


MINISTRY OF HEALTH OF UKRAINE
ODESA NATIONAL MEDICAL UNIVERSITY

Faculty Medical №1
Department of simulation medical technologies

CONFIRMED by
Vice-rector for scientific and pedagogical work

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**METHODICAL RECOMENDATION FOR
INDIVIDUAL WORK OF HIGHER EDUCATION ACQUISITIONS IN THE
ACADEMIC DISCIPLINE**

«EMERGENCY MEDICINE. PRACTICAL ASPECTS. SIMULATION TRAINING»

Faculty, course: International, 5 year

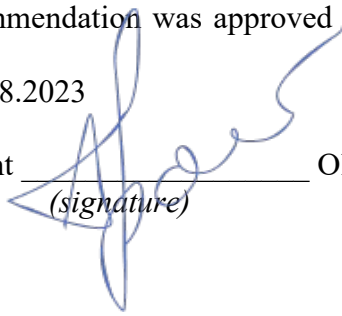
Educational Discipline: Emergency medicine. Practical aspects. Simulation training

Approved:

The methodical recommendation was approved at the meeting of the department of simulation medical technologies

Protocol No. 1 of 28.08.2023

Head of the department



(signature)

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Topic 1: Intraosseous access as an alternative to intravenous in emergency situations

Purpose: Injection site, installation technique.

Basic concepts: Intraosseous access.

Plan

1.Theoretical questions:

Ensuring vascular access is a critical problem at the prehospital stage. From the moment of illness or injury, during evacuation and subsequent treatment in intensive care units, vascular access is one of the most important factors for the survival of victims. And if the patient develops acute vascular insufficiency, shock as a result of acute blood loss or acute dehydration, then setting up peripheral venous access becomes difficult or even impossible.

For a long time, central venous access was the first alternative when it was impossible to set up peripheral venous access. But this requires sufficient practical skills of the staff, the necessary equipment, and also carries a rather high risk of complications. Therefore, in the conditions of military medicine, intraosseous access is increasingly considered as an alternative (in the case of the impossibility of peripheral vein catheterization) as a way to introduce fluid or blood products for the purpose of restoring BCC, and introducing drugs in emergency situations.

Algorithms and protocols of emergency medical care in many countries of the world, including The USA and Europe envisage the establishment of IO access as the second method of choosing vascular access in patients, provided that it was not possible to establish intravenous access in two attempts or in a time of more than 90 seconds.

IO access is standard in emergency care for cardiac arrest and other emergencies. Learning to stage a IO does not require a lot of time and can be achieved in a few classes. At the same time, the time of placement of the IO catheter is much shorter compared to the time required for placement of the IO access.

IO access is recognized as a safe and effective way of introducing drugs into the systemic circulation. During World War II, IO access was the standard of care for shock, with a total of more than 4,000 documented cases of successful IO infusion in the treatment of the critically injured.

IO access is equivalent to a central catheter in terms of drug delivery rate and has a proven lower risk of complications. Medicines injected into the sternum, tibia, and head of the humerus reach the central circulation in a few seconds. Therefore, administration of drugs up to 5 ml bolus is as effective as with central venous access.

However, the rate of fluid administration when large volumes are needed is somewhat slower than when administered intravenously and is approximately equal to the rate of infusion

through a 20-gauge catheter. A properly adjusted system allows you to inject the solution at a rate of up to 30-50 ml per minute (under pressure, it is possible to achieve an injection rate of up to 200 ml).

There are *indications* for setting up IO access :

- the need for rapid intravenous administration of fluids,
- the need for intravenous administration of drugs in case of difficult setting of intravenous access;
- shock states;
- hypotension, burns and other emergency conditions requiring immediate vascular access;
- convulsive status.

Contraindication:

- Chest injury with violation of the integrity of the chest frame or injury to the tubular bone (fluid can leak into the subcutaneous tissue);
- surgical interventions on the sternum;
- burns at the puncture site are also contraindications;
- signs of an infectious process at the puncture site;
- impossibility to establish anatomical landmarks in the place of production;
- osteoporosis;
- age up to 12 years.

Rules for setting up IO access.

Treatment of the puncture site is mandatory according to the rules of asepsis and antiseptics, although the risk of infectious complications is insignificant. In clinical practice, IO infusion has a very low probability of infection, which is approximately 0.6% or 1 case in 200. Currently, there are no data in the literature about cases of osteomyelitis after the placement of IO catheters, which could lead to the death of the victims.

Analgesia Since the manipulation is urgent and is performed in patients with severe injuries, bleeding or other urgent conditions, anesthesia is not required when determining vital signs. Placement of the IO catheter is tolerated satisfactorily, and the pain sensations are comparable to the sensation during the placement of a large-diameter IV catheter. On a 10-point scale, the sensations are approximately 2-3 points, which can be characterized as insignificant. But if the clinical situation requires, it is possible to carry out local infiltration anesthesia with a 1% solution of lidocaine.

Choosing a place. Currently, there are several developed devices for IO access, each of which is designed for a separate anatomical area.

The FAST 1 device (Pyng medical, Canada) is intended for placement in the sternum. Its advantages are that the anatomical area has clear landmarks, the manipulation is standardized. The depth of penetration into the bone is limited by the structure of the apparatus itself. The device consists of a 10-needle base, which provides an accurate position that prevents penetration and damage to the retrosternal space. When pressing on the device, the central penetrating needle enters the space of the bone marrow of the sternum. After use, the needle is removed with a specially designed tool. Pain sensations are slightly expressed and have 2-4 points on a 10-point pain scale.

