



The Ministry of Education and Science of Ukraine
Sumy State University
Medical Institute

4647 Methodical instructions
for the practical lesson
«Basic Life Support»
for the discipline **«First Aid»**
(according to the Bologna system)
for students of the specialty 222 *«Medicine»*
of full-time training, paramedics and non-medical professionals



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Lesson location is a simulation hall, a training room, a classroom.

A purpose of the lesson: to provide students with theoretical knowledge and develop practical life-support skills that meet the requirements of the International Program “Basic Life Support” (BLS).

1. Vocational guidance of students

First of all, the students should be familiar with the terms and definitions that they use when considering a topic and could give a brief description of them.

A medical emergency is a sudden impairment of physical or mental health that poses a direct and imminent threat to the life and health of the affected person or persons surrounding him / her, resulting from illness, injury, poisoning or other internal or external causes.

A victim is a person involved in a medical emergency.

Event location is a territory, premises, or any other place of a medical emergency.

A terminal state (from Latin *terminus* – border) is a transitional state between life and death.

A terminal state is marked by profound, although reversible, impairment of function in the most important body organs and systems and by increasing hypoxia. A terminal state includes the stages of preagony, agony and clinical death, in which there are no external signs of life. The length of the terminal state depends on the severity of the underlying disease and on whether measures are taken to revive the body, including heart massage and artificial or auxiliary respiration.

A preagonal state is a stage of dying, during which the functions of cerebral cortex, the subcortex and its mesodiencephalic region are gradually impaired. It is characterized by disintegration of all body functions, critical level of blood pressure, disorders of consciousness of various degrees as well as breathing.

A terminal pause is termination of respiration and appearance of idioventricular or ectopic heart rhythm. It is caused by a temporary increase in vagal tone nerve, then agonal breathing occurs.

In **agony** the upper parts of the brain are not functioning, regulation of physiological processes is carried out by bulbar centers with primitive and disordered nature. Activation of stem formation leads to some increase in blood pressure and rapid breathing, which is usually pathological. Transition from preagonal to agonal condition is usually associated with progressive CNS suppression. Agonal burst of vital activity is short-term and ends up with complete suppression of all vital functions – clinical death.

Clinical death is a condition in which there is no circulation and respiratory movements and the activity of the cerebral cortex ceases.

Clinical death differs from the condition of the biological death by a fundamental opportunity to return to life during resuscitation. Thus, clinical death is the first period of the dying process that begins with the moment of termination of the basic functions of an organism (blood circulation, breathing) and continues until the cells of the cerebral cortex die. This stage is characterized by ability to restore the brain cortex functions during resuscitation (respiration and blood circulation recovery).

Clinical death is caused by a triad of clinical signs:

- no chest excursion (apnea);
- absence of pulse on the large arteries (asystole);
- no consciousness (coma).

Beside the mentioned important diagnostic symptoms, there are fixed and dilated pupils, clonic and tonic spasms, changes in skin color, reflexes are reduced.

The next period of the dying process is social, or theological (decerebration, decortication) death. This period begins with death of brain cells and lasts until there is a possibility to restore breathing and blood circulation which, however, does not lead to recovery of brain function.

The third period – **biological death** – is characterized by irreversible changes not only in the cerebral cortex but also in other organs and tissues. In this case, restoration of the main functions of an organism (respiratory and circulatory) is not possible.

The duration of clinical death may be extended in cases of hypothermia, drowning, electrical injuries as well as in pediatric practice.

Emergency Medical Care (EMC) is medical care that includes urgent medical, diagnostic and organizational measures performed by employees of emergency medical care system to save and protect a person's life in an emergency and minimize the effects of the consequences of such a condition to their health.

Premedical care refers to urgent actions and organizational measures aimed at saving and protecting a patient's life in an emergency and minimizing the effects of the consequences of such a condition to their health performed on the scene by individuals without medical qualification.

Resuscitation (*reanimatio*; re- + Latin *animatio* – animation) – revival of an organism.

Resuscitation is a system of urgent measures, which are performed in order to resuscitate from the terminal state and further life support.

