CHAPTER «MEDICAL SCIENCES»

OBTURATIVE ASPHYXIA

ОБТУРАЦИОННАЯ АСФИКСИЯ

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Abstract. Obstructive asphyxia is an acute pathological condition that develops at an accidental or intentional overlap of the upper and / or lower respiratory tract followed by the development of signs of acute respiratory failure (ARF) and acute heart failure (AHF). Foreign bodies of the respiratory tract in the structure of mortality in ENT-pathology occupy the 2nd place. Early diagnosis and correct treatment tactics significantly reduce the level of mortality in this pathological condition. Most often (85-95% of all cases) foreign bodies of the respiratory tract occur in children aged 1.5 to 3 years; 80% of cases of foreign bodies of the lower respiratory tract occur at the age from 2 to 15 years. For life, the most dangerous are foreign fixed bodies, which are located at the level from the pharynx to the trachea bifurcation, and those that cause a complete obstruction. Foreign bodies, which partially obturate the airways and create a valve mechanism are also life threatening. The least dangerous to life, but very dangerous for health are foreign bodies of the small bronchi.

1. Introduction

Obstructive asphyxia is an acute pathological condition that develops at an accidental or intentional overlap of the upper and / or lower respiratory

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tract followed by the development of signs of acute respiratory failure (ARF) and acute heart failure (AHF).

Closure of the airways is a pathological condition, based on the accidental or intentional cessation of air access to the lungs by closing the mouth and nasal openings.

Laryngotracheal obstruction is an acute pathological condition in which a foreign body is localized above the trachea bifurcation.

Bronchial obstruction is an acute pathological condition in which a foreign body is located in the main or lobar bronchi.

Relevance of the topic: Foreign bodies of the respiratory tract in the structure of mortality in ENT-pathology occupy the 2nd place. Early diagnosis and correct treatment tactics significantly reduce the level of mortality in this pathological condition. Most often (85-95% of all cases) foreign bodies of the respiratory tract occur in children aged 1.5 to 3 years; 80% of cases of foreign bodies of the lower respiratory tract occur at the age from 2 to 15 years [1, p. 27].

The causes:

1. Forced breath while eating, if there are tablets for sucking in the mouth, lollipops, small toys, etc.

2. Brutal child's play, when one offers to put on the tongue a spike of cereal with beards outwards saying: «Tractor, tractor...».

3. Obstruction of the esophagus with a large piece of food with compression of the trachea through its posterior wall.

4. Aspiration of dental fragments, parts of soft tissues, blood clots in case of maxillofacial trauma or dental intervention.

5. Aspiration with vomiting matters in a person with a depressed cough reflex (bulbar paralysis in amyotrophic lateral sclerosis, myasthenia, disorder of cerebral circulation) or unconscious, which leads to hypopharyngeal obstruction (in relaxation of muscles and flexing of the neck, the root of the tongue bumps into posterior pharyngeal wall).

6. State of alcoholic or narcotic intoxication, when the victims lie hiding face down in pillows or other soft objects.

7. Bad denture fixation.

8. Epileptic seizure, hyperventilation syndrome.

9. The presence of tumors of the esophagus or mediastinum, strictures, diverticula, tumors or injuries of the esophagus, causing stasis of food masses over its anatomical constrictions and compression of the trachea by a food lump through its posterior wall (which does not have cartilage formations.

10. “Overlaying” – closing the breathing openings when the mother falls asleep while breastfeeding and her breast closes the baby’s face.

11. Obstructive sleep apnea syndrome.

12. With criminal intentions: murder or torture (usually carried out with the palm of the hand or with the help of any object: a handkerchief, sheet, plastic bag, etc.).

According to the mechanism of airway obstruction, three types of positions of foreign bodies in the airways are determined:

• «Non-obturating lumen – air can freely pass by a foreign body, both during inhalation and exhalation;

• «Fully obturating lumen – the air does not pass at all;

• «Partially obturating lumen by a» valve type» – on inhalation, air passes by a foreign body into the lungs, and on exhalation, the foreign body blocks the airways, preventing air escaping from the lungs.

By the site of location foreign bodies are divided into localized in the upper respiratory tract: nose, throat, larynx, trachea, main bronchi, or are in the lower respiratory tract (below the trachea bifurcation).

According to the degree of fixation, foreign bodies are divided into fixed (practically do not move during breathing) and balloting (displaced during breathing).