The BIG device (Bone injection Gun, Israel). The most common point for needle insertion is the proximal part of the tibia. A wide flat surface, a thin layer of soft tissue, clear anatomical landmarks and distance from the airways and chest make this anatomical site the site of choice. As alternative places, the proximal part of the humerus, the distal parts of the radius and ulna are considered. Requires knowledge of anatomy when placed in the humerus or tibia. The disadvantage is the frequent displacement of the needle during transportation with subsequent loss of functionality. Often the staging causes severe pain, more than 5 points on the pain scale.

The cavity of the bone marrow is a continuation of the venous channel, so it can be used for the introduction of fluids and medicines.

Intraosseous access is an emergency alternative for administration of drugs and infusion solutions if intravenous access cannot be performed.

Intraosseous access is carried out using a syringe - gun for intraosseous injections.

Injection site. The best place is the anterior inner surface of the tibia, as it is located immediately under the skin and is easy to identify. The front surface of the thigh and the crest of the iliac bone, the sternum, and the calcaneus can also be used.

N.B! *Bones with fractures and osteomyelitis cannot be used.*

Conducting technique:

1. On the scale of the gun, select the desired depth of penetration by unscrewing the sleeve from the cylindrical casing.

Age of the patient	Needle size	Needle penetration depth
Adults (>12 years)	15 G - blue color	2,5 cm
Children from 6 to 12 years old	18 G – red color	1,5 cm
Children from 3 to 6 years old	18 G – red color	1,0 – 1,5 cm

Children from 0 to 3 years old	18 G – red color	0,5 – 0,7 cm
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2. The only approved site for needle insertion is the anterior medial surface of the proximal part of the body of the tibia (upper articular surface of the tibia). - palpation to determine the hump of the tibia directly below the knee,
- determine the upper articular surface of the tibia - the place for insertion (it is located approximately 1-2 cm more medially from the hump of the tibia)

3. Treat the injection site

4. At an angle of 90 ° slightly more caudal, position the front part of the BIG with the leading hand in the entry points, while holding and strongly pressing on the back part. With the other hand, firmly support this leg, trying not to touch it from behind. If necessary, you can use a towel roll for additional leg support.

5. Unfasten the safety latch from the device by simultaneously pressing on both sides.

6. You can bring the BIG into readiness by pressing the rear part to both casing holders or by firmly pressing the rear part to the injection site.

7. Take the BIG and separate the trocar needle from the case.

8. Pull out the trocar stylet and separate it from the needle. Only the cannula of the needle should remain in the bone.

9. Make sure of the correct introduction by trying to introduce the liquid. The liquid should pour in easily, without penetrating from the blood vessels into the tissues.

10. Provide the device with a reliable stop and stability, using a safety latch.

11. Medicines are administered under slight pressure manually using syringes or by inflating the cuff around the infusion bag.

12. If the introduction is unsuccessful, the procedure is repeated on the other leg.

BIG remains in place for several hours. The intraosseous method of infusion should be replaced by traditional intravenous as soon as possible. Long-term use increases the risk of developing complications.

Questions for self-control:

1. Expediency of using IO access.
2. Indications for setting up IO access.
3. Contraindications to setting up IO access.
4. Localization of installation of IO access.
5. Grading of IO access.

Approximate tasks for processing the theoretical material:

Term	Definition
Intraosseous access	
IO infusion	
Hemorrhagic shock	
Traumatic amputation	
Acute dehydration	

2. Practical works (tasks) that will be performed during the lesson:

- Determination of indications for installing IO access,
- Determining the optimal localization for IO access,
- Using the BIG device,
- Using the NIO device.
- Selection and use of IO needles.

3. Test tasks for self-control:

1. You are a doctor in the reception department. The victim was brought to the hospital in an unconscious state, who had been in a shelter without food and drinking water for days, according to her relatives, she suffers from anorexia. After examination: HR -100/min, RR - 24/min, BP - 85/60 mmHg, saturation - 92%, soft tissue turgor decreased, eyes inflamed. Having decided on the tactics of treatment, the nurse was instructed to ensure IV access. After a few minutes, the nurse reports to you that no veins can be found. At the moment, it is not possible to invite an anesthesiologist-reanimatologist. Your actions:

- A Provision of IO access
- B Providing central access through the femoral vein
- C Providing central access through the jugular vein
- D Providing central access through the subclavian vein
- E Ensuring diuresis control

2. You, as part of the ambulance brigade, arrived at the scene of the accident. The victim had a traumatic amputation of the right upper limb. Massive bleeding was recorded, controlled by a tourniquet imposed by other road users 8 minutes after its onset. The victim is

in a state of hemorrhagic shock, which you begin to treat. IV access cannot be established.

Your actions:

- A Provision of IO access
- B Intubation followed by ventilation
- C Providing central access through the jugular vein
- D Providing central access through the subclavian vein
- E Installation of a nasogastric tube

3. What actions should be taken if it is not possible to ensure intravenous access during resuscitation of children:

- A Provision of IO access
- B Providing central access through the femoral vein
- C Providing central access through the jugular vein
- D Providing central access through the subclavian vein
- E Ensuring diuresis control

4. Individual tasks for students on the subject of the lesson:

- Determination of indications for installing IO access,
- Determining the location of access to the IO on the humerus,
- Determining the location of the IO access on the tibia,
- Using the BIG device on children's bone dummies,
- Using the NIO device on adult bone dummies,
- Using the BIG device on adult bone dummies,
- Using the NIO device on children's bone dummies.

5. List of recommended literature:

Main:

1. Internal Medicine: Critical Care: textbook (III—IV a. 1.) / O.Ya. Babak, O.M. Bilovol, N.M. Zhelezniakova et al.; edited by O. Ya. Babak, O.M. Bivol 2018
2. Richard D Zane, Joshua M. Kosowsky Pocket Emergency Medicine (Pocket Notebook) Fourth Edition, 2018.

