

TOPIC 1. Natural, anthropogenic emergencies, their medical consequences. First aid in the extreme and combat conditions. Primary survey of the casualty. CPR.

Lesson 1.

1. Introduction.
2. Classification of emergencies.
3. Types of medical care in the EMS system.
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5. Contacting the victim (response). Qualification of the consciousness level according to the APVU scale.
6. Primary survey performance. Secondary survey. Recovery position.

INTRODUCTION

A wide range of illnesses and injuries require emergency care. Every year millions of patients are transported by ambulance to emergency departments, usually because of chest pain, shortness of breath, abdominal pain, injury from a motor vehicle crash or other accident, convulsions, or general weakness. Persons presenting with imminent childbirth, poisoning, or uncontrolled bleeding are examples of the types of emergencies for which immediate attention is required.

For each patient category, distinct interventions can improve the patient's chances for survival. Patients themselves should know the signs and symptoms of illnesses that require immediate intervention and how to access the emergency medical service (EMS). They also should know some basic self-help measures in the event that immediate help from bystanders is not available. The bystander involvement and adequate self-help can sustain a life until EMS arrives.

EMS is defined as the system that organizes all aspects of medical care provided to patients in the pre-hospital or out-of-hospital environment. Generally speaking, patients requiring "pre-hospital care" are planned or intended to be transported to hospital for further treatment, whereas in "out-of-hospital" emergency care, such intent or planning may be absent. Apart from being a common resource for a variety of medical conditions, EMS is also the foundation for effective disaster response and management of mass casualty incidents.

Q2.

Emergency is a state in which normal procedures are suspended and extraordinary measures are taken in order to avert a disaster.

Disasters are undesirable and often sudden events causing human, material, economic and/or environmental losses, which exceed the coping capability of the affected community or society. They are caused either by natural forces/processes (known as '*natural disasters*') or by human actions, negligence, or errors (known as '*anthropogenic disasters*').

Classification of disasters.

In general all disasters can be divided into 2 major groups: natural and man-made (anthropogenic).

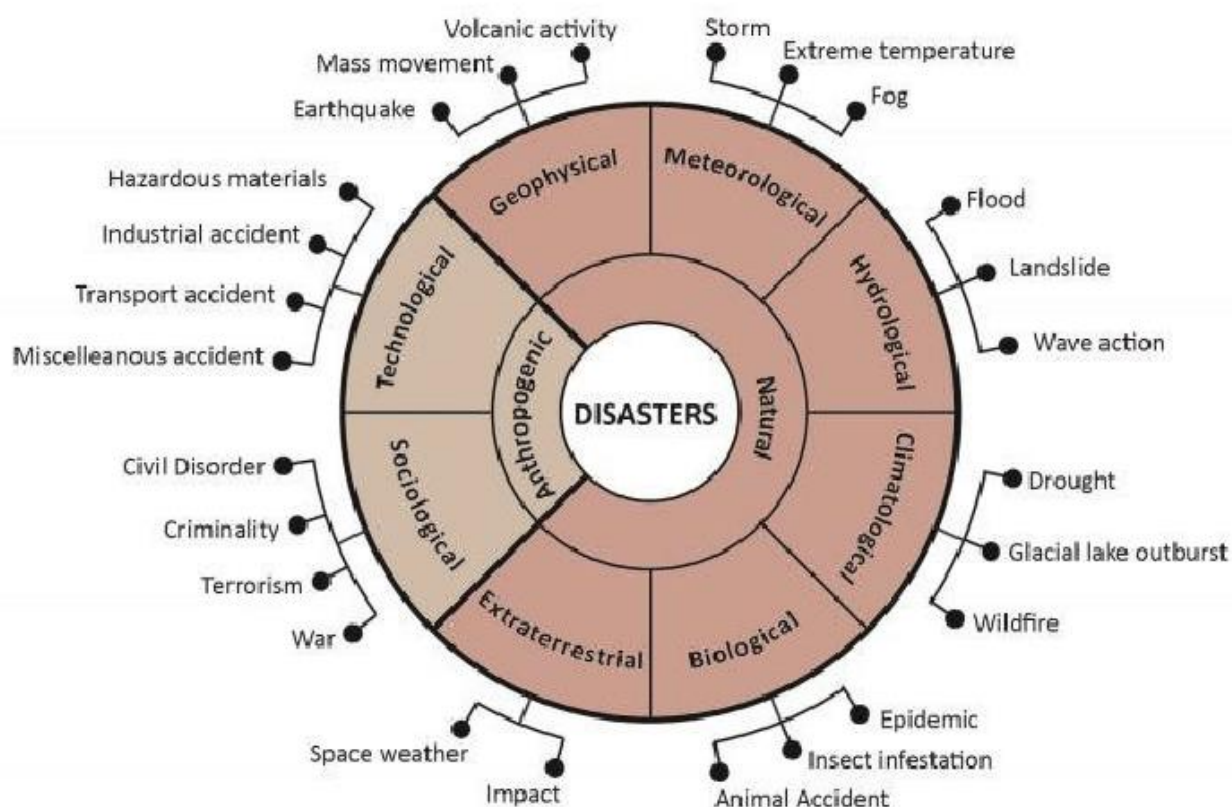
A **natural disaster** is a natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Types of natural disasters:

- geophysical (earthquakes, landslides, tsunamis and volcanic activity),
- hydrological (avalanches and floods),
- climatological (extreme temperatures, drought and wildfires),
- meteorological (cyclones and storms/wave surges) or
- biological (disease epidemics and insect/animal plagues).

Anthropogenic disasters are broadly classified into two major groups:

- technological disasters (e.g., disasters due to engineering failures, transport disasters, and environmental disasters); and
- sociological disasters (e.g., criminal acts, riots, war, stampedes, etc.).



In relation to the hospital disasters can be subdivided into several categories:

External disasters occur at locations that are physically separate from the hospital (e.g., transportation accident, industrial accident).

An internal disaster is an event that occurs within the confines of the hospital (e.g., bomb scare, laboratory accident involving radiologic agents, power failure).

Disasters can be both internal and external (e.g., earthquake with mass casualties as well as damage to the internal hospital).

The involvement of EMS in the disaster consequences' elimination depends not only on the type of event and number of casualties, but also on an ability of ambulance to provide medical care. Based on these conditions all the events can be classified into events with:

1. *Single casualty* – incidents with one single victim and complete medical assistance can be provided by staff of one ambulance with present equipment and means.

2. *Multiple casualties* – incidents with more than one victim, which demand medical sorting and medical assistance can be provided to all casualties with life-threatening conditions with present means and staff of an ambulance in current region.

3. *Mass casualty* - incidents with more than one victim, which demand medical sorting and necessity of medical compromise, because the numbers of victims who need urgent medical assistance, exceed resources of the rescue services on a scene of an event.

The purpose of the rescuers actions in mass casualties is to save peoples' lives as much as it is possible on a base of the first aid principles that can be provided by rescuers and medical personnel.

Q2.

An *emergency* is an unforeseen combination of circumstances or the resulting state that calls for immediate action. The term *medical* means relating to or concerned with the practice of medicine. *Service* refers to the occupation or function of serving, or a contribution to the welfare of others. Finally, system refers to a regular interaction or interdependent group of items forming a unified whole.

An *emergency medical services system* (EMSS) is the planned configuration of community resources and personnel necessary to provide immediate medical care to patients with sudden or unexpected illness or injury.

In Ukraine the Law “About emergency medicine service system” has been established in 2013. It outlines 2-stage system of emergency medical care: pre-hospital and hospital one.

