

**PUBLIC HEALTH MINISTRY OF UKRAINE
UZHGOROD NATIONAL UNIVERSITY
MEDICAL FACULTY
ONCOLOGY DEPARTMENT**

ANAESTHESIOLOGY AND INTENSIVE CARE

**CARDIOPULMONARY AND CEREBRAL RESUSCITATION.
GENERAL PROBLEMS OF ANAESTHESIOLOGY.
CLINICAL ANAESTHESIOLOGY.**

Methodical instructions for 5 year medical student practical training

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I. CARDIOPULMONARY AND CEREBRAL RESUSCITATION (CPR)

Topic actuality

Clinical death is the terminal complication of any critical state kind, which may be develop because of severe disease or suddenly environmental influences. Most frequently, the medical staff faced with this state and the necessary of CPR providing. The determination of cause, which lead to onset of clinical death and it effective elimination require certain time. However, in clinical death state patient the central nervous system irreversible changes developed already after 5 minutes from it onset. So early starting and accurate providing of basic life support, especially in out of hospital conditions, may give the patients or victims more time for advanced life support and the following higher nervous activity full recovery.

In most cases of sudden cardiac arrest the CPR is not limited only basic life support. In contrast, it is continuous process, which require the using of drugs and equipment. Therefore, the physician must not only organize and be able to perform basic and advanced life support, but clear understand and be able to correct all pathological processes in postresuscitation period patient.

Teaching aims.

<p align="center"><u>General purpose:</u> be able to diagnose clinical death and terminal states and to perform cardiopulmonary and cerebral resuscitation.</p> <p align="center"><u>Concrete aims</u></p>	<p align="center"><u>Initial level of knowledge-abilities</u></p>
Be able to:	
1. To determine signs of clinical and biological death	1. Interpret physical examination findings (Department of internal medicine preliminary)
2. The use of different CPR procedures and control its efficacy (open airway support, artificial lung ventilation, chest compression, to determine the type of sudden cardiac arrest according to ECG, electrical defibrillation and drug therapy of different sudden cardiac arrest kinds).	2. Impart the necessary patient positions for "mouth to mouth" and "mouth to nose" mechanical ventilation, chest compressions (General surgery department).
3. Mark out of CPR stages	3. Interpret action of adrenomimetics, arrhythmogenic and other drugs for resuscitation (Pharmacology department), the mechanisms of cardiac electrical activity and its disturbances (pathophysiology department).
4. To perform clinical and laboratory diagnostics of postresuscitation disease, brain death.	4. Interpret type of consciousness disturbance and performing neurological (Department of neurology).
5. Mark out the features of CPR in different age group children.	5. Interpret anatomical and physiological features of newborn, infant and preschool children (Pediatric department, department of obstetrics and gynecology).

1). Cardiopulmonary and cerebral reanimation (European Association).

Cardiopulmonary and cerebral reanimation is performed:

- **Basic (elementary) life support. Urgent oxygenation.**

A – airway

B – breathing

C – circulation

- **Advance (furture) cardiac support. Bestoring blood circulation.**

D – drugs

E – electrocardiography

F – fibrillation

- **Prolonged (long) life support. Cerebral reanimation.**

J – patient's state evaluation

H – normal thinking restoration

I – intensive therapy.

2). Treatable causes of cardiac arrest (5 H's and 5 T's):

- Hypoxia
- Hypovolemia
- Hydrogeion (acidosis)
- Hypo-/ hyperkalemia
- Hypothermia

And

- Toxins
- Tamponade (cardiac)
- Tension pneumotorax
- Thrombosis, pulmonary

- Thrombosis, coronary.

3). The relation of compression to breathing frequency must be 30:2.

Chest compression frequency must be 100 per minute. While using Ambu sack – 1 breath every 5 seconds.

4). Two main approaches are used to introduce medical preparations:

intravenous (into central or peripheral vessels) and intercostals – which gives an adequate plasma concentration. It is equal in time to the central vein introduction.

1. In a case of asystoly 0,1% adrenalin hydro-chloride solution is introduced – 1 mg every 3-5 minutes intravenously. In case of fibrillation – adrenalin is administered only after the third non-effective defibrillation discharge in dose 1 mg. Later the same dose is introduced every 3-5 minutes intravenously (before every second defibrillation) until fibrillation persists.
2. Amiodaron – first-line antiarrhythmic preparation in case of fibrillation, resistant to electro-impulse therapy after the third non-effective discharge – initial dose 300 mg (dissolved in 20 ml physiologic solution), further 150 mg are introduced if necessary. In the third stage of postreanimation disease 900 mg amiodaron are introduced during 24 hours to prevent refrillation.
3. Lidocaine – only when amiodaron is not available – the initial dose is 100 (1-1,5 mg/kg) intravenously.
4. Sodium bicarbonate is introduced **only** in case of hyperkalemia or tricyclic antidepressants overdose – 50 ml 8,4% solution intravenously.

5. Calcium chloride – 10 ml 10% solution in case of hyperkalemia, hypocalcaemia and in case of overdose of calcium channel blockers.

6. It is not recommended to use atropine during reanimation.

5). During fibrillation **defibrillation** is performed.

For monophasic defibrillators the energy of the first and further discharges is 360 Joules. For biphasic defibrillators the initial discharge must be 150 J with further increase in energy up to 360 J.

Reanimation is made during 30 minutes, and when it is not effective – it is stopped. The time when reanimation is stopped is fixed as the time of patient's death.

6). **Postreanimation disease intensive therapy** is performed in 2 directions – general measures and measures for improving cerebral metabolism.

1. General measures:

- blood circulation restoration and support, tissue perfusion restoration, its efficiency control – hourly diuresis, «small discharge» syndrome treatment, preparations for better blood reology,
- gas exchange restoration,
- metabolic impairments correction – eliminating hypoxia-consequences, acidic-base state correction, electrolyte balance and osmolarity correction, and energy exchange (2000-3000 calories).