Electronic information resources:

1. <https://emedicine.medscape.com/article/2172100-overview>
2. <https://emergencymanual.stanford.edu/>
3. <https://www.c-tecc.org/>

Topic 2: First aid for upper respiratory tract obstruction

Purpose: To learn how to perform the Heimlich technique, conicotomy.

Basic concepts: Heimlich reception, conicotomy, puncture of the cricothyroid membrane.

Plan

I. Theoretical questions for the lesson:

Abdominal thrusts are a method of ensuring patency of the respiratory tract, which was popularized by Dr. Henry Heimlich, and was later called the Heimlich reception.

Indication:

Obstruction of the respiratory tract by a piece of food or aspiration of another foreign body, which is not eliminated by the cough reflex.

Contraindication:

1. Rib fracture.
2. Fracture of the sternum.
3. Tamponade of the heart.
4. Aspiration of liquid (drowning).
5. Suspicion of traumatic damage to the organs of the abdominal cavity.
6. Suspicion of traumatic damage to the organs of the chest cavity.
7. With severe edema.
8. Second half of pregnancy.
9. Obesity of a high degree (more than 30%).

Necessary equipment. No special equipment is required.

Machinery:

I. Removal of a foreign body in adults:

If the victim is in an upright position:

1. Ask the patient to try to breathe more slowly and deeply.
2. Approach the standing patient from behind and wrap both hands around his body.
3. Lean your body closely to the patient (prevention of shocks during further maneuvers).
4. Place your legs wide in the case of a relatively short height of the patient, place the legs of the patient wide in the case of a relatively short height of the person performing the reception.
5. Place the fist of the left hand with the lateral surfaces of the first and second fingers turned on the front wall of the abdomen between the sword-like process of the sternum and the umbilical ring.
6. Grasp the fist of your left hand with your free right hand.

7. Place your foot between the victim's legs. Tilt your head away from the victim's back. The goal is to prevent the victim from falling after performing the reception and to prevent injury to the rescuer's face.

8. With both hands, make one strong push in the direction of the patient inwards and upwards. If the execution is successful, the foreign body is pushed out of the upper respiratory tract.

If the victim is in a horizontal position, then in order to remove a foreign body from the victim's respiratory tract, the victim should be placed on his back, sit on his hips, and use the bases of both palms (or two fists) to make sharp pressures (thrusts) on the upper part of the abdomen in the direction of lungs

Note: To restore the patency of the respiratory tract in pregnant women and patients with excessive body weight (obesity more than 30%), it is necessary to place the fist of the hand directly under the xiphoid process of the sternum. When performing the Heimlich maneuver, press with a quick push in the direction of the diaphragm, as well as directly on the chest.

If it was not possible to dislodge the foreign body, the cycle must be repeated until it can be pushed out or the victim loses consciousness. In the latter case, it is necessary to carefully place the victim on his back, preventing him from falling after losing consciousness. To do this, you need to put your foot between the legs of the victim, and when he loses consciousness, he will slide on it to the floor. To release the airways, sit on top of the victim's legs and press sharply with the bases of both palms (or two fists)

in the subdiaphragmatic area in the direction of the diaphragm. Repeat a series of compressions (up to 5 times) until the foreign body is removed.

Note: Immediately after the foreign body leaves the victim's larynx, a reflexive deep breath will occur, in which the foreign body, if left in the mouth, may re-enter the larynx, so the foreign body must be removed from the mouth immediately.

Attention: In the event of several repeated negative attempts at Heimlich reception, immediate conicotomy or puncture of the cricothyroid membrane is indicated.

II. Removal of a foreign body in infants (younger than 1 year):

1. Place the child on your forearm with the stomach down, the head should be below the body, and strike 5 blows on the back between the shoulder blades with the base of the palm.

2. Turn the child over on his back and perform 5 chest thrusts

cell 1 finger below the internipple line along the longitudinal axis of the sternum.

3. If a foreign body is visible in the oral cavity and there is no danger of pushing it, attempt to remove it. Blind foreign body removal in young children is contraindicated due to the risk of worsening the obstruction.

4. Ensure patency of the respiratory tract by raising the chin and tilting the child's head, perform mechanical ventilation.

5. In case of inefficiency of the ventilator, change the position of the head and retry ventilation.

6. In case of unsuccessful measures, repeat the entire cycle from the beginning.

III. Removal of a foreign body in children aged 1-8 years:

1. Hold the child on your thigh upside down, hit 5 times between the shoulder blades.

2. Turn the child over on his back. Quickly press on the sternum at the level of the inter nipple line 5 times.

3. Examine the oral cavity, try to remove the foreign body. After removal — ventilator.

4. If the measures are unsuccessful, repeat the entire cycle until the foreign body is removed.

IV. Removal of a foreign body in 8-year-old children:

1. Perform the Heimlich maneuver: stand behind the child who is standing or sitting, wrap your arms around the waist, press on the stomach and perform a sharp push up the midline of the abdomen between the navel and the xiphoid process 5 times.

2. If the patient is lying down, use the "horseman's" position: make a sharp push with the proximal part of the lower palm in a cross shape

with folded hands between the navel and the xiphoid process, push inward and upward 5 times.

3. If a foreign body appears in the oral cavity, try to remove it and perform ventilation.

4. If the measures are ineffective, make 5 blows between the shoulder blades and 5 pressures on the sternum, then ventilator.

5. Continue Heimlich administration until the obstruction is eliminated, alternating with ventilator.

6. Urgent hospitalization in the ENT department.

Notes: with complete obstruction of the respiratory tract by a foreign body you should choose the method that will be the most effective;

WARNING:

- in a conscious child, the above techniques are performed in a standing or sitting position, in an unconscious child — lying on the side;

- in newborns and small children, manipulations are performed in a face-down position on the resuscitator's thigh, pressure on the chest is performed with two fingers, abdominal compression is not used.