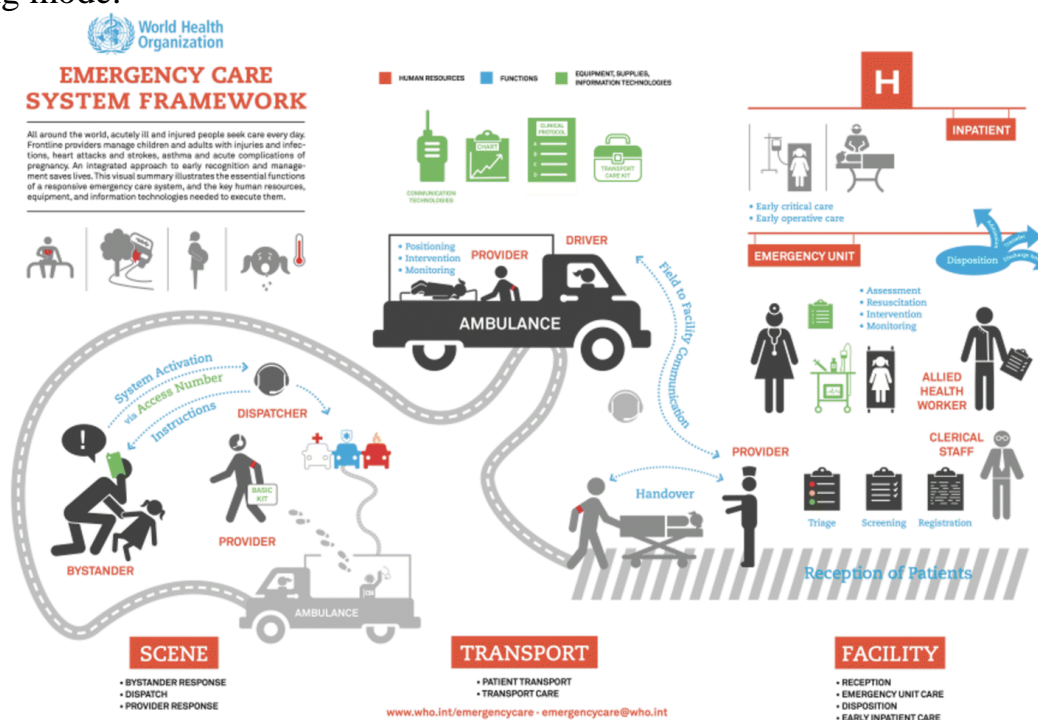
Pre-hospital stage includes: pre-medical assistance at the scene of an emergency situation, time restrictions, ambulance equipment and means, etc. Special peculiarity here is the involvement of non-medical personnel (First responders) into the system of first aid and their training.

On the level of pre-hospital stage medical assistance (first aid) can be provided by casualty himself, bystander, police officer, firefighter, emergency medical technician (EMT), and paramedic.

First aid is the provision of immediate medical assistance to an ill or injured person until definitive medical treatment can be accessed, or until the illness or injury is fully dealt with.

First responder – is a person (such as a police officer or an EMT) who is among those responsible for going immediately to the scene of an accident or emergency to provide assistance.

Hospital stage includes the existence of the emergency departments (ED, A&E) in common hospitals and emergency hospitals with the round-the-clock working mode.



<https://intjem.biomedcentral.com/articles/10.1186/s12245-018-0207-6>

Q4.

Size-up is the first aspect of patient assessment. It begins as the first responder approaches the scene. During this phase, the responder surveys the scene to determine if any threats may cause an injury to the rescuer or additional injury to the patient. To ensure the safety of both responder and patients, however, it is important to always begin by assessing the overall picture at any scene. The information gained through this overview also will give valuable clues about the types of injuries that may be encountered and what additional EMS resources may be required.

a. Scene Safety

Is the scene safe? The first responder should think about safety throughout the time they are on scene. Upon arrival at the scene, the question should be asked: Is it safe to approach the patient? Numerous scenarios can create an unsafe situation for emergency personnel. Motor vehicle collision (MVC) scenes can have sharp objects and unstable wreckage, as well as risks for electrical shock, fire, and

explosions. Chemicals and other toxic substances can be released from vehicles in which they are transported. Fires, as well as clouds of smoke or chemicals, can consume or displace oxygen, creating a life-threatening environment for personnel. There is the potential for violence at crime scenes that have not yet been secured by the police. Potentially unstable landscapes such as steep slopes, icy surfaces, and bodies of water present additional risks to emergency personnel and the patients they are trying to care for.