The tasks of a resuscitator is to restore and maintain cardiac, respiratory and metabolic functions. In case of a sudden cardiac arrest resuscitation measures may be effective while maintaining compensation abilities of an organism. If the cardiac arrest occurred against the background of a serious incurable disease, when an organism compensation abilities are completely exhausted, resuscitation will be ineffective.

Basic Life Support (BLS). Basic life support includes airway breathing and circulation, maintaining blood circulation and external respiration. All mentioned above is performed without use of special equipment, except personal protective equipment. Basic life support can be provided by both doctors and non-medical workers who have received special training.

Advanced Life Support (ALS). Specialized resuscitation measures that should be performed by a qualified and trained medical professional with adequate equipment and medications.

Basic resuscitation measures

Basic resuscitation measures are presented in accordance with the 2015 revised standards adopted by the European Council of Resuscitation (ERC) and the American Cardiac Association (ACA), and have the following sequence:

Make sure you, the victim and any bystanders are safe.

It is necessary to approach the victim cautiously, being convinced of own safety and safety of others. Keep in mind the dangers of traffic, electric shock, falling debris, aggressive participants of the event.

Check for consciousness.

Check the reaction of the victim by loudly asking them “Are you all right?” and slightly shaking by the shoulder.

Call for help of bystanders.

You must inform others that you have been trained to provide first aid and, by contacting any person from the crowd, ask for their help and give them direction.

Open the airways.

A person without consciousness has impaired airway obstruction that occurs as a result of falling back of the tongue. Turn the patient onto his back if necessary. Place your hand on his forehead and gently tilt his head back. With your fingertips under the point of the patient’s chin, lift the chin to open the airways.

Check for breath (I see, I hear, I feel).

It is necessary to get closer to the victim’s face and look at the chest. At the same time, try to hear the noise of breathing or moaning, feel the warmth of the air that is exhaled by your cheek and see how the chest rises and falls.

It should take no more than 10 seconds to determine the presence of breathing.

If the victim is unconscious but breathing, it is necessary to move him to a stable position.

Move the victim to a stable position.

1. The hand of the victim, located closer to a rescuer, should be placed along the torso with the palm up.

2. The other arm should be bent at the elbow joint and the back of the palm rested on the opposite cheek of the victim.

3. The leg of the victim, located farther from a rescuer, should be bent at the knee at right angles.

4. Pressing the victim's palm against his cheek, at the same time grasp the bent leg under the knee and, using it as a lever, turn the injured person on his side to face the rescuer.

5. Position the leg bent at the knee at right angles.

6. It is necessary to check the presence of self-breathing in the victim.

After moving to a stable position it is necessary to call an Ambulance and monitor the vital signs of the victim.

Call for emergency medical service.

If the victim is unconscious and is not breathing, it is necessary to call an emergency medical service.

An emergency call is a message about the emergency condition of a person and the place of the event and / or application about the need for emergency medical care using a single emergency number 103 or the emergency number of the emergency system for population – 112.

If there is an assistant, ask him to call.

If there is no assistant, you yourself should call for help. When calling it is advisable to use «hands free».

During the call, you must give the report about the victim: he is unconscious, not breathing, name the location of the event, indicate that cardiopulmonary resuscitation has been started, answer the dispatcher's question.

In the absence of breathing or uncertainty about its presence you should begin **cardiopulmonary resuscitation** (CPR) immediately.

The ratio of chest compressions to artificial breaths is 30:2. Resuscitation should be started by compressing the chest. The compressions rate must be 100–120 compressions per one minute, at the proper depth of 5–6 cm. The chest must be allowed to fully recoil between each compression, while trying to minimize breaks between compressions.

When performing artificial lung ventilation, it is required to perform inhales with 1 second duration, exhaling the volume of air, sufficient for visible expansion of the chest.

You should not stop performing indirect cardiac massage for more than 10 seconds.

Application of automated external defibrillator (AED).

If there is an automated external defibrillator nearby, the rescuer should immediately bring it or ask an assistant to do so, while continuing indirect cardiac massage and artificial lung ventilation (or cardiac massage alone for the impossibility of artificial ventilation performance).