2. Classification of asphyxia in closure of the respiratory tract

1. Dislocation asphyxia – a pathological condition that occurs in sinking down of the tongue in patients with a bilateral fracture of the lower jaw (especially in the chin area). The root of the tongue shifted back presses on the epiglottis and closes inlet to larynx.

2. Obstructive asphyxia – a pathological condition that develops as a result of the closure of the upper respiratory tract with a foreign body, vomiting masses or blood clot.

3. Stenotic asphyxia – a pathological condition that occurs in edema of the larynx, vocal chords and tissues of the subglottic space, in compression of the posterior parts of the larynx with hematoma, tumor, etc.

4. Valve asphyxia – a pathological condition that develops when the inlet to larynx closes with a fragment of lacerated soft tissues of the back wall of the larynx (on inhaling, a hanging flap sticks in the form of a valve, blocking air through the fissure glottis in the trachea and bronchi).

5. Aspiration asphyxia – a pathological condition that is observed when vomiting masses, blood clots or contents of the oral cavity enter (aspiration) into the trachea and bronchi.

Foreign bodies of the oropharynx. Asphyxiation is not caused by soft objects, if they fill only the oral cavity and do not reach the posterior pharyngeal wall, because air enters through the nose. If a foreign body reaches the posterior pharyngeal wall, the access of air is stopped and asphyxiation occurs.

Foreign bodies of the larynx. A large object when got in the larynx closes its lumen and glottis, prevents air from entering, and quickly causes asphyxiation. Inspiratory dyspnea not only does not push the foreign body out, but vice versa, draws it even deeper, irritates laryngeal nerves and causes a state of shock.

Foreign bodies of the trachea foreign bodies are mostly mobile (balloting), most often seen in the trachea in young children, who aspire beads, peas or other small objects during the game, which are freely placed in the cavity of the trachea. Such a fact can go unnoticed by adults and is determined only by a sudden entrapment of a foreign body in the subglottic space: the child turns blue, loses consciousness, falls and remains motionless for a few seconds. Such attacks occur in a position on the back or when a child is standing on the head (tumbles). After this, the spasmed muscles relax, the foreign body is released and falls back into the tracheal cavity, consciousness and normal breathing are restored. Such attacks are mistaken by parents as manifestations of epilepsy or spasmophilia. The real cause remains unrecognized before the medical examination of the child.

Foreign bodies of the bronchi, if their size is smaller than the diameter of the bronchus, can also be mobile, but until they are stuck in the narrow bronchus due to migration. If the body is of organic origin (beans, haricot beans, etc.), it swells due to its hydrophilicity. In cases of penetration of a foreign body into the main bronchus, shortness of breath and paroxysmal cough occur. The fixation of such a body at the level of the trachea bifurcation causes asphyxia.

Mechanisms of bronchial obstruction: a) ball valve – a condition where the foreign body is tightly in place during inspiration, but it shifts during expiration (early development of atelectasis of the affected lung lobe);

b) stop-valve – a condition when a swollen foreign body blocks air movement on inspiration and expiration (early atelectasis of the affected lung lobe);

c) vent valve – a condition when a foreign body lets the air in during inspiration, but blocks during expiration (emphysema of the lungs on the part of the affected bronchus and displacement of the mediastinum to the intact side («air trap»), repeated respiratory cycles cause obstruction emphysema of this lung area, which depending on the caliber of the blocked bronchus, can be total, partial or lobular;

d) pass-through valve – a condition where the foreign body is fixed, but does not block the passage of air (gradual development of atelectasis, but without a noticeable displacement of the mediastinum);

e) wedged in (immovable) foreign bodies are more often observed in the bronchi, clinical manifestations may occur in complications.

In case of incomplete obstruction of the bronchus there is observed displacement of the mediastinal shadow on inspiration towards the affected bronchus during forced breathing or coughing (Goltsknecht-Jacobson symptom), lagging of the diaphragm on the same side and different transparency of the pulmonary fields, this occurs during inspiration (reduced on the obturated bronchus side, slower filling of the lungs with air) and becomes even until the moment of expiration, this is due to the fact that the excursion of a healthy lung is always more than of the lungs with a pathological process [9, p. 207].

In case of complete obstruction of the bronchus, atelectasis (apneumatosis) of the corresponding pulmonary element occurs.