2. Measures to improve brain metabolism and its functions:

- drug therapy,

- infusion therapy to improve oxygen transport,
- internal cerebral pressure correction,
- hyperbaric oxygenation,
- hypothermia.

Complications during the postreanimation period during the first 24 hours:

- sudden cardiac arrest,
- brain edema,
- pulmonary edema,
- increase in tissue bleeding,

later complications:

- acute renal insufficiency,
- acute hepatic insufficiency,
- inflammatory and suppurative processes,
- sepsis.

Teaching content in accordance with aims.

Theoretical questions.

1. Clinical death, signs,diagnostics .
2. Urgent stage CPR
3. Signs effectiveness resuscitation, indications to stopping it.
4. Specialized stage CPR.
5. Kinds of circulation arrest, its diagnostics.
6. Drugs for the specialized stage of cardiac-pulmonary and cerebral resuscitation, its doses.
7. The ways of introduction drugs for resuscitation and its foundation.
8. Technique of defibrillation.
9. Indication for the direct cardiac massage.
10. Complications of resuscitation.
11. Postresuscitation period.
12. Conception for about decortication, decerebration, brain death.
13. The main principles in treatment in postresuscitation period.
14. Intensive therapy brain edema.

Determination and providing of initial level of knowledge-abilities.

Tasks for initial level verification.

Task 1.

60 years old patient felt unwell on the street. Bystanders determined diagnosis of clinical death. Which most reliable sign for this diagnosis?

- A. Convulsion
- B. Cyanosis
- C. Absence of carotid pulse
- D. Mydriasis
- E. Bradypnoea

Task 2.

Bystander found an elderly male on the street. According to bystanders information he was there during 1 hour. Arrived for call emergency physician stated biological death. By what sign is this diagnosis made?

- A. Putrid smell
- B. Low jaw postmortem rigidity
- C. Low extremities livores mortis
- D. Cornea desiccation
- E. Total body livores mortis

Task 3.

Patient was pulled out of basin after 5 minutes of jump to the water. The pupils are dilated, skin covers are cyanotic, breaths and carotid pulse are absent. CPR was started by rescuers. What rule should be followed during basic life support in this patient?

- A. Rescue breathing always performed with twofold volume

- B. Epinephrine dose for i.v. is 1 mg
- C. Always used Heimlich maneuver
- D. Safar maneuver perform without head throw back
- E. After cleaning mouth cavity moved front on low jaw

Task 4.

40 years old obesity patient found without consciousness. During transfer to the hospital sudden cardiac arrest occurred. Emergency physician perform electrical defibrillation, which was effective. Why emergency physician supposed about ventricular fibrillation in this patient?

- A. Because it is most widespread type of sudden cardiac arrest
- B. It is developed mainly in male person
- C. Always complicate coma state course
- D. Developed mainly in obesity person
- E. It has typical clinical signs

Task 5.

60 years old female patient suddenly fell down on the street. During examination unconscious, the skin surface pale, spontaneous breath and carotid pulse absents. Which action should be used as started aid?

- A. Turn the patient to the prone position
- B. Open airways support
- C. Determining of the skull integrity
- D. "Mouth to mouth" rescue breathing
- E. Sylvester technics of artificial lung ventilation

Task 6.

65 years old patient transfer to the hospital by ambulance with supposed diagnosis acute cerebral circulation disturbances. Suddenly the patient became pale, there are no breath and carotid pulse. What should we need to do after restore open airways?

- A. Air bag mask system ventilation
- B. Peripheral vein puncture
- C. Open airways
- D. ECG record
- E. Heimlich maneuver

Task 7.

56 years old patient admitted to the hospital after clinical death concerning foreign body aspiration. There are increasing breathless, ventricular extrasystole, decreasing urine output, arterial hypotension. What the most reliable cause of this state?

- A. Aspiration pneumonia
- B. Postresuscitation disease
- C. Pulmonary atelectasis
- D. Advanced heart failure
- E. Hypertonic crisis

Task 8.

70 years old patient after successful CPR admitted to the hospital. She is unresponsive after 6 days, BP 80/40 mm Hg, spontaneous breath absent. Which of the additional criterion is useful for the diagnostics of brain death in this patient?

- A. Unresponsiveness to painful stimuli

- B. Negative result of contrast angiography of cerebral vessels.
- C. Pupili unresponsiveness to the direct bright light and fixed eyeballs
- D. Unresponsiveness to the intratracheal tube movements.
- E. The absent of oculocephalic reflexes and positive meningeal signs.

Task 9.

After wasp bite in 10 years old child the anaphylactic shock and clinical death developed. The CPR was started by emergency staff. What is the point of chest compressions?

- A. The middle of the chest and 1 sm to the right from median line
- B. Low third of chest strictly on the median line
- C. The middle of the chest, strictly on center
- D. The middle of the chest and 2 sm to the left from cardiac projection
- E. Two sm. up from xiphoid process on the median line

Task 10.

In 4 years old child with acute tracheal stenosis the sudden cardiac arrest occurred.. During CPR the epinephrine is used. Which is the single dose of 0,1% epinephrine for i.v. injection in this child?

- A. 0,01 ml/kg body mass
- B. 0,1 ml/kg body mass
- C. 0,001 ml/kg body mass
- D. 1 ml/kg body mass
- E. 1 ml, independently of body mass.

Standards of right answers.

Task 1. C. **Task 2.** B. **Task 3.** D. **Task 4.** A. **Task 5.** B.

Task 6. A. Task 7. B. Task 8. B. Task 9. C. Task 10. A.

Short methodical instructions for practical study.