With foreign bodies in the respiratory tract, it is necessary:

- urgently transport the victim to a specialized medical institution for emergency direct laryngoscopy and removal of the foreign body;
- carry out oxygen therapy using a face mask;
- if it is impossible to remove the foreign body and there are severe respiratory disorders, perform urgent intubation and resolve the issue of performing a tracheostomy.

Complication:

1. Fractures of ribs and sternum.

Prevention: clear implementation of the manipulation technique, do not touch the ribs and sternum during the Heimlich procedure.

Tactics: hospitalization.

2. Rupture of the liver or spleen. A common complication of Heimlich administration.

Prevention: clear implementation of the manipulation technique.

Tactics: monitoring of hemodynamics, diuresis, in the presence of shock - infusion therapy, transfer to the surgical department.

3. Vomiting. It occurs due to excessive compression in the epigastric region.

Prevention: clear implementation of the manipulation technique.

Tactics: return the patient to a stable position in order to prevent aspiration of vomitus.

Conicotomy

Conicotomy — surgical restoration of airway patency by perforation (median dissection) of the larynx between the cricoid and thyroid cartilages) of the cricoid membrane.

It is used in adults and children over eight years old. Puncture conicotomy is used in children under the age of eight (due to the high risk of damage to the cartilages of the larynx. Damaged cartilages lag behind in development, which leads to narrowing of the airways. When using a needle, the integrity of only the conical ligament is violated).

Indication:

1. Inability to perform tracheal intubation in case of:

- massive bleeding;
- laryngospasm;

- swelling of the soft tissues of the larynx and connective tissue (anaphylaxis, diphtheria croup, false croup, etc.);
 - severe facial injury;
 - volumetric formation;
 - the presence of ulcerative and necrotic lesions of the larynx;
 - bilateral vocal cord paralysis;
 - foreign body of the upper respiratory tract;
 - violation of the patency of the respiratory tract due to swelling of the oropharynx;
 - some congenital malformations of the facial skull;
 - tightly clenched jaws during convulsions.
2. Trauma of the cervical spine with a high risk of its destabilization.
 3. Chemical burns of the upper respiratory tract.

Contraindication:

1. The possibility of safely performing orotracheal or nasotracheal intubation.
2. Section (dissection) of the trachea.
3. Dissection of the larynx with retraction of the distal end of the trachea into the mediastinum.
4. Fracture or the presence of pathological changes in the cartilage of the larynx.
5. Detachment of the larynx from the trachea.
6. Age younger than eight years.
7. Violations of the blood coagulation system and platelet-vascular hemostasis.
8. Inability to determine landmarks (presence of anatomical barriers: a large hematoma, an enlarged thyroid gland, or pronounced subcutaneous emphysema, which make it impossible to palpate anatomical landmarks — thyroid and cricoid cartilage).
9. Basic anatomical abnormality (tumor).
10. Acute diseases of the larynx due to infection or trauma.

Location and position of the patient. Conicotomy is performed with the patient lying on his back, a roller is placed under the shoulder blades, and the head is thrown back. By palpation, a conical connection located between the thyroid and cricoid cartilages is found.

Necessary equipment: a set for conicotomy, a wide needle (from a catheter), syringes with a capacity of 5-20 ml with needles, gauze balls, tampons and napkins, diapers, bandages, rubber gloves, a mask, a scalpel, an antiseptic solution, a disinfectant solution, an adhesive plaster.

Technique for adults and children over 8 years old.

1. Make sure of the expediency of conicotomy.
2. Provide the patient with an appropriate body position.
3. Palpate to determine the localization of the arc of the cricoid cartilage and the lower edge of the thyroid.
4. Treat the front surface of the neck with an antiseptic solution (if possible).
5. Delimit the place of manipulation with napkins.
6. Fix the thyroid cartilage with the fingers of the left hand (for shulga - the right hand).
7. Place a scalpel with a narrow blade vertically along the middle line of the neck immediately under the lower edge of the thyroid cartilage with the cutting side up (to avoid damage to the back wall of the larynx, tightly wind cotton wool on the base of the scalpel, leaving 1.5-2 cm of its blades open) and in one movement stab into the larynx to a depth of 1.5 cm, but no more than 2 cm, dissecting all layers of the front wall of the larynx. The incision can be started from the arc of the cricoid cartilage.
8. Without pulling out the scalpel, the incision is continued a few millimeters up to the upper edge of the cricoid cartilage.
9. After removing the scalpel, first insert the blunt side of the scalpel into the incision and turn it 90° (or any blunt atraumatic object) in order to widen the opening.
10. Insert a tracheostomy tube (or any tube) into the created hole and fix it with a plaster or bandage.
11. In the absence of independent breathing, carry out ventilation through a tube or hole.

WARNING!

It must be taken into account that below the arc of the cricoid cartilage there is a thyroid gland, the injury of which is accompanied by severe bleeding.

Technique of puncture conicotomy (*mainly for children under 8 years old*):

1. Make sure of the expediency of conicotomy.
2. Provide the patient with an appropriate body position.
3. Palpate to determine the localization of the arc of the cricoid cartilage and the lower edge of the thyroid.
4. Treat the front surface of the neck with an antiseptic solution (if possible).
5. Delimit the place of manipulation with napkins.
6. Fix the thyroid cartilage with the fingers of the left hand (for shulga - the right hand).
7. With the right hand, insert the needle through the skin and conical ligament into the lumen of the trachea.
8. Fix the needle with an adhesive plaster or bandage. If a catheter with a needle is used, remove the needle.

9. To increase the respiratory flow, you can insert several needles in sequence.

Complication:

1. *Bleeding*, usually superficial and stops on its own.

Prevention: clear implementation of manipulation stages.