3. Clinical forms

– fulminant;
– acute;
– subacute;
– chronic;
– asymptomatic.

Clinical periods:

Initial ("debut" period) is laryngospasm, asphyxia attack (from a few seconds to 15–20 minutes), on a total overlap of the larynx or trachea, convulsions appear, a patient faints quickly and dies from paralysis of the respiratory center and circulatory arrest, possibly involuntary urination, defecation, ejaculation; if the condition develops in a pregnant woman – there is a high probability of miscarriage (in case of acute development of asphyxia, death occurs within 5-7 minutes, maximum – 10 minutes);

Latent (relative compensation of respiratory function or «imaginary well-being») – if obstruction is incomplete or foreign body has advanced into one of the main bronchi and further – clinical manifestations are practically absent (from several days to 14-16 days) the further away the foreign body is located from the main bronchus, the less pronounced clinical symptoms are at this time;

Full scaled (period of complications) – acute laryngitis, tracheitis, bronchitis, pneumonia, erosive bleeding, atelectasis of the lungs, and the like.

Vital signs consistently go through 4 stages:

– 60 seconds – onset of respiratory failure, acceleration of the heart rate (up to 180 beats per 1 min.) and systolic blood pressure (up to 200 mm. Hg), attempt to inhale prevails over an attempt to exhale;

– 60 seconds – cramps, becoming blue, decrease in heart rate and pressure, attempt to exhale prevails over an attempt to inhale;

– 60 seconds – short-term respiratory arrest;

– up to 5 minutes – intermittent irregular breathing persists, vital signs diminish, pupils dilate, respiratory paralysis occurs.

In most cases, death in complete respiratory arrest occurs within 3 minutes. Sometimes this may be caused by a sudden circulatory arrest. In other cases, episodic heartbeats can persist for up to 20 minutes after the onset of asphyxia. If the obturation layer is not too thick, then death may occur later than 15 hours from the moment of the event.

Anamnesis data indicating a high probability of the presence of foreign bodies in the respiratory tract:

• Suddenness of the event.

• Full health until the state of health or well-being changed.

• Cough while eating.

• Cough in a child who held in his mouth, touched with the lips, simply held a foreign object in his hands.

• Clinical symptoms in foreign bodies of the oropharynx:

• Pains, especially severe when swallowing.

Clinical symptoms in case of foreign bodies in the tracheal and larynx:

• Inspiratory dyspnea, repeated pertussis-like coughing attacks, accompanied by cyanosis;

• Marked excitement.

• Hoarseness or aphonia.

• Hissing respiration, heard at a distance;

• Long, repeated paroxysmal «barking» cough, which often pass into vomiting.

• Acute respiratory disorders may be caused by displacement of a foreign body and spasm of the vocal cords during contact with the aspirated body.

• Older children occasionally notice dull retrosternal pain.

• A pathognomonic sign of the displacement of a foreign body in the trachea is a symptom of «clap» and the presence of flotation during auscultation, often a clapping sound on breathing is heard at a distance, and its intensity changes as the victim changes position.

• Tympanitis on percussion and simultaneous weakening of breath sounds on auscultation.

• Changes in the state of consciousness, skin coloration, hemodynamic parameters.

• Jackson's symptom – the accumulation of mucus in pear-shaped pockets.

• In highly localized foreign bodies, painful pressing on the larynx.

Clinical symptoms in case of foreign bodies in bronchi:

• Migrating foreign bodies in the area of bifurcation of the trachea disturb ventilation in one bronchus or another, which is reflected in the intermittent clinical picture.

• Hemoptysis is possible due to damage of the respiratory tract mucosa with foreign bodies.

• Expiratory dyspnea – in case of foreign bodies in the small bronchi.

• Physical data in case of foreign bodies of the bronchus indicate the presence of atelectasis (a sharp weakening or lack of breathing, dullness of percussion sound) or emphysema (percussion sound with a box resonance, diminished breathing).

• Diminished respiratory murmur from one or both sides.

• Bad coughing.

• Copious mucopurulent sputum.

• Hyperthermia.

• Inflammatory picture of «white» blood.

N.B.! Diagnosis of foreign bodies of the respiratory tract in children is made difficult by the impossibility of establishing the exact fact and time of aspiration, therefore this diagnosis should be suspected in any child with the development of ARF if the relevant history data is available.