In the study start there is the students initial knowledge-ability level control with using test tasks. Then the syudents take participation in clinical round in intensive care departments, examine the patients after CPR, got to know with clinical and laboratory findings of this patients. If there are no this patients, the students had situational tasks. All answers and curatio controled by teacher.

In classroom the students with teacher discussed the results of patients examination and resuscitation actions, which was performed for patients. On the basis of studied algorithms the students with teacher make up the programmes of resuscitation actions for examined patients, make the tactics of their management and discuss committed errors. Then the students had test control. At the end of the classes, the sums up of work performed and the students achieved overall study evaluation.

Suggested Literature

1. Intensive Care Medicine, 6th Edition. Irwin R.S., Rippe J.M. – Lippincott Williams & Wilkins. – 2008.
2. ICU Book, 3rd Edition. P. Marino. – Lippincott Williams & Wilkins. – 2007.
3. Clinical Anesthesia, 6th Edition. P.G.Barash, B.F.Cullen et al. – Lippincott Williams Wilkins. – 2009.
4. 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment

Recommendations. Nolan J.P. et al. Resuscitation. 2010 Oct;81 Suppl 1:e1-25. (available at www.erc.edu).

5. The (new) European 2010 Resuscitation Guidelines. - Jerry Nolan. - 233 pages - 1st edition (October 2010).

II. GENERAL PROBLEMS OF ANAESTHESIOLOGY

Topic actuality

In the era of surgery becoming even the skilfully executed operative interventions were completed by unfavorable outcomes because pain shock development in patient on an operating table or in the nearest postsurgery period. Therefore appearance of powerful analgetics and new anaesthetic management methods induced to substantial shove to development of medicine as a whole. However, currently, pain is a serious clinical problem which requires permanent perfection for patient safety during surgery, and adequate anaesthetization during and after surgery intervention. Currently anaesthetist disposes plenty of medicinal agents for different kinds and methods providing of all anaesthesia components. He has the choice possibility of exactly that type of anaesthesia, which will be optimal for a concrete patient. Therefore a student must know about anesthesia, classification of anaesthesia types, general indications and contra-indications to the basic methods of anaesthesia, its components, and complications, and apparatus which necessary for its realization, monitoring of the patient state in an operating-room and department of intensive therapy.

Teaching aims.

General purpose: able to define the degree of surgery and anaesthesia risk and the anaesthesia tactics for the surgical patients

<u>Concrete aims</u>	<u>Initial level of knowledge-abilities</u>
Be able to:	
1. To classify the modern methods of anaesthesia, compare advantages and lacks of these methods.	1. To interpret the groups of anesthetics, calculate the dose of drugs, used for the anaesthesia and surgery providing (department of pharmacology).
2. To differentiate the typical clinical manifestation of the different anesthesia stages.	2. To interpret the degree of consciousness disturbances (department of neurology), clinical investigation data (department of internal medicine propedeutics).
3. To define the degree of surgery and anaesthesia risk and plan the tactics of the anaesthesia.	3. To interpret data of medical history, physical examination, laboratory data and workup (department of internal medicine propedeutics), to interpret the action of drugs for premedication, preoperative management (department of pharmacology), topography of the upper airways, reference-points of neural trunks and plexuses, spinal cord and brain tunics (department of operative surgery and topographical anatomy).
4. To detect the anaesthesia possible complications and give the first aid.	4. To interpret the mechanism of anaphylaxis reaction development, laryngospasm, bronchiolospasm, hypovolemic and anaphylactic shock (department of pathophysiology).

Anesthesia.

1. Anesthesia, or **anaesthesia** (from Greek ἀν-, *an-*, "without"; and αἴσθησις, *aisthēsis*, "sensation", see spelling differences) is a temporary state consisting of unconsciousness, loss of memory, lack of pain, and muscle relaxation.

The types of anesthesia are broadly classified into general anesthesia, sedation and regional anesthesia. General anesthesia refers to the suppression of activity in the central nervous system, resulting in unconsciousness and total lack of sensation. Sedation (or dissociative anesthesia) uses agents that inhibit transmission of nerve impulses between higher and lower centers of the brain inhibiting anxiety and the creation of long-term memories. Regional anesthesia renders a larger area of the body insensate by blocking transmission of nerve impulses between a part of the body and the spinal cord. It is divided into peripheral and central blockades. Peripheral blockade inhibits sensory perception within a specific location on the body, such as when a tooth is "numbed" or when a nerve block is given to stop sensation from an entire limb. Central blockades place the local anesthetic around the spinal cord (such as with spinal and epidural anesthesia) removing sensation to any area below the level of the block.

There are both major and minor risks of anesthesia. Examples of major risks include death, heart attack and pulmonary embolism whereas minor risks can include postoperative nausea and vomiting and readmission to hospital. The likelihood of a complication occurring is proportional to the relative risk of a variety of factors related to the patient's health, the complexity of the surgery being performed and the

type of anesthetic. Of these factors, the person's health prior to surgery (stratified by the ASA physical status classification system) has the greatest bearing on the probability of a complication occurring. Patients typically wake within minutes of an anesthetic being terminated and regain their senses within hours. One exception is a condition called long-term post-operative cognitive dysfunction, characterized by persistent confusion lasting weeks or months, which is more common in those undergoing cardiac surgery and in the elderly.

2. Medical uses.

The purpose of anesthesia can be distilled down to three basic goals or endpoints:

- hypnosis (a temporary loss of consciousness and with it a loss of memory)
- analgesia (lack of sensation which also blunts autonomic reflexes)
- muscle relaxation

Different types of anesthesia (which are discussed in the following sections) affect the endpoints in different ways. Regional anesthesia, for instance affects analgesia, benzodiazepine type sedatives (used in twilight sleep) favor amnesia and general anesthetics can affect all of the endpoints. The goal of anesthesia is to achieve the necessary endpoints with the least amount of risk possible to the patient.