Once the scene is secure and you have assessed any risks to personnel, protect the patient from any on-scene hazards or environmental exposures to prevent any further deterioration of their condition. Exposure to cold, wind, and rain is a serious problem in trauma patients exposed to the elements, and can result in hypothermia, which can worsen their chances for survival.

In addition to protecting the patient, it is necessary to consider the safety of bystanders who may try to approach the accident scene out of curiosity or a desire to help. Do not allow bystanders to become ill or injured. Bystanders should be kept away from the scene if there are any real or potential risks to their safety, if their presence creates a risk to the patient or emergency personnel, or if they interfere with patient care efforts.

If the scene is unsafe, make it safe. Otherwise, do not approach. Request assistance from qualified public safety personnel, such as fire, rescue, and/or police units whenever you are uncertain about the safety of an accident scene.

b. Personal safety: Body Substance Isolation Review

If there is any possibility of exposure to blood or other bodily fluids that may transmit infectious diseases, then emergency personnel must take the necessary precautions to minimize their risk of exposure by wearing personal protective equipment (PPE).

PPE is equipment that will protect the user against health or safety risks at work. It can include items such as safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. It also includes respiratory protective equipment (RPE).

Therefore, it is necessary to wear latex/nitrile gloves whenever coming in contact with a patient who is bleeding or who has blood visible on or near them. Wear eye protection and face mask if there is active bleeding and/or a risk of being splashed in the face. A protective gown to cover the arms and body may also be used in these circumstances.

c. Mechanism of Injury/Nature of Illness

Determining the mechanism of an injury means evaluating the forces that caused the injury. Understanding the mechanism of injury may be helpful in determining the presence and/or type of internal injuries. For example, different types of car collisions are associated with different types of injuries. Frontal collisions, where the driver is thrown forward and hits the dashboard with the knees, are associated with fracture or dislocations of the hip. Side-on collisions with intrusion into the passenger compartment can result in fractures of the upper

extremities and ribs. Mechanisms of injury in trauma can be determined by questioning the patient, family members, and bystanders, as well as by inspecting the scene. For patients requesting emergency medical services for a medical complaint, determine from the patient, family, or bystanders the nature of the illness or symptoms that led to the call.

d. Number of Patients Involved

Situations with multiple patients will require additional help from law enforcement, fire, rescue, advanced emergency medical units, and/or utility workers (gas, water, electricity). First responders will be less able to call for additional help once they are involved with patient care. Request additional help early if you will need assistance. Then begin triaging patients to determine who requires immediate intervention and who can wait.

e. Additional EMS Resources

After addressing immediate, life-threatening problems, the First Responder can confirm that additional EMS resources are en route.

Q5.

The initial assessment is completed to identify immediate threats to life.

The general impression of the patient is based on detection whether the patient is ill (medical case) or injured (trauma case). In situations where this is unclear because of inadequate patient information, treat the patient as though he/she could be a trauma victim. Determine the approximate age and sex of the patient.

If there is any suspicion of trauma, the patient's spine must be stabilized from the very beginning. The head and neck must not be moved in any way in case there is an unstable fracture of the spine that could result in a spinal cord injury with movement. Begin by speaking to the patient. Introduce yourself and tell the patient that you are here to help. The "AVPU" scale is used to describe the level of responsiveness of a patient (short neurological exam):

- A – alert
- V – responds to verbal stimuli
- P – responds to painful stimuli
- U – unresponsive

Infants and small children will often not respond to methods used to assess responsiveness in adults. Instead of providing verbal and painful stimuli, assess the child's interactions with the environment and parents.

Q6.

The **primary survey** is a quick way to detect any life threatening conditions a casualty may have in order of priority.

As it was mentioned before (in question 5), when situation is unclear the trauma approach is used because biological death in case of bleeding and airway

obstruction due to trauma (trauma case) will occur faster than in cardiac arrest due to illness (medical case).