N.B.! Late diagnosis of insertion of foreign bodies into the respiratory tract leads to irreversible changes in the lungs, requiring complex surgical procedures.

Special and instrumental studies:

• X-ray (identification of Goltsknecht-Jacobson symptom).
• X-ray.
• Tomography.
• Bronchoscopy.

Complications of obstructive asphyxia:

• Secondary apnea from exhaustion.
• Posthypoxic/postapne encephalopathy.
• Irritation of the respiratory tract, larynx, vocal cords.
• Laryngospasm.
• Reflex circulatory arrest.
• Acute laryngitis, tracheitis, bronchitis.
• Aspiration pneumonia.
• Bronchiectasis.
• Paresis of the vocal cords.
• Erosion of bronchial vessels, pulmonary hemorrhage.
• Inflammatory changes and granulation incarnation in adjacent tissues.
• Atelectasis of the lungs.
• Hyperargic aspiration pneumonitis (in obstetric practice – «Mendelson's syndrome»).

4. Treatment

In the prehospital stage:

• Record the time, call for help.
• Place the victim on his back on a hard surface, then apply the modification of the triple method of P. Safar, performing the following steps:
• Tilt the victim's head back. With one hand, lift the neck behind, and with the other – press the forehead down, lagging the head back. If the cervical spine is damaged, such manipulations are contraindicated (only cranial traction is performed).
• Push the lower jaw forward by traction, pulling by its angles (with both hands) or chin (with one hand).
• Open and inspect the mouth. If blood or mucus or vomit masses are found in the mouth or throat that impair breathing, it is necessary to

remove them with a gauze cloth or a handkerchief on your finger. In this manipulation, the patient's head is gently turned to the side.

• Removal of foreign bodies from the respiratory tract:

•Postural position.

• Application of the finger (try to remove the foreign body with a finger or two fingers inserted into the throat in the form of tweezers to the root of the tongue.

• Apply active aspiration.

• «In the position of the patient on the side, make 4-5 strong blows with the palm between the shoulder blades.

• «D. Heimlich's maneuver (1974) – abdominal (subphrenic) thrust provides the pushing-out effect.

Technique of performing G.D. Heimlich's maneuver:

(* Technique = maneuver = method)

(* Haimlich = Heimlich = Geimlich = Hemlich)

In the vertical position of the victim:

Stand behind the victim and clasp him with your hands at the level of the upper abdomen. While supporting the body, tilt the victim forward. Squeeze one of your wrist into a fist and place it with your thumb in the direction to the trunk in the epigastric region of the victim. Fix the fist from above with your second wrist. Intensively sharply squeeze the abdomen and lower ribs of the victim (up to 5 episodes) in the direction from below – up to the diaphragm in order to create a powerful reverse movement of air from the lungs (due to a forced increase in intra-abdominal pressure), which pushes the foreign body from the larynx. It should be remembered that after the foreign body leaves the victim's larynx, a deep breath will reflexively take place, in which the foreign body, if it remains in the mouth, can again get into the larynx again, therefore it should be immediately removed from the mouth.

In a horizontal position of the victim:

The victim should be laid on his back, sit on his hips «bestride» and with two fists make sharp pressings (strokes) on the upper abdomen below the xiphoid process in the cranial direction. The upward movement of the diaphragm helps to push the foreign body out of the airways.

One cannot use D. Heimlich's maneuver in its classic version in the following cases:

– if a traumatic injury to the ribs and organs of the chest cavity is suspected;

– in case of suspected traumatic damage to the abdominal organs;

– in pronounced edema, to obese victims, victims in the second half of pregnancy, children under 12 years old (in this case, an alternative to abdominal (subphrenic) is thoracic stroke to a point above the lower portion of junction of the ribs with the sternum).

Emergency care for dislocation asphyxia is that the victim is laid on his side (on the side of damage) or face down so that his mouth and nose do not touch the hard surface (earth, stretcher, etc.). When trying to remove a foreign body with a finger from the oropharynx, it is sometimes possible to detect a fragment of soft tissues. In such cases, patients with valvular asphyxia should be transported in a position on the side (on the side of injury) or in a sitting position with the face down. In an extreme situation, when it is impossible to impose a tracheostomy, the life of the victim can be saved by performing inferior laryngotomy or puncturing the trachea with a thick needle (or venous catheter of large diameter) through the thyroid– cricoid ligament or between its rings. A radical help is to stich the soft tissue flap in the correct position or cut it off if it is impossible to save. The surgery is performed by a dental surgeon.

