lift?

Reference

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- https://www.silverpages.sg/sites/silverpagesassets/
- Emergency Care, 11th Edition© 2009 by Pearson Education, Inc., Upper Saddle River, NJ
- https://en.wikipedia.org/wiki/Stretcher#Wheeled_stretchers
- "draw-sheet". mondofacto.com. Retrieved 10 October 2010.
- https://www.merriam-webster.com/dictionary/backboard
- https://www.slide player.net.
- www.alibaba.com

LESSON NO – 19

Report Writing and Preparation for Next Call

Introduction

An often under represented skill that EMS staff or Medical First Responer need to work on is writing detailed Patient Care Reports (PCRs) that provide a clear Pre-hospital treatment picture of the patient's needs. While providing the best care for the patient is important, it's vital that this care be accurately reported. Continued patient care can also depend on well written PCRs, as receiving facilities may use these as a guide as to what treatment patients have already received and future treatment plans.

All Advanced Life Support (ALS) first responder and transport personnel are responsible for documenting patient information on a Patient Care Record (PCR). A PCR is a confidential patient medical record and should be treated as such. Pre-hospital personnel shall make every effort to see that completed PCRs are delivered to the receiving facility for use by the receiving hospital personnel in planning emergency care for patients.

Outcomes

Upon completion of this lesson, you will be able to:

- Record information about the patient‘s condition and treatment given on the prescribed form.
- Five steps to decontaminate the transport vehicle.
- Four steps decontaminate the stretcher.
- Three steps to decontaminate instruments.
- The three items for personal decontamination.

Terminology

PCR (Patient Care Record): Any electronic or paper information recorded about a person for the purpose of managing their healthcare or pre-hospital treatment.

First Responder: A first responder is a person with specialized training who is among the first to arrive and provide assistance at the scene of an emergency, such as an accident, natural disaster, or terrorist attack. First responders typically include paramedics, emergency medical technicians, police officers, firefighters, rescuers, and other trained members of organisations connected with this type of work.

Vital Signs: Vital signs are used to measure the body's basic functions. These measurements are taken to help assess the general physical health of a person, give clues to possible diseases, and show progress toward recovery.

Report Writing

Documentation is extremely important and may be legally required for patient care rendered by the MFR. A properly completed written report not only provides all the pertinent facts, it also provides them in a logical order.

The documentation that you provide is a permanent record of the patient care you performed. When you provide excellence, patient-centered pre-hospital care, you may be proud of your abilities.

The reporting done by emergency medical responder can called "**Patient Care Report**" or "**Pre-Hospital Care Report**". Patient Care Report (PCR) is prepared by hand or electronic document. Regardless of how the report is completed, there are many regions for accurate and complete documentation. These include:

- Community of care
- Education
- Administration
- Quality assurance
- Legal

NOTE: the PCR report created by medical first responder is a legal document. It may be called into a civil or criminal court for number of reasons.

Pre-Hospital Treatment Report

A pre-hospital treatment report is used for all the following reasons:

1. **To transfer patient information from one person to another :**
   Your report is handed over to the personnel who transport the patient/victim. They will, in turn, give it to the hospital staff who use it to learn the patient's/victim's history, including the condition in which he/she was found, what emergency care was provided, and how the patient responded to that care.

2. **To provide legal documentation:**
   A written report prepared at the scene of an emergency may be used as an official record. If you provide care at the scene of an injury or act of violence, for example, your report may become evidence in the court proceedings.

3. **To document the care you provided:**
   This is important for official reasons, as well. Unfortunately, patients and their families sometimes use first responders and other EMS professionals. Accurate documentation can be one of your best defenses against legal or official action.

4. **To improve your EMS system:**
   To improve the EMS system, generally the Patient Handoff Report helps to take an appropriate decision.

NOTE: Always take official report forms to document the patient's information and gather data in the standard format.

Basic data to be recorded while preparing patient report:

- Age and sex
- Chief complaint
- History of the current illness
- Medical history
- Medication that the patient is receiving
- Allergies
- State of consciousness and the patient's general condition
- Vital signs
- Pertinent physical findings
- Treatment given
- Disposition (treatment you have given)

Decontamination of the Unit, Equipment and Personnel

Transport Unit (Ambulance or other)

After completing a call, the transport unit should be prepared to be available to respond to the next call.