The AED must be turned on and the voice commands are executed. Some AEDs turn on automatically when opened, others after pressing the button.

It is necessary to expose the chest of the victim, after that attach the AED pads to the chest and wait for the AED to analyze heart rhythm. One pad is placed on the upper right chest below the right clavicle to the right of the sternum, place the other pad on the left side of the chest on the mid-axillary line a few inches below the left armpit. During heart rhythm analysis it is necessary to stop the chest compressions and not to touch the victim.

If, after heart rhythm analysis, there is a need for electrical defibrillation (defibrillation rhythm), the rescuer should make sure no one touches the victim ("Stop resuscitation, discharge!"), and following the command of the AED press discharge button for defibrillation (completely automatic AED will perform the discharge on its own).

Immediately after defibrillation, you need to resume performing CPR in the ratio of 30:2. Two minutes later the

defibrillator automatically re-analyzes the heart rhythm of the victim. The number of defibrillations is unlimited.

If after the analysis of the heart rhythm another discharge is not required, it is necessary to immediately continue CPR in the ratio of 30:2 by voice and visual commands of AED. Two minutes later, the AED will re-analyze the heart rhythm and decide on the need for defibrillation.

If possible, change the person performing chest compressions every 2 minutes.

It is necessary to continue CPR until the appearance of life signs (breathing, movements, eye opening) before the arrival of the Emergency team or until physical exhaustion of the rescuer.

If the victim shows signs of life, the rescuer should move him to a stable position on the side and wait for the arrival of the Emergency team, while constantly monitoring the breathing and be ready to continue CPR.