To achieve the goals of anesthesia, drugs act on different but interconnected parts of the nervous system. Hypnosis, for instance, is generated through actions on the nuclei in the brain and is similar to the activation of sleep. The effect is to make people less aware and less reactive to non-noxious stimuli.

Loss of memory (amnesia) is created by action of drugs on multiple (but specific) regions of the brain. Memories are created as either declarative or non-declarative memories in several stages (short-term, long-term, long-lasting) the strength of which is determined by the strength of connections between neurons termed synaptic plasticity. Each anesthetic produces amnesia through unique effects on memory formation at variable doses. Inhalational anesthetics will reliably produce amnesia through general suppression of the nuclei at doses below those required for loss of consciousness. Drugs like midazolam produce amnesia through different pathways by blocking the formation of long-term memories.

Tied closely to the concepts of amnesia and hypnosis is the concept of consciousness. Consciousness is the higher order process that synthesizes information. For instance, the “sun” conjures up feelings, memories and a sensation of warmth rather than a description of a round, orange warm ball seen in the sky for part of a 24-hour cycle. Likewise, a person can have dreams (a state of subjective consciousness) during anesthetic or have consciousness of the procedure despite having no indication of it under anesthetic. It is estimated that 22% of people dream during general anesthesia and 1 or 2 cases per 1000 have some consciousness termed “awareness during general anesthesia”.

3. Techniques.

Anesthesia is unique, in that it does not offer any particular benefit, rather it allows others to do things that might be beneficial. The best anesthetic, therefore is the one with the lowest risk to the patient that still achieves the endpoints required to complete the procedure. The first stage of an anesthetic is the pre-operative risk assessment made up of the

medical history, physical examination and lab tests. Diagnosing a person's pre-operative physical status allows the clinician to minimize anesthetic risks. A well completed medical history will arrive at the correct diagnosis 56% of the time which increases to 73% with a physical examination. Lab tests help in diagnosis but only in 3% of cases, underscoring the need for a full history and physical examination prior to anesthetics. Incorrect pre-operative assessments or preparations are the root cause of 11% of all adverse anesthetic events.

ASA physical status classification system	
ASA class	Physical status
ASA 1	Healthy person
ASA 2	Mild systemic disease
ASA 3	Severe systemic disease
ASA 4	Severe systemic disease that is a constant threat to life
ASA 5	A moribund person who is not expected to survive without the operation
ASA 6	A declared brain-dead person whose organs are being removed for donor purposes
(E)	Suffix added for patients undergoing emergency procedure

One part of the risk assessment is based on the patients' health. The American Society of Anesthesiologists have developed a six-tier scale which stratifies the pre-operative physical state of the patient called the

ASA physical status. The scale assesses a high-order of risk as the patient's general health relates to an anesthetic.

The more detailed pre-operative medical history aims to discover genetic disorders (such as malignant hyperthermia or pseudocholinesterase deficiency), habits (tobacco, drug and alcohol use), physical attributes (such as obesity or a difficult airway) and any coexisting diseases (especially cardiac and respiratory diseases) that might impact the anesthetic. The physical examination helps quantify the impact of anything found in the medical history in addition to lab tests.

Aside from the generalities of the patient's health assessment, an evaluation of the specific factors as they relate to the surgery also need to be considered for anesthesia. For instance, anesthesia during childbirth must consider not only the mother but the baby. Cancers and tumors that occupy the lungs or throat create special challenges to general anesthesia. After determining the health of the person undergoing anesthetic and the endpoints that are required to complete the procedure, the type of anesthetic can be selected. Choice of surgical method and anaesthetic technique aims to reduce risk of complications, shorten time needed for recovery and minimise the surgical stress response.

4. General anesthesia.

A vaporizer holds a liquid anesthetic and converts it to gas for inhalation (in this case sevoflurane).

Anesthesia is the combination of the endpoints (discussed above) which are reached by drugs acting on different but overlapping sites in the central nervous system. General anesthesia (as opposed to sedation or regional anesthesia) has three main goals: lack of movement (paralysis),

unconsciousness, and blunting of the stress response. In the early days of anesthesia, anesthetics could reliably achieve the first two, allowing surgeons to perform necessary procedures, but many patients died because the extremes of blood pressure and pulse caused by the surgical insult were ultimately harmful. Eventually, the need for blunting of the surgical stress response was identified by Harvey Cushing, who injected local anesthetic prior to hernia repairs. This led to the development of other drugs that could blunt the response leading to lower surgical mortality rates.

The most common approach to reach the endpoints of general anesthesia is through the use of inhaled general anesthetics. Each has its own potency which is correlated to its solubility in oil. This relationship exists because the drugs bind directly to cavities in proteins of the central nervous system, although several theories of general anaesthetic action have been described. Inhalational anesthetics are thought to exert their effects on different parts of the central nervous system. For instance, the immobilizing effect of inhaled anesthetics results from an effect on the spinal cord whereas sedation, hypnosis and amnesia involve sites in the brain. The potency of an inhalational anesthetic is quantified by its minimum alveolar concentration or MAC. The MAC is the percentage dose of anaesthetic that will prevent a response to painful stimulus in 50% of subjects. The higher the MAC, generally, the less potent the anesthetic.

The ideal anesthetic drug would provide hypnosis, amnesia, analgesia, and muscle relaxation without undesirable changes in blood pressure, pulse or breathing. In the 1930s, physicians started to augment inhaled general anesthetics with intravenous general anesthetics. The drugs used in combination offered a better risk profile to the person under

anesthetic and a quicker recovery. A combination of drugs was later shown to result in lower odds of dying in the first 7 days after anesthetic. For instance, propofol (injection) might be used to start the anesthetic, fentanyl (injection) used to blunt the stress response, midazolam (injection) given to ensure amnesia and sevoflurane (inhaled) during the procedure to maintain the effects. More recently, several intravenous drugs have been developed which, if desired, allow inhaled general anesthetics to be avoided completely.