- Dispose of all contaminated supplies (bandages, dressings, disposable materials) in a sealed plastic bag.
- Collect all contaminated reusable equipment and seal them in another plastic bag.
- Clean the floor, walls and ceiling with soap and water. They may be contaminated with blood, vomitus, faecal matter, dust, mud, etc.
- Disinfect surfaces with a solution of water and 10% bleach. This solution may be harmful to bright metal surfaces.
- Air out the ambulance.

Decontamination of the Stretcher

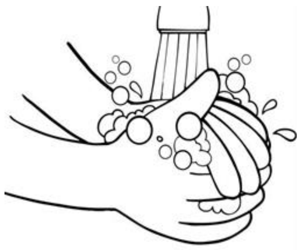
- Remove the contaminated sheet.
- Clean and disinfect the stretcher mattress.
- Turn the mattress.
- Place a clean sheet on the mattress.

Decontamination of instruments

- Scrub contaminated instruments to eliminate any dried-on material, and then wash them with soap and water.
- Soak instruments in a 10% bleach and water solution for 10 minutes, then dry them off.
- Replace instruments and any medication on the unit.

Personal Decontamination

Make sure to decontaminate the following three items after every incident:



- **Hands:** Thoroughly wash hands in soap and water. Pay close attention to the Finger nails.
- **Clothes:** Change out of any contaminated clothing and immediately wash separately from other linens. Keep a spare change of clothes available.
- **Shoes:** Wipe shoes clean. Wash off all bodily fluids with a 10% bleach solution.

FINAL REPORT FORMAT (SAMPLE)

INCIDENT INFORMATION

Incident No. :-	Date :-

Crew Members Name :-

1. -------------------------------------- 2. ----------------------------------
3. -------------------------------------- 4. ----------------------------------

Patient--------------- of--------------- Unit No. ---------------Station No.--------------
Receive Call (Time) :----------------- Contact with Patient (Time): -------------------
Dispatched (Time): ------------------- Alerted Hospital (Time): ------------------------
En-route (Time): ---------------------- Transport Patient (Time): ----------------------
Arrival on Scene: --------------------- Arrival at Destination (Time): -----------------
- (Hospital)

Incident Address :---

Nature of the Call :---

Other agencies involved :--

Agency transporting patient:---

PATIENT INFORMATION

Last Name :--First Name :----------------------------

Incident Address :--

--- Identification No:--------------------------------------

Sex :- M ☐ F ☐ Age:----------------------------- Date of Birth :-------/------/----------

VITAL SIGNS BASELINE

Airway:--------------------------------------- Respirations :--

Temperature:------------------------------- Skin Color :---

Skin :--- Pupils:---

Palpable Pulses

Radial:------------------------------------

Carotid:-----------------------------------

Other:--------------------------------------

Time:--

Pulse:--

Respirations:---

Blood Pressure:--

HISTORY

Medical History :---

Chief Complaints :---

Allergies :---

VITAL SIGNS

TIME	PULSE	RESPIRATION	BLOOD PRESSURE	COMMENTS

NARRATIVE

PATIENT REFUSAL OF TREATMENT

Patient's Signature

Witness 1 Signature   Witness 2 Signature

MFR Office in Charge

Printed Name   Signature

HAND-OFF REPORT

The patient hand off report contains eight items of information:

- Patient age and sex
- Chief complaint
- Level of Consciousness
- Airway status
- Breathing status
- Circulation status
- Patient history
- Treatment given

Summary

Report Writing

Documentation is extremely important and may be legally required for patient care rendered by the MFR. A properly completed written report not only provides all the pertinent facts, it also provides them in a logical order.

NOTE: the PCR report created by medical first responder is a legal document. It may be called into a civil or criminal court for number of reasons.

Basic data to be recorded while preparing patient report:

- Age and sex
- Chief complaint
- History of the current illness
- Medical history
- Medication that the patient is receiving
- Allergies
- State of consciousness and the patient‘s general condition
- Vital signs
- Pertinent physical findings
- Treatment given
- Disposition (treatment you have given)

Decontamination

After completing a call, the all unit should be prepared to be available to respond to the next call and decontaminations is require before response to next call.