In obstructive asphyxia, remove all blood clots and foreign bodies from the oropharynx with a finger (wrapped with gauze or a bandage). If possible, by vacuum suction clean the cavity of the oropharynx, which will ensure the free passage of air. It is impossible to stitch the tongue in obstructive asphyxia, since this contributes to the advancement of a foreign body into the lower parts of the upper respiratory tract.

Diagnosis and elimination of stenotic asphyxia is possible only in a clinical setting after appropriate examination. Ligation of the bleeding vessel, on the neck with the removal of the discharged blood and anti-edema therapy prevents the progression of respiratory failure. When it grows, one can perform inferior laryngotomy, with a thick needle or a stylet with a venous catheter, to puncture the trachea through its rings or thyroid-cricoid ligament. Suturing of the tongue is not indicated.

In case of aspiration asphyxia, the victim should be put into a position that promotes the outflow of fluid from the respiratory tract.

If it is not possible to eliminate the cause of obstructive or aspiration asphyxia, as well as with stenotic and valvular asphyxia, surgical interventions aimed at normalizing the respiratory function are performed.

If the cough is effective, the optimal action is to allow the child to cough up a foreign body.

If the cough is ineffective:

In children under the age of 1 year:

Taking the legs, turn the child upside down, tapping with the base of the palm in the interscapular region in the cranial direction (do not shake the child, especially sharply, because the head/body weight ratio in an infant is much greater than in other age categories and this causes more danger of the cervical spine injuries).

N.B.! An accidental, unintentional palm strike to the back of the head of an infant in this procedure in most cases ends in death.

• The child is placed prone on the forearm on the left arm and with the edge of the palm of the right hand one makes 5 glancing blow between the shoulder blades. Check for the presence of foreign bodies in the oral cavity and remove them.

• If the above options were ineffective, the child is placed on the knees with the face up, make 5 strokes onto the chest at the level of the lower third of the sternum and the foreign body is removed from the mouth.

• If the obstruction is not eliminated, try to open the airway by tilting the head and performing artificial pulmonary ventilation.

• In children older than 1 year:

• Percussion massage of the back (sliding slapping), with upper trunk and head of a child down.

• Examine the oral cavity, remove a foreign body.

• If in the patient a reduced breathing in the form of convulsive breaths persists, perform a inferior laryngotomy (crycothreotomy) or inject 1-2 thick injection needles into the trachea at an angle of 45-60° in the caudal direction along the midline.

Self-management in airway obstruction:

• With your own hands, it is just as impossible to carry out an "autoHeimlich" maneuver by pressing your hands on the epigastric region as it is to invent a perpetual-motion machine from the standpoint of elementary physics.

• The "chair" method (you can use the back of the chair, the corner of the table, the handrail, the armrest of the chair, etc.). It is necessary to strongly press your belly just above the navel to the back of the chair. Due to the weight of your own body, it is recommended to perform jerks from the top down and from the outside to the inside.

In the absence of the effect of the above-mentioned treatment measures, urgently perform endoscopic examination of the tracheo-bronchial tree (upper trachea-bronchoscopy) and remove the foreign body.

In case of inhaled gastric contents one should immediately perform:

• Tracheal intubation.

• Placing the victim into Tredelnburg position.

• Aspiration of the contents of the trachea-bronchial tree with suction with the introduction of a small volume of liquid (up to 2-3 ml of warm isotonic sodium chloride solution).

• As soon as possible call an endoscopist to perform fibrobronchoscopy (FBS is performed to aspirate the contents of the lower respiratory tract under visual control, the main purpose of the manipulation is to restore the full permeability of the lower respiratory tract to the level of subsegmental bronchi).

The effectiveness of such measures as lavage of the lower respiratory tract using antibiotic solutions (to which anaerobic microflora is sensitive), glucocorticoid hormones (hydrocortisone, methylprednisolone) and proteolysis inhibitors (kontrakal, aminocaproic acid) require further study and confirmation.

• Artificial lung ventilation by transnasal or transoral tracheal intubation (in case of technical problems during tracheal intubation, artificial lung ventilation using a laryngeal mask, esophageal-tracheal obturator with forced ventilation of the lungs may be an alternative (in the hope that air will penetrate by the foreign body). Ventilator should be carried out until the victim is brought to the appropriate medical facility.