5. Sedation.

Sedation (also referred to as *dissociative anesthesia* or *twilight anesthesia*) creates hypnotic, sedative, anxiolytic, amnesic, anticonvulsant, and centrally produced muscle-relaxing properties. From the perspective of the person giving the sedation, the patient will appear sleepy, relaxed and forgetful, allowing unpleasant procedures to be more easily completed. Sedatives such as benzodiazepines are usually given with pain relievers (such as narcotics, or local anesthetics or both) because they don't, by themselves, provide significant pain relief.

From the perspective of the person receiving sedative, the effect is a feeling of general relaxation, forgetfulness and time passing quickly. Many drugs can produce a sedative effect including benzodiazepines, propofol, thiopental, ketamine and inhaled general anesthetics. The advantage of sedation over a general anesthetic is that it generally doesn't require support of the airway or breathing (no tracheal intubation or mechanical ventilation) and can have less of an effect on the cardiovascular system which may add to a greater margin of safety in some patients.

6. Regional anesthesia.

Backflow of cerebrospinal fluid through a spinal needle after puncture of the arachnoid mater during spinal anaesthesia

When pain is blocked from a part of the body using local anesthetics, it is generally referred to as regional anesthesia. There are many types of regional anesthesia either by injecting into the tissue itself, a vein that feeds the area or around a nerve trunk that supplies sensation to the area. The latter are called nerve blocks and are divided into peripheral or central nerve blocks.

The following are the types of regional anesthesia:

- *Infiltrative anesthesia*: a small amount of local anesthetic is injected in a small area to stop any sensation (such as during the closure of a laceration, as a continuous infusion or "freezing" a tooth). The effect is almost immediate.
- *Peripheral nerve block*: local anesthetic is injected near a nerve that provides sensation to particular portion of the body. There is significant variation in the speed of onset and duration of anesthesia depending on the potency of the drug (e.g. Mandibular block).
- *Intravenous regional anesthesia* (also called a Bier block): dilute local anesthetic is infused to a limb through a vein with a tourniquet placed to prevent the drug from diffusing out of the limb.
- *Central nerve blockade*: Local anesthetic is injected or infused in or around a portion of the central nervous system (discussed in more detail below in Spinal, epidural and caudal anesthesia).

- *Topical anesthesia*: local anesthetics that are specially formulated to diffuse through the mucous membranes or skin to give a thin layer of analgesia to an area (e.g. EMLA patches).
- *Tumescent anesthesia*: a large amount of very dilute local anesthetics are injected into the subcutaneous tissues during liposuction.
- *Systemic local anesthetics*: local anesthetics are given systemically (orally or intravenous) to relieve neuropathic pain.

7. Nerve blocks.

When local anesthetic is injected around a larger diameter nerve that transmits sensation from an entire region it is referred to as a nerve block. Nerve blocks are commonly used in dentistry, when the mandibular nerve is blocked for procedures on the lower teeth. With larger diameter nerves (such as the interscalene block for upper limbs or psoas compartment block for lower limbs) the nerve and position of the needle is localized with ultrasound or electrical stimulation. The use of ultrasound may reduce complication rates and improve quality, performance time, and time to onset of blocks. Because of the large amount of local anesthetic required to affect the nerve, the maximum dose of local anesthetic has to be considered.

Nerve blocks are also used as a continuous infusion, following major surgery such as knee, hip and shoulder replacement surgery, and may be associated with lower complications. Nerve blocks are also associated with a lower risk of neurologic complications when compared to neuraxial blocks.

Spinal, epidural and caudal anesthesia.

Central neuraxial anesthesia is the injection of local anesthetic around the spinal cord to provide analgesia in the abdomen, pelvis or lower extremities. It is divided into either spinal (injection into the subarachnoid space), epidural (injection outside of the subarachnoid space into the epidural space) and caudal (injection into the cauda equina or tail end of the spinal cord). Spinal and epidural are the most commonly used forms of central neuraxial blockade.

Spinal anesthesia is a "one-shot" injection that provides rapid onset and profound sensory anesthesia with lower doses of anesthetic, and is usually associated with neuromuscular blockade (loss of muscle control). Epidural anesthesia uses larger doses of anesthetic infused through an indwelling catheter which allows the anesthetic to be augmented should the effects begin to dissipate. Epidural anesthesia does not typically affect muscle control.

Because central neuraxial blockade causes arterial and vasodilation, a drop in blood pressure is common. This drop is largely dictated by the venous side of the circulatory system which holds 75% of the circulating blood volume. The physiologic effects are much greater when the block is placed above the 5th thoracic vertebra. An ineffective block is most often due to inadequate analgesia or sedation rather than a failure of the block itself.

8. Acute pain management.

Pain that is well managed during and immediately after surgery improves the health of patients (by decreasing physiologic stress) and the potential for chronic pain. Nociception (pain sensation) is not hard-wired