For the trauma cases the **DR (C)ABCDE** approach has to be used to provide care in proper order. The following means: Danger, Response, (Catastrophic bleeding), Airway with Cervical spine protection, Breathing and ventilation, Circulation and hemorrhage control, Disability, Exposure/Environment.

Here, to present a complete picture of the primary survey some information will be repeated in a broad style.

Danger. Before approaching the casualty, always make sure the area is safe for you as a rescuer and for the patient.

Danger can be internal and external.

Patient can be a carrier or sick with blood/airborne or droplet diseases, that can be a source of rescuer's infection. To prevent contamination the available PPE should be used: such as latex gloves, goggles, shields, aprons, medical facial masks or respirators N-95, etc.

The source of external danger can be anything, according to situation, that can cause injuries of the rescuer or his/her death. For instance: highway traffic, open wires, broken glass, leaking fuel, etc. The safety of the area can be provided by bystanders or first responders (police, firefighters, etc.). Otherwise, it is not recommended to be involved in resuscitation or first aid management.

Response. Check if the casualty is responsive or unresponsive. As you approach them, introduce yourself and ask them questions to see if you can get a response. Kneel next to their chest and gently shake their shoulders, asking, 'Sir/Madam can you hear me?' 'What has happened?', 'Open your eyes!'

- If the casualty opens their eyes, or gives another gesture, they are responsive.

- If they do not respond to you in any way they are unresponsive and should be treated as quickly as possible.

- If your training allows carrying out AVPU examination – proceed.

Catastrophic hemorrhage. In case of trauma, patients are dying because of arterial bleeding from large vessels of lower (more often) and upper extremities. Therefore, you need to know how to detect it by understanding signs and symptoms, and the bleeding management (see topic 3). In the frames of primary survey, it is necessary to investigate each lower and upper extremity with protected by latex gloves hands to detect external massive bleeding. If bleeding has been found – it's management should not be delayed.

Airway with C-spine protection. Next, you need to check that the airway is open and clear using the proper technic of airway management (see topic 2)

If they unresponsive, you need to move on to **breathing** as quickly as possible.

Breathing and ventilation. You now need to check if the casualty is breathing normally. Place your ear above their mouth, *looking* down their body.

Listen for sounds of breathing and see if you can *feel* their breath on your cheek. Watch to see if their chest moves. This is called “look-listen-feel” approach. Do this for 10 seconds.

- If they are unresponsive and not breathing, you need to call 103/112 for emergency help and start CPR straight away.
- If they are responsive and breathing move on to circulation.

Circulation with hemorrhage control. Once you have established they are breathing, look and check for bleeding being under control. This means check if your management of bleeding is effective (pressure bandage or tourniquet are applied properly and there is no additional continuous loss of blood); check for signs of internal bleeding and hemorrhagic shock.

- If they are unresponsive and breathing but with no bleeding, put them in the recovery position and call 103/112 for emergency help.

Disability. Quite often, especially in case of MVC, extremity trauma’s accompanied by trauma brain injury (TBI) or spinal injury. In this step medical personnel assess Glasgow Coma Score and clear cervical spinal injury. Additional medical knowledge and skills are required to carry out proper neurological assessment. So the first responder can stop on the previous step of the algorithm.

Exposure/Environment. All potential sources of bleeding must be investigated, so it is necessary to observe patient from front and back and remove clothing. Usually it is performed by paramedics or in the ED personnel.

Person that loose blood, loose temperature (hypothermia) that can lead to trauma death triangle: hypothermia, acidosis and coagulopathy. To prevent irreversible changes in casualty’s organism, it is necessary to keep and injured patient warm (cover with blanket).

In case of witnessed cardiac arrest or being sure that unconscious patient doesn’t have any obvious signs of trauma, responder need to follow **primary survey** algorithm *for medical case: DR ABC (DE)*. Where DR-part has the same meaning. **ABC(DE)** means following: A – Airway, B – breathing and ventilation, C – circulation (chest compressions), D – drugs and differential diagnosis, E – extra investigations (ECG). Last two steps require special equipment and means and refer to paramedics. It is not performed by bystanders and is not a part of first aid.