• If all of the above techniques are not successful – perform surgical (in a sharp time shortage – puncture) inferior laryngotomy. The use of the standard Quich-Trach kit (MiniTrach) is recommended for quick puncture and catheterization of the trachea.

• If the foreign body is located above the dissection site of the cryotyreoid membrane, breathing is immediately becomes easier after the opening of the incision and insertion of the cannula (if any).

• If the foreign body is located below the intersection site of the crycothyroid membrane, it must be removed from the lower respiratory tract by an endoscopic method;

• Artificial lung ventilation with 100% oxygen 10–15 l/min. under the control of SpO2 and immediate transportation to the specialized hospital.

• If clinical death develops, follow the protocol as if it were a sudden death.

Hospitalization:

• All adults and children with suspected or accurate diagnosis of the foreign body of the respiratory tract are subject to hospitalization at a specialized hospital.

• A successful attempt in removing a foreign body at the prehospital stage cannot be a reason for refusal of hospitalization.

at the hospital stage:

• Continue ALV with the use of a moderate or high PEEP level, which is enough to keep the damaged alveoli open (IP Shlapak, 2006).

• Introduction of bronchodilators: theophylline (eufillin) – 10-20 ml of 2% solution (0.2-0.4 g) (if necessary, dissolve 0.9% in 100-150 ml of sodium chloride solution and inject at a rate of 30-50 drops per minute).

• Introduction of drugs with antispasmodic action: drotaverin – 2% – 2-4 ml IV; papaverine 2% – 2-4 ml IV (in 20 ml of sodium chloride solution 0.9%).

• Introduction of drugs with myorelaxing action: diazepam (sibazon) IV in the initial dose of 10-20 mg, then, if necessary, 20 mg IM or IV drip (not more than 6 ml), diluted in 5% solution glucose or in sodium chloride solution (0.9%).

• Introduction of antihypoxants: meldonium (vazopro, mildronate) – 10.0 ml (100 mg) IV, thiotriazoline – 2-4 ml IV, sodium hydroxybutyrate – 20% – 10-20 ml IV, ascorbic acid – 1-3 ml of 5% solution, for intravenous drip, a single dose is dissolved in 50-100 ml of 0.9% sodium chloride solution and administered by slow infusion at a rate of 30-40 drops per minute.

• Only in case of uncontrollable hypovolemia: hydroxyethyl starch 130 / 0.42 – 500 ml IV, solution of sodium bicarbonate 4% – 200 ml IV;

• In case of psychomotor agitation – drugs of sedative action diazepam (sibazon) 0.5% – 2-4 ml (further 2 ml IV in order to obtain the effect), sodium hydroxybutyrate 20% – 10-20 ml IV / V;

• Introduction of GCS: dexamethasone or betamethasone (betaspan) – 12–20 mg IV;

• Introduction of saluretics: furosemide 1% 20-40 mg, torasemide (torsid) – 20 mg;

• Introduction of antihistamines (if an allergic reaction to an organic foreign body is suspected): chloropyramine (suprastin) – 2% – 1-2 ml IV;

• Treatment of posthypoxic / postanoxic encephalopathy.

5. Conclusions:

• For life, the most dangerous are foreign fixed bodies, which are located at the level from the pharynx to the trachea bifurcation, and those that cause a complete obstruction.

• Foreign bodies, which partially obturate the airways and create a valve mechanism are also life threatening.

• The least dangerous to life, but very dangerous for health are foreign bodies of the small bronchi.

References:

1. Ilko A.A. (2014). Anesteziolohiia, intensyvna terapiia i reanimatolohiia [Anesthesiology, intensive care and resuscitation]. Kyiv: Medytsyna. (in Ukrainian)

2. Kligunenko E.N., Lyashchenko O.V., Ekhalov V.V., Nosenko I.V., Lebedev S.A. (2017). Trudnaya intubatsiya trakhei: sovremennye metody resheniya [Difficult tracheal intubation: modern methods for solving]. *Meditsina neotlozhnykh sostoyaniy*, no. 5(84), pp. 61-64.