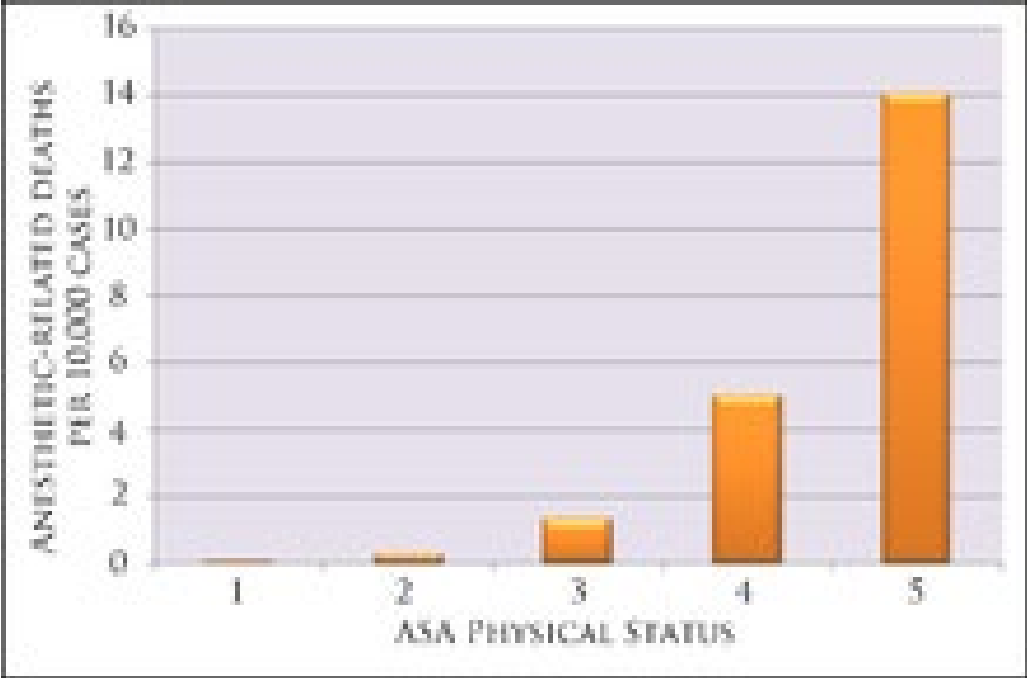
into the body. Instead, it is a dynamic process wherein persistent painful stimuli can sensitize the system and either make pain management difficult or promote the development of chronic pain. For this reason, preemptive acute pain management may reduce both acute and chronic pain and is tailored to the surgery, the environment in which it is given (in-patient/out-patient) and the individual patient.

Pain management is classified into either pre-emptive or on-demand. On-demand pain medications typically include either opioid or non-steroidal anti-inflammatory drugs but can also make use of novel approaches such as inhaled nitrous oxide or ketamine. On demand drugs can be administered by a clinician ("as needed drug orders") or by the patient using patient-controlled analgesia (PCA). PCA has been shown to provide slightly better pain control and increased patient satisfaction when compared with conventional methods. Common preemptive approaches include epidural neuraxial blockade or nerve blocks. One review which looked at pain control after abdominal aortic surgery found that epidural blockade provides better pain relief (especially during movement) in the period up to three postoperative days. It reduces the duration of postoperative tracheal intubation by roughly half. The occurrence of prolonged postoperative mechanical ventilation and myocardial infarction is also reduced by epidural analgesia.

9. Risks.

Risks and complications as they relate to anesthesia are classified as either morbidity (a disease or disorder that results from anesthesia) or mortality (death that results from anesthesia). Attempting to quantify how anesthesia contributes to morbidity and mortality can be difficult because a

person's health prior to surgery and the complexity of the surgical procedure can also contribute to the risks.



Anesthesia-related deaths by ASA status.

Teaching content in accordance with aims.

Theoretical questions.

1. Classification of anaesthesia types.
2. Breathing circuits, advantage and limitations.
3. Inhalation anesthetics: pharmacokinetics, clinical picture of anesthesia.
4. General anaesthesia components.
5. Steps of the anaesthesia management.
6. Premedication, its kinds.
7. Patient preparation to the surgery and anesthesia.
8. Clinical picture and stages of anesthesia by ether, halothane, by a nitrous oxide.
9. Mask method of general anaesthesia.
10. Intratracheal anesthesia. Indications, methods of realization.
11. Pharmacology of muscle relaxants.
12. Complications of general anaesthesia.
13. Noninhalation anesthetics: ketamine, sodium thiopental, sodium oxybutirate, propofol. Pharmacokinetics, clinical picture.
14. Kinds and methods of regional anaesthesia.
15. Features of general anaesthesia in ambulatory and urgent conditions.
16. Features of patients preparation for the surgery and anesthesia.
17. Physiological and pathophysiological features of general anaesthesia for children and elderly persons.

Determination and providing of initial level of knowledge-abilities.

Tasks for initial level verification.

Task 1.

Anaesthesiologist planned intravenous anaesthesia with using of ketamine and diazepam for the right foot 5 finger amputation in 70 year old patient. What is the limitation of such anaesthesia method?

- A. Poor controllability
- B. Absence of shutdown of consciousness
- C. Necessity of the use only together with droperidol
- D. Large expense of anesthetic
- E. Impossibility to combine it with other preparations

Task 2.

Urgent operative intervention coming the 64 year old patient of concerning the strangulated postsurgical hernia of largenesses, diffuse peritonitis. What quality will anaesthetist in this situation prefer the intratracheal method of ИБЛ on the basis of during anaesthesia?

- A. Diminishing of volume of dead ground
- B. Possibility to use the maximal doses of anesthetics
- C. Achievement of muscle relaxation necessary degree
- D. Most simple method of anaesthesia
- E. Prophylaxis of laryngospasm

Task 3.

The motor excitation is expressed in 20 years old female patient during ether mask anesthesia. Ciliary reflex is stored, pupils are extended, photoreaction living. Breathing frequent, deep. BP is 140/90 mmHg, pulse 116 per minute. What is the stage of anesthesia in this patient?

- A. I stage
- B. II stage
- C. III stage, 1 level
- D. III stage, 2 level
- E. III stage, 3 level

Task 4.

A female 40 years old patient, which suffering from bronchial asthma, appendectomy is performed under mask halothane anesthesia. Eyeballs are immobile, pupils narrow, a photoreaction is stored. Muscles of low jaw and extremities are relaxed. Breathing slightly superficial, BR 17 per minute. BP is 110/60 mm Hg. What is the stage of anesthesia in this patient?