Tactics: stop bleeding by finger pressure, applying a clamp or ligature.

2. *Subcutaneous emphysema* occurs if air enters the tissues due to a mismatch in the diameter of the tube to the opening in the trachea, tight suturing of the tissues, or the application of a tight bandage that gets wet and becomes impermeable to air inhaled past the tube.

Prevention: clear implementation of manipulation stages. Exclusion of dense sewing of fabrics, application of a dense bandage.

Tactics: subcutaneous emphysema resolves on its own within a week and does not require special treatment.

3. *Pneumothorax* occurs when the lung tissue and the visceral layer of the pleura are ruptured as a result of increased pressure in the lungs due to valvular closure of the bronchial lumen.

Prevention: clear implementation of manipulation stages.

Tactics: puncture and drainage of the pleural cavity; hospitalization.

4. *Pneumopericardium* is associated with the passage of air along the fold of the pleura, large vessels with subsequent breakthrough into the pericardial space.

Prevention: clear implementation of manipulation stages.

Tactics: puncture of the pericardial cavity for air aspiration.

5. *Damage to the wall of the esophagus* occurs as a result of damage to the back wall of the trachea.

Prevention: clear implementation of manipulation stages.

Tactics: consultation of a thoracic surgeon.

6. *Infection (mediastinitis)*.

Prevention: clear execution of manipulation stages; compliance with the rules of asepsis and antiseptics.

Tactics: hospitalization and rational antibiotic therapy.

Questions for self-control:

1. Tactics of actions in relation to a foreign body in the respiratory tract of a conscious victim.

2. Indications for performing the Heimlich reception.

3. Tactics of actions in relation to a foreign body in the respiratory tract of an unconscious victim.

4. Indications for conicotomy.

5. Contraindications to conicotomy.

6. Peculiarities of Heimlich administration for children of different ages.

7. Stages of conicotomy.

8. Peculiarities of conicotomy in children of different ages

Approximate tasks for processing the theoretical material:

Term	Definition
Kit for conicotomy	
Removal of a foreign body in adults	
Subcutaneous emphysema	
Ensure the patency of the respiratory tract	
Damage to the wall of the esophagus	
Bleeding of the arteries of the thyroid gland	

2. Practical works (tasks) that will be performed during the lesson:

- Determination of indications for Heimlich reception,
- The technique of performing the Heimlich maneuver in adults,
- The technique of performing the Heimlich maneuver in children of different ages,
- Determination of optimal localization for abdominal thrusts in pregnant women and obese people,
- Determination of indications for conicotomy,
- Determination of optimal localization before conicotomy,
- Conducting a conicotomy on an adult dummy according to the algorithm.
- Conducting a conicotomy on a child's dummy according to the algorithm.

3. Test tasks for self-control:

1. What stages does the modern Heimlich reception for adults include?

A 5 back blows between the shoulder blades and 5 abdominal thrusts

B 3 back blows between the shoulder blades and 3 abdominal thrusts

C 5 rescue ventilation

D do no harm

E to call for help

2. You, as part of the ambulance brigade, arrived at the scene of the accident. The victim has a recorded injury and massive bleeding of the facial part of the skull. The victim is unconscious and has signs of airway obstruction. Your actions to ensure the patency of the respiratory tract:

A Emergency conicotomy

B Intubation followed by ventilation

C Reception of Safar

D Ventilation with an Ambu bag

E Check the ribcage for bruising

3. What actions should be taken if the Heimlich technique is not effective, the victim has lost consciousness:

A start CPR

B lay down the victim and raise the legs

C lay down the victim and perform pericardial shock

D position the victim and perform defibrillation

E intubate immediately

4. Individual tasks for students on the subject of the lesson:

- Determination of indications for Heimlich reception,
- Determination of localization to abdominal thrusts,
- The technique of performing the Heimlich maneuver in children of different ages,
- The technique of determining the place for dissection for conicotomy,
- Tracheostomy tube installation technique,
- Conic puncture algorithm,
- Sanitation of the tracheostomy tube after installation.

5. List of recommended literature:

Main:

1. Internal Medicine: Critical Care: textbook (III—IV a. 1.) / O.Ya. Babak, O.M. Bilovol, N.M. Zhelezniakova et al.; edited by O. Ya. Babak, O.M. Bivol 2018
2. Richard D Zane, Joshua M. Kosowsky Pocket Emergency Medicine (Pocket

Notebook) Fourth Edition, 2018.

Electronic information resources:

1. <https://emedicine.medscape.com/article/2172100-overview>
2. <https://emergencymanual.stanford.edu/>
3. <https://www.c-tecc.org/>

Topic 3: Puncture of the pleural cavity

Purpose: To learn how to perform pleural puncture

Basic concepts: Drainage of the pleural cavity, pneumothorax, hemothorax.

Plan

1. Theoretical questions for the lesson:

Pleural puncture is a puncture of the pleural cavity, which is carried out for diagnostic and therapeutic purposes, for aspiration of pleural contents with subsequent determination of its nature and quantity and expansion of the lungs.

Indication:

1. Therapeutic pleurocentesis:
 - 1.1. Exudative pleurisy (thickness of the fluid layer in the pleural cavity on an X-ray in the position of lying on the side is more than 10 mm).
 - 1.2. Pneumothorax.
 - 1.3. Administration of drugs into the pleural cavity.
 - 1.4. Acute respiratory failure.
2. Diagnostic pleurocentesis:
 - 2.1. Diagnosis of the etiology of pleural effusion.
 - 2.2. Diagnosis of the main disease (pancreatitis, subdiaphragmatic abscess).

Contraindication:

1. Violation of the hemostasis system.
2. Inflammatory and purulent diseases of the skin at the place of manipulation.
3. Adhesion processes in the pleural cavity.
4. Bullous transformation of the lungs.
5. Condition after surgical intervention (thoracotomy, esophagectomy, heart surgery).