- Transport Unit (Ambulance or other)
- Decontamination of the Stretcher
- Decontamination of instruments
- Personal Decontamination

Reference:

- Peer instructor’s guide for medical first responder course
- Bready: first responder book 8th edition
- https://en.wikipedia.org/wiki/
- http://www.firedepartment.org/about/SAM/references/Category/
- http://www.advancedpractice.scot.nhs.uk/legal-and-ethics-guidance/documentation-and-record-keeping/defining-a-health-record.aspx

LESSON NO – 20

Multiple Casualty Incident & Triage

Introduction

A multiple-casualty incident (often shortened to MCI and sometimes called a mass casualty incident or multiple-casualty situation) is any incident in which emergency medical services, resources, such as personnel and equipment are overwhelmed by the number and severity of casualties. The general public more commonly recognizes events such as building collapses, train and bus collisions, earthquakes and other large-scale emergencies as mass casualty incidents.

Outcomes

Upon completion of this lesson, you will be able to:-

- Multiple Casualty Incident and Incident Response System.
- Functions of the EMS sector of the Incident Response System.
- Triage.
- Categories of triage with their associated colors and briefly explain each category.
- Three benchmarks of the START system of triage.
- The START triage criteria for assessing patients in a Multiple Casualty Incident.
- Demonstrate correct triage in a simulated MCI.

Terminology

Medical First Responder: A person who is certified to provide medical care in emergencies before more highly trained medical personnel arrives on the scene.

EMS: Emergency Medical Services, more commonly known as EMS, is a system that provides emergency medical care. Once it is activated by an incident that causes serious illness or injury, the focus of EMS is emergency medical care of the patient(s).

Perfusion: Perfusion is the passage of fluid through the circulatory system or lymphatic system to an organ or a tissue, usually referring to the delivery of blood to a capillary bed in tissue. Perfusion is measured as the rate at which blood is delivered to tissue or volume of blood per unit time (blood flow) per unit tissue mass.

Triage: Triage is the sorting of patients based on the severity of their injuries and or illness. The goal of triage is to save as many patients using the available resources.

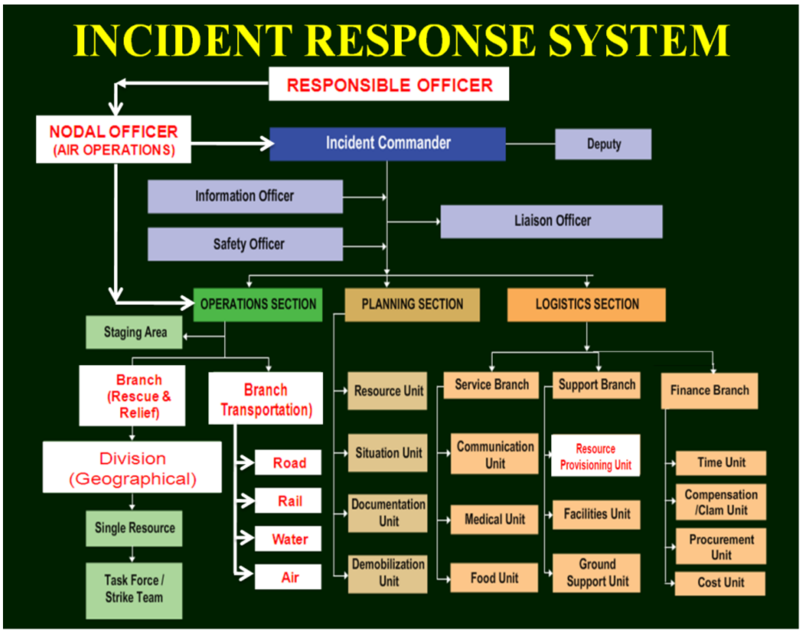
Multiple Casualty Incidents

Multiple-casualty incident (MCI) is any emergency with three or more than three victims. Although MCIs do indeed involve more than one victim, a more realistic definition is any emergency that involve multiple victims and overwhelms the first responding units. Most fire services, rescue squads, and ambulances are prepared and capable of managing a scene with more than one patient. In most cases, it is up to the first emergency personnel on the scene to make a judgment call and declare an MCI. If they feel that they can manage the number of patients with the resources immediately available, then an MCI may not be declared. If they cannot manage the number of patients, then an MCI is declared and an incident management system is put into action.

The role of Emergency Medical Responders at an MCI will vary depending on several factors, such as:

- When they arrive at the scene, the type of agency for whom they are working, and their specific level of training.
- Emergency Medical Responders who are first on scene may be dedicated to making the scene safe and keeping bystanders from becoming injured. Thus, they may not immediately become involved in patient care.
- For those who arrive after the scene has been made safe, their role will likely involve the triaging of patients.
- Other roles for the emergency medical responder include treatment of patients and assisting with the transport of patients to appropriate receiving facilities.