- A. I stage
- B. II stage
- C. III stage, 1 level
- D. III stage, 2 level
- E. III stage, 3 level

Task 5.

Urgent surgery coming for 34 years old female patient, concerning acute adhesive small bowel obstruction. About 5 years ago underwent appendectomy. There are no chronic somatopathies. What is the degree of operating risk according to ASA classification for this patient?

- A. 1
- B. 2
- C. 3
- D. 5
- E. 6

Task 6.

The planned surgery - TURP coming for 86 years old male patient with diffused atherosclerosis. What is the optimal type of the anaesthetic management for surgery in this patient?

- A. General multicomponent anaesthesia
- B. Intravenous ketamine anaesthesia
- C. Intravenous anaesthesia with phentanyl and droperidol using
- D. Epidural anaesthesia
- E. Mask halothane anesthesia

Task 7.

Urgent operative intervention concerning multiple trauma is planned for 45 years old male patient which suffering from pyloric stenosis. For regurgitation prevention during trachea intubation the anaesthetist performed Sellick's maneuver. What is this maneuver consist of?

- A. Squeezing of oesophagus between a larynx and spine
- B. Leading-out of low jaw forward and up
- C. Irrigation of mouth cavity by lidocaine
- D. A turn of the head to the right during trachea intubation
- E. Throwing back of head during the trachea intubation

Task 8.

The urgent operative intervention concerning the strangulated ventral hernia is coming for a 55 years old patient, with lingering duodenum ulcerous disease. In which manner is it possible to prevent of regurgitation in this patient?

- A. By the use of nasotracheal intubation
- B. Precurarisation
- C. Preventive tracheostomy
- D. Setting of stomach-pump during an intubation
- E. By irrigation of vocal cords corticosteroid solution

Task 9.

Implementation of the superficially located abscess dissection is planned in 20 years old patient with the use of non-inhalation anesthetic. What from the preparations listed below does refer to this group?

- A. Halothane
- B. Ether
- C. Nitrous oxide
- D. Sodium thiopentalum
- E. Sevoflurane

Task 10.

A 80 years old female patient is admitted to the hospital with an ischemic stroke. In response to the spiking and touching the patient opens eyes, but instruction does not perform, there are no answer to the questions, sometimes pronounces indistinct sounds. There are right arm movement without assistance. What is assessment of this patient consciousness according to the Glasgow coma scale?

- A. 10 points
- B. 13 points
- C. 8 points
- D. 15 points
- E. 6 points

Standards of right answers.

Task 1. A. Task 2. C. Task 3. B. Task 4. C. Task 5. A.
Task 6. D. Task 7. A. Task 8. B. Task 9. D . Task 10. A .

Short methodical instructions for practical study.

The initial level of students knowledge-abilities performed at the beginning of the study, using the test tasks. Students examine patients which operative intervention coming, see the results of patients laboratory and instrumental investigations, study hospital charts, determine the degree of surgical risk and choose the optimal type of anaesthesia. If it possible they are in an operating-room, if not they decide situational tasks. All students independent work and their answers controlled by a teacher.

In an educational room students together with a teacher discuss the results of examination, produce the general tactic/pl of conduct of patients in a before operation period, optimal type of anaesthesia, general tactic/pl of conduct of patients and after operation period. Students discuss with a teacher by them sufferet errors. After it students pass test control. In the end worked out the totals of work, and students get the estimations of the work on employment.

III. CLINICAL ANAESTHESIOLOGY

Topic actuality

A clinical anaesthesiology is very large and important part of speciality, because it is predetermines a choice of anaesthesia method for every patient and for any surgical procedure. A choice of anaesthesia method is a very responsible process, as requires from a doctor the account of great number of factors, such as a volume and place of operative intervention, common state of patients taking into account their basic and concomitant pathology, age, urgency, technical feasibilities and presence of contra-indications for implementation of one or another anaesthesia method, or for the use of some medicinal agents. Thereby anaesthesiologist should provide the adequate state of patient organism not only during but before and after surgery. So a doctor must be able to estimate possibilities, features and consequences of anaesthesia during surgery, and also to know the features of such patients management in a postsurgical period.

Teaching aims.

General purpose: to be able to define the tactic of the anaesthesia choice during operative interventions in different anatomic areas and for the different age patient groups , to define the tactic of patients management in pre- and postsurgical period for pyloric stenosis, bowel obstruction, peritonitis and pancreatonecrosis

<u>Concrete aims</u>	<u>Initial level of knowledge-abilities</u>
To be able:	
1. To interpret syndromes, which substantially influence on the choice and course of anesthesia management in depend on basic pathology and place of surgery.	1. To interpret the features of acute surgical pathology (Department of surgery), acute obstetric and gynaecological pathology (Department of obstetrics and gynaecology), acute surgical pathology in children (Department of pediatric surgery), acute neurological pathology, (Department of neurology).
2. To justify the choice of anesthesia method for different surgical procechure, including. for children and elderly patients.	2. To interpret the action of general and local anesthetics, analgetics, antycholinergic drugs , antihistamines, neuroleptics, ataractics, glucocorticoids, diuretics, fluid solutions, including. in the age-related aspect (Department of pharmacology).
3. To determine of anaesthesia complications in postsurgical period, to perform emergency.	3. To interpret the main disturbances of the nervous, respiratory, cardiovascular, endocrine, digestive, and secretory systems (department of pathophysiology).
4. To define the tactic of preparation to the operation and postsurgical intensive care for patients with acute abdominal pathology.	4. To interpret the action of medicinal agents, used in pre- and postsurgical period, as components of acute surgical pathology intensive care (Department of pharmacology).

Theoretical questions.

1.Choice of anaesthesia and its features for surgery on a head and neck.

General anaesthesia is in neurosurgery.