Location and position of the patient. Pleural puncture is performed in the procedure room, in the case of a serious patient - in the ward. To remove air from the pleural cavity, a puncture is performed in the II intercostal space along the mid-clavicular line or in the V-VI intercostal spaces along the mid-axillary line. In the first case, the patient sits facing the doctor, in the second case, he also sits, but turned to the doctor on the appropriate side with

his hand behind his head. If the patient cannot sit, the puncture is performed in a lying position on the healthy side with the hand held behind the head.

To remove exudate from the pleural cavity, a puncture is performed in the VIII-IX intercostal spaces along the posterior axillary or scapular lines. At the same time, the patient sits on a chair facing his back, tilting his head slightly and placing his hands on his chest. Pleural puncture is performed in compliance with the rules of asepsis.

Necessary equipment: sterile trays, needle for pleural puncture, syringes with a capacity of 5-20 ml with needles, Jean syringe, gauze balls, tampons and napkins, diapers, bandages, rubber gloves, mask, clamp, forceps, antiseptic solution, 0.5% solution of novocaine (2% solution of lidocaine), cordiamine in ampoules, disinfectant solution, sticky patch or cleol, sterile and non-sterile test tubes with stoppers, tripod, phonendoscope, tonometer.

Conducting technique.

1. Conduct psychological preparation of the patient for manipulation, obtain consent for its implementation.
2. Offer the patient to empty the intestine and bladder.
3. Measure the patient's blood pressure and pulse.
4. Conduct an intradermal test for sensitivity to anesthetics.
5. Sit the patient on a chair facing the back, placing his hands on the back of the chair and lowering his head on them (to widen the intercostal spaces, the patient raises his hand on the side of the puncture and puts it behind his head).
6. Wash your hands, treat them with alcohol, put on a sterile mask and rubber gloves.
7. Take a sterile gauze ball with a clamp, moisten it with an antiseptic solution and treat the puncture site.
8. Cover the puncture area with a sterile diaper with a hole inside.
9. Fill the syringe with 5-20 ml of 0.5% novocaine solution (2% lidocaine), attach the needle.
10. Conduct infiltration anesthesia of the skin, subcutaneous fat, and intercostal muscles.
11. After anesthesia, the needle is removed from the chest and in this place, a puncture of the pleural cavity is performed with a special needle and a syringe with a capacity of 20 ml, which contains 1 ml (1000 units) of heparin solution to prevent pleural fluid from settling.
12. With the finger of the left hand, determine the upper edge below the lying rib and slightly pull the skin down in the place of the intended puncture.
13. Strictly perpendicular to the skin of the chest, a pleural puncture is quickly performed with a small effort.

14. When the pleura is punctured, a feeling of failure is created, and when the piston is pulled up, pleural fluid enters the syringe. This indicates that the needle has reached the pleural cavity. Pleural fluid does not enter the syringe if the needle is inserted above (into the lung) or below the pleural cavity (into the abdominal cavity) or if there is no pleural fluid in it.

15. After aspirating the liquid into the syringe, the needle is removed and a sterile gauze swab moistened with an antiseptic solution is applied to the puncture site, and a sterile gauze napkin is placed on top of it, which is attached to the chest wall with adhesive tape or Cleol. The pleural fluid is sent to the laboratory immediately to prevent the destruction of enzymes and cellular elements.

Methodology of therapeutic pleurocentesis. The patient is in such a position as during diagnostic pleurocentesis. To remove air from the pleural cavity, a puncture is performed in the II intercostal space along the mid-clavicular line; to extract free fluid - more often - in VI-VII intercostal spaces along the posterior axillary line.

Disinfection of the puncture site, covering with sterile napkins and layer-by-layer anesthesia are performed in the same way as during diagnostic pleurocentesis.

Puncture of the pleural cavity is performed with a sterile needle with a blunt end, a rubber tube is put on and fixed to the cannula. The rubber tube is covered with a clamp to prevent air from entering the pleural cavity (there is negative pressure in the pleural cavity). After the needle enters the pleural cavity, a Janet syringe or a fluid pumping system (Bobrova apparatus, tube system, clamp, suction) is attached to the rubber tube.

Complication.

1. A sharp decrease in blood pressure, *collapse*, which is associated with a reaction to pain, the appearance of blood, with the procedure, etc. The patient becomes pale, lethargic, the skin is covered with cold sweat, there may be chills.

Tactics: the procedure is stopped, the patient is placed in bed, the tender end of which is raised, and 2 ml of cordiamine is administered intravenously.

2. *The appearance of a vasovagal reflex*, which develops as a result of irritation of the leaves of the pleura when it is punctured. It is characterized by a liquid pulse of weak filling, a decrease in blood pressure.

Tactics: the procedure is stopped, the patient is put to bed, and 1 ml of 0.1% atropine sulfate solution is administered intravenously.

3. *Pneumothorax* develops as a result of incorrect manipulation, when the pleural cavity communicates with the atmosphere. If the visceral pleura is damaged by a needle, air enters the pleural cavity from the alveoli of the lungs.

Prevention: clear implementation of the manipulation technique.

Tactics: repeated puncture with aspiration.

4. *Infection of the pleural cavity* occurs when asepsis and antisepsis are violated.

Prevention: compliance with the rules of asepsis and antiseptics.

Tactics: rational antibiotic therapy.

5. *Hemothorax* develops as a result of damage to the intercostal artery.

Prevention: clear implementation of the manipulation technique.

Tactics: urgent hospitalization in the surgical department.

6. *Penetration* of the needle into the abdominal cavity and damage to the liver, intestines and spleen.

Prevention: clear implementation of the manipulation technique.

Tactics: urgent hospitalization in the surgical department.