Incident Management System



The Incident Management System (IMS), also called an Incident Response System (IRS), is a model tool for the command, control, and coordination of resources at the scene of a large-scale emergency involving multiple agencies. It consists of procedures for organizing personnel, facilities, equipment, and communications.

Most Incident Management Systems are based on well-established management principles of planning, directing, organization, coordination, communication, delegation and evaluation. They must be flexible enough to accommodate a single-agency or single-jurisdiction emergency, as well as multi agency or multi-jurisdictional events. Most incident management systems employ a top-down modular structure that can be scaled to any size event. Some of the modules that might be included in a typical incident management system are command, operations, planning and logistics.

EMS Sector Functions

Triage Sector – Provides patient assessment, tagging, and removal of patients to a designated treatment area.
Treatment Sector – Sets up a treatment area.
Transportation Sector – Arranges for ambulances and tracks patients.
Staging Sector – Releases and distributes resources when they are needed.
Safety Officer – Maintains scene safety.

Medical First Responder's Role

As an MFR, find out what your EMS system requires you to do in the first crucial minutes of an MCI. Your major goals are then to:

- Establish command.
- Assess the scene.
- Request additional resources.
- Begin triage

Scene Assessment

Note that once you identify an incident as an MCI, you must resist the urge to take part in providing treatment. During your scene assessment, identify the following: -

- Scene safety
- Number of patients
- Needs for extrication
- Estimated number of ambulances needed
- Other factors affecting the scene and resources
- Number of sectors needed
- Area to stage resource

Make an initial scene report to EMS dispatch. Keep it brief. Give all information necessary for other rescuers to react to the MCI appropriately.

- **Scene survey**

H	Hazards – is there anything in the area that could cause problems or injuries
E	Environment – is the area hot…cold…toxic…unstable…etc…
M	Mechanism of Injury – what happened to cause the injury or condition
P	Number of Patients – how many people require assistance or transport
A	Additional Resources – more personnel…ambulance…fire dept…hazmat… Poison control…tech rescue…etc…

- **Primary Survey**

LOC	AVPU – Alert…Verbal stimulus…Pain stimulus…Unresponsive	Critical Interventions Quickly manage life threatening problems as you find them
D	Delicate Spine – Presumed or Ruled Out	
C	Circulation – Radial Pulse, Skin and Rapid Body Survey - Blanket	
A	Airway – with “Cheater Carotid Check” and OPA if unresponsive	
B	Breathing – Oxygen or Assisted Ventilations if needed	

- **Secondary Survey**

Interview		
S	Signs and Symptoms – what is hurting or causing discomfort	
	O	Onset – did this happen suddenly or gradually
	P	Provokes – is there anything that makes the pain better or worse
	Q	Quality – sharp… dull… throbbing… aching… stabbing… burning… crushing… squeezing… tingling… etc…
	R	Radiating – where is the pain; and does it stay in one spot or move to other areas
	S	Severity – how bad is the pain on a scale of 1-10
	T	Timing – when did the pain start; and does is come and go or stay constant

A	Allergies – are you allergic to anything…and have you been recently exposed
M	Medications – do you take medication…have you taken too much…too little…missed them…new ones recently
P	Previous Medical History – medical conditions or past incidents; diabetes… high BP… asthma… COPD… etc
L	Last Meal – what and when did you last eat or drink…is that normal for you
E	Events Leading Up To – what were you doing when the pain or discomfort started

Triage

Triage is a process of sorting patients into categories and prioritizing their medical care and transport based on the severity of their injuries and medical conditions. This process is used at the scene of multiple casualty incidents. When there are more victims than there are rescuers, the process of triaging helps ensure that the most critical but still salvageable patients are for first.

For many MCIs, there may be a delay before additional help is on scene. If the emergency is large enough or in a remote area, an hour or more may pass before there are enough rescuers present to render care for all patients. So triage is also used to determine the order of transport for patients. Patients who appear to have serious medical or trauma related problems such as heart attack, shock, major injuries, and heat stroke-must be transported quickly, while patients with minor injuries or illnesses are transported later.