2.Choice of anaesthesia and its features for thoracic surgery.

3.Choice of anaesthesia and its features for abdominal surgery.

4.Choice of anaesthesia and its features for traumatology and orthopaedic surgery.

5.Anaesthesia for delivery, minor obstetric surgery and caesarian.

6.Features of general anaesthesia for children's and elderly patients.

7.Presurgical preparation and intensive care for pyloric stenosis patients.

8.Presurgical preparation and intensive care for bowel obstruction patients.

9.Presurgical preparation and intensive care for patients with peritonitis.

10.Presurgical preparation and intensive care for patients with pancreatonecrosis.

Tasks set for concrete study goal achievement control

Task 1.

The phlegmon of mouth floor and neck, and mediastinitis, are developed in 42 years old patient after 6 days of dental extraction. Objectively: excited, hardly accessible to the productive contact, cyanosis of lips and acrocyanosis . Breath rate is 30 per minute, the shortness of breath increased in horizontal position. Dissection of phlegmon, revision of cellulose spaces and mediastinum, is planned under general anaesthesia. What is it necessary to begin the anaesthesia for this surgery?

- A. Tracheostomy in patient with consciousness
- B. Introductions of small doses of anticholinergic drag
- C. Introductions of maximal doses of barbiturates
- D. Introductions of narcotic analgetic
- E. Mask inhalation of halothane

Task 2.

The right-side hemicolectomy is planned in 54 years old patient, which suffering from chronic obstructive pulmonary disease. What examination is indicated for this patient with the purpose of respiratory insufficiency level determination?

- A. The physical load test
- B. Three-fold sputum investigation
- C. Spirometry
- D. Electrocardiography
- E. Chest X-ray

Task 3.

Because the eclampsia attack is occurred, the urgent delivery coming by implementation of caesarian for 26 years old 30 weeks pregnancy patient. Which type of anaesthesia is it necessary to choose for this patient?

- A. Intravenous anaesthesia with using of ketamine and diazepam
- B. Halothane mask anesthesia
- C. Multicomponent general anaesthesia
- D. Nitrous oxide mask anesthesia with an oxygen
- E. Epidural anaesthesia

Task 4.

Operative intervention is coming for 52 years old head trauma patient with intracranial hypertension and seizures. The multicomponent anaesthesia with mechanical ventilation is selected for surgery providing . What drug from listed below is most optimal for introductory anesthesia of this patient?

- A. Ketamine
- B. Halothane
- C. Sodium oxybutyric
- D. Methoxyflurane
- E. Sodium thiopental

Task 5.

Surgery is executed for the 42 years old patient on the subject of abdominal penetrating wound. Anaesthetist performed patient extubation

and transferred him in recovery room. However after 15 minutes the patient expressed cyanosis and breathing inadequacy were developed. Which tactic of anaesthetist should be in this situation?

- A. To execute the Heimlich maneuver three times
- B. To intubate, initiate mechanical ventilation
- C. To introduce cordiamin
- D. Oxygen mask inhalation
- E. To introduce the sodium bicarbonate and

Task 6.

Laparoscopic cholecystectomy is executed with the use of dithylinum as a relaxant for 56 years old patient. In a half hour after surgery the patient consciousness was restored, but there is no adequate tonus during subsequent two hours. That is the most credible reason of prolonged apnoea?

- A. Pathology of plasma cholinesterase
- B. Kaliopenia
- C. Supercooling of patient on an operating table
- D. Hypermagnesemia
- E. Hyponatremia

Task 7.

A 58 years old patient is transferred to the intensive care department after surgery on the subject of perforated gastric ulcer. Which drug is it necessary to use with the purpose of postsurgical period pain relief?

- A. Ketamine

- B. Baralginum
- C. Diclofenac sodium
- D. Fentanyl
- E. Promedol

Task 8.

The patient of 63 years entered clinic with complaints about схваткообразную pain on all stomach, continuous vomiting, which began 4 hours back. At examination, breathing is some superficial, breath rate is 26 per minute. BP is 90/50 mm Hg, HR is 110 per minute. A stomach is painful during palpation of right flank, peritoneal signs are positive. An urgent laparotomy is planned. That is the anaesthesia management of presurgical period in this situation?

- A. Abdomen plain film
- B. Fluid therapy in a dose of 70-80 ml/kg of body mass, CVP control
- C. Preparation of the operating field
- D. Stimulation of diuresis
- E. Presurgical colon clearing

Standards of right answers.

Task 1. A. Task 2. C. Task 3. C. Task 4. E.
Task 5. B. Task 6. A. Task 7. E. Task 8. B.

Short methodical instructions for practical study.

At the study beginning the students pass control of knowledge-abilities initial level by means of test tasks. Students examine patients with different surgical pathology, which operative intervention coming, got to know of the clinical and laboratory results and additional findings of these patients, study hospital charts, determine the surgical risk level and choose the optimal type of anaesthesia, on possibility are in an operating-room. Also in the intensive care department they are examine postsurgical patients, estimate the adequate consciousness, breathing, hemodynamics and tonus restore, work out the tactic of patients management in an early postsurgical period, got to know of hospital and anesthesia charts, features of management in children's and elderly patients. In default of such patients the students decide situational tasks. Curatio and answers of students controlled by a teacher.

In classroom students together with a teacher discuss the results of patients examination and students mistakes. Then the students pass test control. In the end of the study the totals of work summarize, and students get the marks of the study work.

Suggested Literature

1. Clinical procedures in Emergency Medicine, 5th edition, James R. Roberts, 2010.
2. Emergency Medicine, Brown and Michael D. Cadogan, 6th edition, 2003.
3. Emergency Medicine, Eric D. Barton, 2008.
4. The atlas of Emergency Medicine, Kevin J. Knoop and others, p. 1857, 2010.