7. *Infection* of the soft tissues of the chest occurs when the rules of asepsis and antiseptics are violated.

Prevention. To minimize the occurrence of possible complications during pleurocentesis, it is necessary to follow all the proper rules for performing this procedure.

Tactics: rational antibiotic therapy.

8. *Swelling of the lungs*, which can occur in case of simultaneous evacuation of a large amount of liquid (more than 1.5 l) and rapid expansion of the lung.

Prevention: gradual evacuation of fluid from the pleural cavity. With the simultaneous evacuation of a large amount of liquid, the procedure is carried out at a rate of no more than 1 liter per 30 minutes. and no more than 1.5 liters at a time.

Tactics: immediate hospitalization.

9. *Allergic reactions* manifested by itching and rashes on the skin, Quincke's edema, anaphylactic shock.

Prevention: Before the first injection of any drug, it is necessary to collect an allergic history and directly perform a test for the individual sensitivity of the body to the drug. In the case of a negative reaction, make the first injection of 0.01 ml of the prescribed dose into the limb and observe the patient for 20 minutes.

Tactics: according to the protocol of the Ministry of Health of Ukraine dated 03.07.06 No. 432 "On the approval of protocols for the provision of medical care in the specialty "Allergology".

Questions for self-control:

1. Indications for pleurocentesis in pneumothorax.

2. Indications for drainage of the pleural cavity in hemothorax.
3. Definition of symptoms of tension pneumothorax.
4. Concept of active and passive drainage.
5. Pleurocentesis algorithm.
6. Algorithm for draining the pleural cavity.
7. Algorithm for pleural cavity decompression.

Approximate tasks for processing the theoretical material:

Term	Definition
Pleurocentesis	
Chest tube	
Tension pneumothorax	
Hemothorax	
Lung collapse	
Deviation of the trachea	

2. Practical works (tasks) that will be performed during the lesson:

- Carrying out needle decompression on a mannequin according to the algorithm,
- Carrying out pleurocentesis on an adult dummy according to the algorithm.
- Carrying out drainage of the pleural cavity on a dummy according to the algorithm.

3. Test tasks for self-control:

1. Which of the X-ray examination techniques should be used initially in a patient with a chest injury?

- A Electroradiography
- B Fluorography
- C Multi-projection radiography
- D X-ray*

2. A patient was delivered with a chest wound on the right. There is a 1.5x0.4 cm wound with moderate bleeding from the V intercostal space along the anteroaxillary line. Blood

pressure 120/70 mm Hg. st., pulse 88 beats. per minute, Er. 4.0 T/l. Breathing 20 per minute.

What would indicate a penetrating wound?

And bleeding from the wound.

B Rapid breathing.

C* Subcutaneous emphysema.

D Tachycardia over 100.

E Cyanosis.

3. What place should be used for needle decompression in tense pneumothorax:

A II-III intercostal space along the midclavicular line

B II intercostal space along the middle inguinal line

C III intercostal space along the scapular line

D II-III intercostal space along the parasternal line

E at the Aubaniac point*

4. Individual tasks for students on the subject of the lesson:

- Indications for pleurocentesis in pneumothorax.
- Indications for drainage of the pleural cavity in hemothorax.
- Definition of symptoms of tension pneumothorax.
- Concept of active and passive drainage.
- Pleurocentesis algorithm.
- Algorithm for draining the pleural cavity.
- Algorithm for pleural cavity decompression.

5. List of recommended literature:

Main:

1. Internal Medicine: Critical Care: textbook (III—IV a. 1.) / O.Ya. Babak, O.M. Bilovol, N.M. Zhelezniakova et al.; edited by O. Ya. Babak, O.M. Bivol 2018
2. Richard D Zane, Joshua M. Kosowsky Pocket Emergency Medicine (Pocket Notebook) Fourth Edition, 2018.

Electronic information resources:

1. <https://emedicine.medscape.com/article/2172100-overview>
2. <https://emergencymanual.stanford.edu/>
3. <https://www.c-tecc.org/>

Topic 4: Transport immobilization for spinal injuries

Purpose: To learn how to fix the injured on a hard stretcher (shield).

Basic concepts: spinal cord injury, immobilization.

Plan

1. Theoretical questions for the lesson:

Transport immobilization is the creation of immobility and rest for an organ, part or the whole body during the period of transportation of the victim from the place of injury to a medical institution. It is performed when providing first aid at the scene of an accident, for fractures and dislocations of bones, extensive soft tissue damage, wounds, etc.

The purpose of transport immobilization is to prevent additional damage to tissues and organs, the development of shock during transfer and transportation of the victim.

Indication:

1. Providing rest to the injured part of the body and reducing the pain syndrome.
2. Prevention of secondary damage to blood vessels, nerves, soft tissues, displacement of bone fragments.
3. Creation of conditions for transporting the victim.
4. Damage to bones and joints.
5. Large injuries of soft tissues of the limb.
6. Damage to large vessels and nerves of the limb.

Types of transport immobilization:

- self-immobilization - bandaging the damaged lower limb of the victim to a healthy one or the upper limb to the trunk;
- immobilization using improvised means — using boards, plywood, skis, etc. as a rigid frame to which the damaged limb is fixed;
- immobilization using standard transport shields.

General principles of transport immobilization:

- a) immobilization is carried out at the scene of the accident; transferring, transferring the victim without immobilization is unacceptable;
- b) before immobilization, the victim must be administered painkillers (omnolon, promedol, tramadol, morphine, etc.);
- c) in the presence of bleeding, it must be stopped with a compression bandage or tourniquet; the dressing applied to the wound must be sterile.