Figure 1 – International definition of AED



Figure 2 – Automated external defibrillator

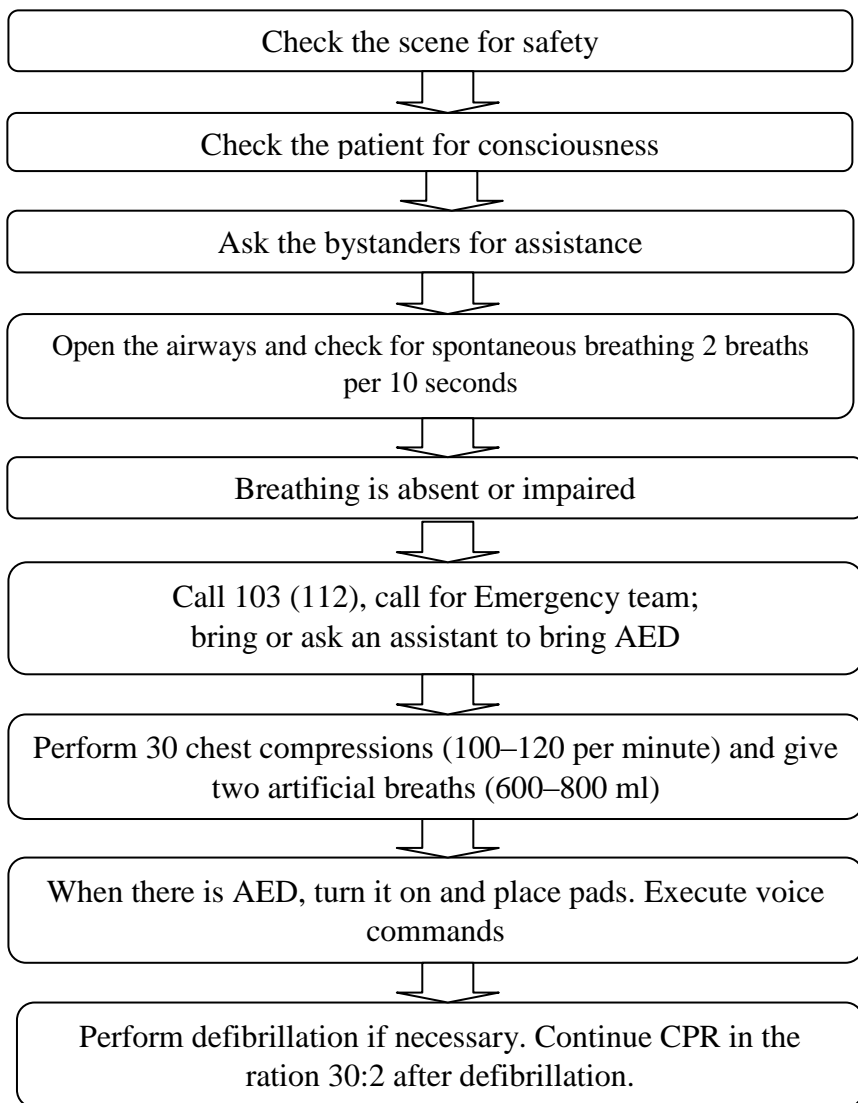


Figure 3 – The sequence of basic cardiopulmonary resuscitation in adults using the AED

In case of resuscitation of a baby or a drowned man you should start with 5 consecutive breaths.

Obstruction of the respiratory tract with a foreign body most often occurs while eating. This is an atypical and potentially reverse cause of sudden death. The first few minutes victims are often conscious, which allows to determine the cause of respiratory disturbance and take life-saving measures. There is incomplete and complete obstruction of the respiratory tract.

A victim who is conscious should be asked: “Are you having trouble breathing? Are you choked?” If the victim is able to talk, cough or breathe, he or she has an incomplete airway obstruction.

Signs of complete obstruction of the respiratory tract: a victim is not breathing, unable to answer questions, there are paradoxical movements of the chest and unproductive attempts to cough, cyanosis, subsequent loss of consciousness and death.

When determining the signs of complete obstruction of the respiratory tract in a conscious victim perform the following actions:

1. Being at the side of the victim and trying to keep him from falling, it is necessary to bend him forward and give 5 sharp blows with a heel of your hand between the shoulder blades. It is forbidden to hit with a fist! In this case, the torso of the victim should be bent so that a foreign body freely came out, and did not get into the respiratory tract again.

2. If after 5 blows the obstruction is not removed, it is necessary to perform the Heimlich maneuver (abdominal thrusts). The technique of the Heimlich maneuver: a rescuer is standing behind a victim, places the arms around his waist, makes a fist and places it below the sternum and above the navel, thumb side in. Grab the fist of the other hand and push it inward and upward at the same time. Perform five of these abdominal thrusts. On a pregnant woman and obese person, you need to place your hand a little higher on their torso, around the base of their breastbone.

In cases when the airway can not be cleared, steps 1 and 2 are repeated in sequence. If the victim loses consciousness, the rescuer should put him on his back, call an Emergency team and begin chest

compressions. The purpose of compression is to try to remove the foreign body from the respiratory tract. After 30 compressions open the victim's mouth and try to remove the foreign body, and then give 2 artificial breaths. It is not recommended to perform the Heimlich maneuver on unconscious people.

People with incomplete airway obstruction are asked to cough. If the coughing attempts were successful, the victim should be examined by Emergency team if necessary.

2. The objectives of the lesson

2.1. A student should know:

- fundamentals of Ukrainian legislation on health care;
- medical, legal and ethical aspects of resuscitation;
- rules for providing your own safety;
- rules for inspection of the scene;
- methods of assessing the signs of life in victims with sudden cardiac arrest;
- rules for an emergency medical call, rules for communication with the dispatcher;
- algorithm for cardiopulmonary resuscitation in adults;
- algorithm for cardiopulmonary resuscitation in children;
- algorithm for cardiopulmonary resuscitation using an automatic external defibrillator;
- algorithm for restoration of airway patency in patients of different age groups.

2.2. To acquire practical skills in:

- assessment of the condition of a person without consciousness;
- providing a person without consciousness with normal breathing a safe lateral position;
- restoration of airway patency;
- techniques for performing chest compressions;
- techniques of performing artificial respiration;
- safe use of automatic external defibrillator;
- first aid in obstruction of the respiratory tract by a foreign body.