Triage system: One variation of a Triage System that is common in fire departments and EMS is the START Triage System developed by the Newport Beach, California, Fire and Marine Department and Hoag Hospital. The letters **START** stand for **Simple Triage and Rapid Treatment**. START is based on the rapid assessment of patients using the following three criteria: (RPM)

- Respiration
- Perfusion
- Mental status

Patients are classified into one of four categories:

- Immediate
- Delayed
- Minor
- Deceased

The first rescuers on the scene begin the triage process and quickly identify and separate those patients who are probably the least injured. They are initially classified as **Minor**. This is accomplished by directing all the walking wounded to a specific location away from the immediate emergency scene. By responding to the direction to move, patients who are able to move and therefore self-triage into the **Minor** category, at least initially. It is important not to send these patients too far away because some of them may be able to assist with the care of more injured patients.

Once the walking wounded has exited the scene, the next step will be to begin triaging the remaining patients. START triage recommends you to start where you stand that is, begin assessing the patients closest to you and work your way out to all patients.

Each remaining patient is assessed for the presence of respirations. Open the airway and check for breathing. If the patient takes a breath, he is tagged Immediate. If he is not breathing, he is not salvageable and is tagged Deceased. All respiratory rates are estimates based on quick observation. It is not necessary to take actual rate during the triage process.

- **No respiration:** dead or non-salvageable
- **Respiration above 30 per minute:** immediate (red tag). No further assessment needed.
- **Respiration above 30 per minute:** assess perfusion.

S.T.A.R.T Method of Triage

S.T.A.R.T. which stands for —Simple Triage and Rapid Treatment is a very successful program. There are four START categories:

Priority 1-RED Highest priority, assigned to patients with critical conditions such as airway and breathing difficulties, uncontrolled or severe bleeding, and decreased mental status.

Priority 2- YELLOW Second priority or urgent care category. Assigned to patients with conditions such as without airway problems and major or multiple painful, swollen or deformed extremities and back injuries.

Priority 3- GREEN Lowest priority or delayed care category. Assigned to patients who are not seriously injured, need minimal care and can wait for treatment without getting worse? This includes patients with minor painful, swollen, or deformed extremities, and minor soft-tissue injuries.

Priority 0- BLACK Assigned to the dead or fatally injured. Includes injuries incompatible with life.

BLUE – **There is fifth category**: The non-wounded (some time tagged **'Blue'**). They are victims of the incident but seem not to be injured.

Triage ribbons and tags

After patients are assessed and sorted, they must be tagged for Rapid Identification. Triage ribbons and tags come in a variety of sizes, shapes and colors. Once a patient is given a tag, do not remove it. If patient changes statuses before being treated draw a bold line through the original tag, note the time and put a new tag on the patient.

The S.T.A.R.T. System

In the S.T.A.R.T. system, first tell all patients who are able to walk to move unassisted to a specified area. Assign these patients called the walking wounded a Priority 3 **i.e. Green** (delayed care) and non-wounded **(Blue).**

Then turn your attention to the patients unable to walk away. Begin triage with an initial assessment using the following benchmarks:

Respirations:

- If breathing is faster than 30 and less than 11 respirations per minute, assign Priority1 **i.e. Red.**
- If the patient is not breathing, make one attempt to open the airway and clear foreign matter from the mouth. If unassisted breathing resumes, assign Priority 1 **i.e. Red.**
- If breathing does not resume, assign Priority 0 **i.e. Black.**
- If breathing is between 11 and 30 per minute, perform Perfusion assessment.

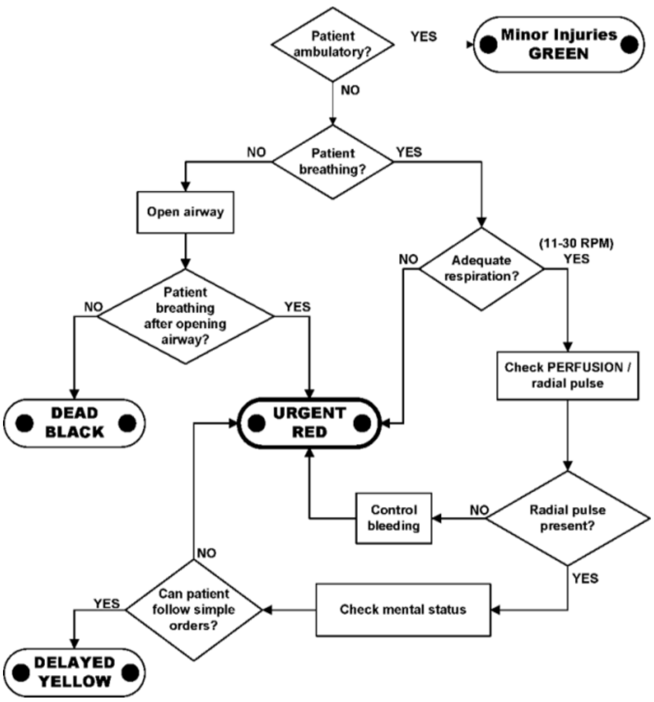
Perfusion:

- Assess Capillary refill. More than **2 seconds** indicates inadequate perfusion – assign Priority 1 **i.e. Red**. Control all major haemorrhages.
- If capillary refill is less than 2 seconds, perform Mental Status assessment.
- Capillary refill time for toe assessment is 3 second.
- In cases of poor lighting, check radial pulse. Absent pulse indicates blood pressure below 80mmHg and inadequate perfusion – assign Priority 1 **i.e. Red.**

Mental Status (ability to follow simple commands):

- If patient is unable to respond to simple commands such as — “close your eyes”, assign Priority 1 **i.e. Red.**
- If the patient is able to respond, assign Priority 2 **i.e. Yellow.**

Once you have tagged to a patient, your assessment ends. Move onto the next patient.



START Flowchart

Summary

Multiple Casualty Incidents

A multi-casualty incident (MCI) is an emergency situation where the number of patients overwhelms the available resources.

Purpose: In emergency medical services, the term multi-casualty incident is used to trigger a change in the way patients are handled to more efficiently allocate resources to treat the most patients possible.

Incident Management System

The Incident Management System (IMS), also called an Incident Response System (IRS), is a model tool for the command, control, and coordination of resources at the scene of a large-scale emergency involving multiple agencies. It consists of procedures for organizing personnel, facilities, equipment, and communications.

EMS Sector Functions

Triage Sector – Provides patient assessment, tagging, and removal of patients to a designated treatment area.
Treatment Sector – Sets up a treatment area.
Transportation Sector – Arranges for ambulances and tracks patients.
Staging Sector – Releases and distributes resources when they are needed.
Safety Officer – Maintains scene safety.

Triage

Triage is a process for sorting injured people into groups based on their need for or likely benefit from immediate medical care.

S.T.A.R.T Method of Triage

S.T.A.R.T. which stands for —Simple Triage and Rapid Treatment is a very successful program. There are four START categories:

Priority 1-RED
Priority 2-YELLOW
Priority3-GREEN
Priority 0-BLACK

Self- Assessment

Objective Questions

1. Staging area shall be used for?
    a. Supplies and members of the media
    b. Patients who need to be triaged
    c. Equipment, supplies and patients
    d. Personnel, equipment and supplied
2. An emergency incident that produces a number of patients that exceeds the capacity of area medical systems and facilities is called a___
    a. Large Scale Disaster
    b. Multiple Injury Events
    c. Multiple Casualty Incidents
    d. Mass Casualty Incident
3. In the START triage system, patients are categorized based on the initial assessment of respiration and:
    a. Perfusion and metal status
    b. Blood pressure and mental status
    c. Perfusion and signs of shock
    d. Signs of shock and mental status
4. You find a patient with the pictured injury at the scene of a mass casualty event. His pulse is 12 bpm and he is apneic. Under the triage system he would be classified as
    a. Expectant (black)
    b. Hold (green)
    c. Immediate (red)
    d. Delayed (yellow)
5. During the triage process, patients will be placed into one of four categories-immediate, delayed:
    a. Minor, or no injury
    b. Minor, or deceased
    c. Non-injury or deceased
    d. Minor or walking wounded

Descriptive Question

1. Define Multiple Casualty Incidents.
2. What are functions of the EMS sector of the Incident Response System?
3. Define triage.

4. Explain four categories of triage with their associated colours and briefly explain each category.
5. Name the three benchmarks of the START system of triage.

Reference:

- Peer instructor's guide for medical first responder course
- Brady: first responder book 8th edition
- https://en.wikipedia.org/wiki/
- https://www.medicinenet.com/script/main/art.asp?articlekey=16736
- http://www.dictionary.com/browse/first-responder