Transport immobilization for injuries of the spine and pelvis. In the case of a spinal cord injury, which is often accompanied by damage to the spinal cord and dysfunction of the pelvic organs, the victims are carefully transported on hard litters; if there are none, then it is

necessary to use an ordinary wooden shield or a sheet of plywood, boards fastened together. In the case of fractures of the cervical and upper thoracic spine, transportation is carried out on hard litters in the position of the victim on his back, a roller is placed under the neck. In the case of a fracture of the spine in the thoracic and lumbar regions and in case of a fracture of the pelvic bones, the victims are transported on hard stretchers in a supine position, with a pad (made of a blanket, clothing, etc.) under the knees, while the knees are slightly spread to the sides ("frog pose") . The victim is tied to a stretcher. In the case of open damage to the spine and pelvis, the victim should be in a prone position.

Transportation of the victim can be carried out by any means of transport, but with the creation of the most comfortable conditions for the patient. In the cold season or during rain, it is necessary to ensure that the victim is protected from the action of an external factor. Transfer the victim carefully. In a passenger car, it is better to place it on the back seat or on the front seat with the backrest folded back. If the victim's breathing is difficult, it is better to transport him in a semi-sitting position, secured with a safety belt. It is better to transport victims with various injuries by special medical transport (in cars, medical planes, helicopters).

Transport immobilization in case of damage to the thoracic and lumbar parts of the spine. Indications for immobilization: spinal fractures in the thoracic and lumbar regions with and without damage to the spinal cord.

The purpose of immobilization for spinal injuries is to prevent displacement of broken vertebrae to prevent compression of the spinal cord or its re-traumatization during transportation, as well as damage to the vessels of the spinal canal. Immobilization of the spine must be carried out in the position of its moderate extension, since bending leads to displacement of the vertebrae. A victim with damage to the lower thoracic and lumbar regions of the spine is fixed on a shield or rigid burdens in a supine position with the limbs extended along the body, placing a cotton-gauze roller under the lumbar region of the spine. Fairly reliable immobilization is achieved with the help of two longitudinal and three short transverse boards, which are fixed from the back to the trunk and lower limbs. If it is not possible to transport the victim on a hard stretcher or there is a large wound in the lower back area, then the victim is placed on a soft stretcher on his stomach.

If the spinal cord is damaged, the victim must be tied to the stretcher to prevent passive movements of the body during transportation and additional displacement of the damaged vertebrae, as well as the patient slipping with the stretcher. Transferring such victims from a stretcher to a stretcher, from a stretcher to a table requires three people: one holds the head, the second puts his hands under the back and lower back, the third - under the pelvis and

knee joints. Lift the patient at the same time on command, otherwise dangerous bending of the spine and additional traumatization are possible. Among the modern methods of immobilization for damage to the thoracic and lumbar parts of the spine, a vacuum immobilization mattress of the "Cocoon" type is used, rigid stretchers or detachable bucket stretchers; they allow careful, but reliable fixation of the spine and prevent additional traumatization during transfer of the patient.

Immobilization errors in case of damage to the thoracic and lumbar regions of the spine:

- lack of fixation of the victim on the shield;
- absence of a ridge under the lumbar spine;
- when placing the victim on a soft stretcher on the stomach under the chest and pelvis, do not put a roller.

Questions for self-control:

1. Transport immobilization.
2. Transport immobilization for injuries of the spine and pelvis.
3. Transport immobilization in case of damage to the thoracic and lumbar parts of the spine.
4. Transport immobilization for fractures of the cervical and upper thoracic spine.

Approximate tasks for processing the theoretical material:

Term	Definition
Autoimmobilization	
Immobilization with the help of improvised means	
Immobilization using transport shields	
Ensure the patency of the respiratory tract	
Analgesia during immobilization	
Distal pulsation	

2. Practical works (tasks) that will be performed during the lesson:

- Transport immobilization of broken limbs.
- Transport immobilization for spine and pelvis injuries.

- Transport immobilization in case of damage to the thoracic and lumbar parts of the spine.

- Transport immobilization for fractures of the cervical and upper thoracic departments.

3. Test tasks for self-control:

1. You provide first aid to a victim of a road accident. What is the minimum number of assistants you should have to place and fix the victim on the shield?

A two

B three

C is four

D helpers are not needed

E alone

2. The victim of a road accident is significantly slowed down, answers questions in a low voice, monosyllabically. He complains of pain in the lower abdomen and the inability to move his legs. During palpation, a sharp pain is noted in the projection of the pubic fusion. A positive symptom of "sticky heel" is observed, you have administered anti-shock drugs. How should transport immobilization be performed?

A Lay on a hard stretcher in the "frog" position

B Place on a firm stretcher on the stomach

C Place on a stretcher and put a roller under the neck

D With the help of a Dieterichs tire

E With the help of a Beller bandage

3. After the road accident, the victim was diagnosed by a doctor with a closed fracture of the left bone

lower legs Specify the most optimal method of transport immobilization?

A Tire of Dieterichs

B Cramer tire

C Tire of Eolansky

D Beller tire

E Immobilization with improvised means

4. Individual tasks for students on the subject of the lesson:

- Transport immobilization of broken limbs.

- Using a neck collar.
- Use of Kramer splint.
- Use of a Dieterichs splint.
- Using a Dezo bandage.
- Fixation of the pelvis with a SAM splint.

5. List of recommended literature:

Main:

1. Internal Medicine: Critical Care: textbook (III—IV a. 1.) / O.Ya. Babak, O.M. Bilovol, N.M. Zhelezniakova et al.; edited by O. Ya. Babak, O.M. Bivol 2018
2. Richard D Zane, Joshua M. Kosowsky Pocket Emergency Medicine (Pocket Notebook) Fourth Edition, 2018.

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1. <https://emedicine.medscape.com/article/2172100-overview>
2. <https://emergencymanual.stanford.edu/>
3. <https://www.c-tecc.org/>