3. Learning objectives – to inform students about the main character traits of the person providing first aid to the victim in an emergency, namely, balance and speed in decision making, compassion and concern, communication and teamwork.

4. Basic level of knowledge and skills:

- basics of normal and pathological anatomy;
- basics of normal and pathological physiology;
- basics of general and social hygiene.

5. Practical lesson

5.1. Duration of the lesson – 6 hours.

5.2. Stages of the lesson

5.2.1. Preparatory stage

At the beginning of the lesson, the teacher introduces students to the objectives and plan of the lesson. Assessing the initial level of knowledge of students, attention is drawn to the knowledge of the basics of human anatomy and physiology, types of urgent conditions and causes of their development.

5.2.2. Main stage

The main part of the lesson is held in the simulation hall. It consists of four stages:

Real-time demonstration by the teacher of the basic resuscitation complex.

Repeated demonstration by the teacher of the basic resuscitation complex with detailed explanation of his actions.

The implementation of the basic resuscitation complex by the teacher while students comment on the process.

Practicing basic resuscitation skills on dummies by each student.

5.2.3. The final stage

Control and correction of the level of professional skills is carried out by students, demonstrating their ability to perform basic resuscitation on dummies, solving situational problems, assessing students' knowledge and skills with the rationale for each assessment.

The teacher gives homework, recommends the main and additional literature on the topic of the following lesson.

Test questions

1. Demographic situation in Ukraine. The main causes of premature mortality.
2. Willingness of the population to provide emergency care.
3. Terminal states. Clinical death (definitions, duration, signs).
4. Causes and symptoms of upper airway obstruction.
5. Cardiopulmonary resuscitation (definitions, stages).
6. Compliance with on-site safety rules.
7. Procedure for primary examination of a victim.
8. Procedure for cardiopulmonary resuscitation in adults.
9. Procedure for cardiopulmonary resuscitation in children.
10. The concept of automatic external defibrillator; rules for its use.
11. Duration of the basic resuscitation complex.

5.3. Methodological materials for the main stage of the lesson: a dummy for cardiopulmonary resuscitation, a dummy for work with the respiratory tract, a full-height dummy infant, an educational automatic external defibrillator, a barrier device for artificial ventilation of the lungs “a Bag Valve Mask”, disinfectant, gauze wipes, a multimedia projector, a screen, a marker board, markers of different colors, a scenario list and a safety log.

5.4. Methodological materials for students' individual work are set out in the corresponding methodological guidelines for 1st year students regarding the independent work for a practical lesson on this topic

References:

1. American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care / American Heart Association // *Circulation*. – 2015. – Vol. 132 (18). – P. 313–589.
2. European Resuscitation Council Guidelines for Resuscitation Section 1. Executive summary / K. G. Monsieurs, J. P. Nolan, L. L. Bossaert [et al.] // *Resuscitation*. – 2015. – Vol. 95. – P. 1–80.

Short guidelines to a practical lesson

At the beginning of the lesson, it is recommended to conduct test control of the actual level of knowledge. Then the teacher must demonstrate basic resuscitation complex, accompanied by detailed explanations. Each student must practice his resuscitation skills on a dummy. At the end of the lesson the students are recommended to solve several situational tasks and pass final control test.

Technological chart for the lesson

№	Stage	Time, min.	Training materials		Place
			Tests, objects	Equipment	
1	Determination of the initial level of knowledge	20	Multiple choice questions		Classroom
2	Real-time demonstration by the teacher of basic resuscitation complex	60	A dummy for cardiopulmonary resuscitation		Simulation hall
3	Repeated demonstration by the teacher of the basic resuscitation complex with detailed explanations of his actions.	60	A dummy for cardiopulmonary resuscitation		Simulation hall
4	Implementation of the basic resuscitation complex by the teacher, accompanied by students' comments	60	A dummy for cardiopulmonary resuscitation		Simulation hall
5	Practical development of basic resuscitation skills on dummies by each student	100	Dummies, situational problems	Disinfectant, gauze wipes	Simulation hall
6	Final test	30	Tests		Classroom
7	Summation	30			Classroom

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