Airway. Respiratory tract should be opened by head tilt – chin lift maneuver.

If responder has necessary skills pulse check can be performed.

Breathing and ventilation. Two respiratory movements of the patient’s chest must be detected within 10 seconds with look-listen-feel approach.

If patients are unresponsive and not breathing, you need to call 103/112 for emergency help and start CPR straight away. Ask a helper to find and bring an automated external defibrillator or defibrillator (AED).

- If they are responsive and breathing move on to circulation.

Circulation. Once you have established they are breathing, look and check for any signs of severe bleeding.

- If they are unresponsive and breathing, put them in the recovery position and call 103/112 for emergency help.

Once you have completed your primary survey and have treated any life-threatening conditions you can move on to the secondary survey (top to toe survey).

The **secondary survey** is a methodical check to assess a responsive casualty for any other injuries or illnesses.

Once you have completed a primary survey and patient's vital signs are stable, move on to a secondary survey. Ask a responsive casualty and those around them questions about any incident that may have occurred. Your aim is to find out more about the casualty's history, signs and symptoms. If possible, take note of their answers.

Leave the casualty in the position found until you are satisfied that it is safe to move them into a position more suitable for their injury or illness.

History – find out more about the casualty's history. Use the mnemonic **AMPLE** as an easy reminder. Look out for any medical warning jewelry which may provide information their medical history or any allergies.

- **Allergy** – Do they have any allergies? For example, nuts or any medication such as penicillin or aspirin?

- **Medication** – are they taking any medication?

- **Previous medical history** – do they suffer from any medical condition such as diabetes, epilepsy or heart disease? Have they had any previous injuries or surgery?

- **Last meal** – when did they last eat or drink?

- **Event history** – what happened and where? Is the incident due to an illness or an accident? Ask any people nearby what happened and look for any clues that may give you more information.

Signs – look, listen, feel and smell for any signs of injury such as swelling, deformity, bleeding, discoloration or any unusual smells. When checking them you should always compare the injured side of the body with the uninjured side. Are they able to perform normal functions such as standing or moving their limbs? As you check, make a note of any superficial injuries to treat once you've finished your examination.

Symptoms – ask the casualty short, simple questions about any symptoms and sensations they may be feeling. They should answer in as much detail as possible.

It's safe to place someone in the **recovery position** that *is not responding to you but is breathing* normally. This position is used to protect casualty's airway so that it is kept open and any vomit would drain away without interfering with their breathing.

Procedure:

Kneel by the casualty and straighten their legs.

- If they are wearing glasses, or have any bulky items in their pockets, remove them.

- Do not search their pockets for small items.

Place the arm that is nearest to you at a right angle to their body, with the elbow bent and their palm facing upwards.

Bring their other arm across their chest and place the back of their hand against the cheek nearest to you. Hold it there.

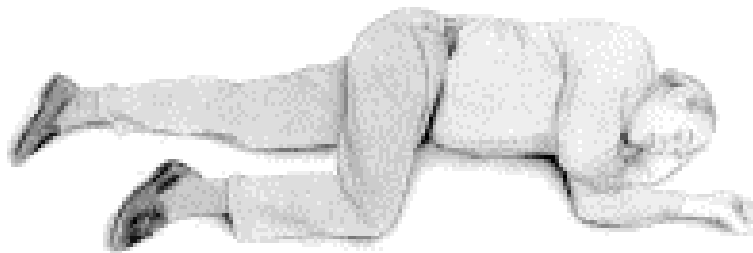
With your other hand, pull their far knee up so that their foot is flat on the floor.

Keeping the back of the casualty's hand pressed against their cheek; pull on the far leg to roll the casualty towards you on to their side. You can then adjust the top leg so that it is bent at a right angle.

Gently tilt the casualty's head back and lift their chin to make sure their airway stays open. You can adjust the hand under their cheek to do this.

Call 103/112 for emergency help if it hasn't already been done. Monitor their level of response while waiting for help to arrive.

- If they remain in the recovery position for 30 minutes, roll them into the recovery position on the other side.



The recovery position