3. Vysochyna I. L., Chukhriienko N.D., Snisar V.I., Aharkov S.F., Yekhalov V.V. (2017). *Alhorytm vykonannia praktychnykh navychok likariamy zahalnoi praktyky na obladnanni ambulatorii* [Algorithm for implementing practical skills by general practitioners at the outpatient equipment]. Dnipro: Helvetyka. (in Ukrainian)

4. Kligunenko E.N., Ekhalov V.V., Sedinkin V.A., Gayduk O.I. (2016). Sovremennye aspekty obucheniya vrachey tsiklov spetsializatsii priemam serdechno-legochnoy reanimatsii [Modern aspects of training of physicians of specialist cycles on cardiopulmonary resuscitation]. *Molodyi vchenyi*, no. 12(39), pp. 307-310.

5. Klyhunenko O.M., Liashchenko O.V., Yekhalov V.V. (2017). Sovremennye podkhody k vedeniyu trudnoy intubatsii trakhei [Modern approaches to the management of difficult intubation of the trachea]. *Hostri ta nevidkladni stany u praktytsi likaria*, no. 1/1, pp. 45.

6. Zhdan V.M., Babanina M.Yu., Kiltura Ye.L., et al. (2011). Nevidkladni stany v praktytsi simeinoho likaria [Urgent states in the practice of family physician]. Poltava: UMSA. (in Ukrainian)

7. *Osnovy intensivnoy terapii: rukovodstvo Vsemirnoy federatsii obshchestv anesteziologov (WFSA)* [Fundamentals of intensive care: the guidlines of the World Federation of Anesthetist Societies (WFSA)], 2nd ed. (2016). Arkhangelsk: Severodvinskaya tipografiya. (in Russian)

8. Nikonov V.V., Savitskaya I.B., Nud'ga A.N., Kinoshenko E.I., Kovaleva E.A., Pavlenko A.Yu. (2008). Postgipoksicheskaya entsefalopatiya: vozmozhnosti korrektsii [Posthypoxic encephalopathy: the possibilities of correction]. *Meditsina neotlozhnykh sostoyaniy*, no. 4(17), pp. 65-71.

9. Feshchenko Yu.I., Yashina L.A. (eds.) (2007). Ratsional'naya diagnostika i farmakoterapiya organov dykhaniya [Rational diagnostics and pharmacotherapy of respiratory organs]. Kyiv: Zdorovia Ukrainy. (in Russian)

10. Klyhunenko O.M., Dziak L.A., Yekhalov V.V. (2011). *Sumizhni spetsialnosti dlia khirurha* [Related specialties for a surgeon]. H.V. Dziak (eds), *Khirurhiia* [Surgery] (Vol. 3, bk. 3). Dnipropetrovsk: Dnipro-VAL. (in Ukrainian)

11. Chaplyk V.V., Oliinyk P.V., et al. (2012). Medytsyna nadzvychainykh sytuatsii [Medicine of emergency states]. Vinnytsia: Nova knyha. (in Ukrainian)

12. Guidelines 2015 CPR&ECC/American Heart Association. Dallas, Texas 75231-4596, USA, 2015. Retrieved from: http://www.heart.org (accessed 27 November 2018).

13. Guidelines for Resuscitation/European Resuscitation Council (ERC). Emile Vanderveldelaan 35, 2845 Niel, Belgium, 2015. Retrieved from: http://www.erc.edu (accessed 19 November 2018).

14. Marushko Yu.V., Shef H.H., Hlumcher F.S., Yaroslavska S.M. (2016). Nevidkladni stany v pediatrychnii praktytsi [Urgent conditions in pediatric practice]. Kyiv: Medytsyna. (in Ukrainian)

15. Babinets L.S., Bezditko P.A., Bondar S.A. et al. (2017). Spetsialna chastyna. Poliprofilnist zahalnoi likarskoi praktyky [Special part. Multitasking of general medical practice] In O.M. Hyrina, L.M. Pasiieshvili (eds.) *Simeina medytsyna* [Family medicine] (Vol. 3). Kyiv: Medytsyna. (in Ukrainian)

16. Tarasiuk V.S. (ed) (2017). Persha medychna (ekstrena) dopomoha z elementamy taktychnoi medytsyny na dohospitalnomu etapi v umovakh nadzvychainykh sytuatsii [First medical (emergency) assistance with elements of tactical medicine at the prehospital stage in emergency situations], 2nd ed. Kyiv: Medytsyna. (in Ukrainian)

17. Mavrodiy V.M. (2016). Spravochnik po neotlozhnoy i intensivnoy terapii [Reference book for urgent and intensive care]. Kyiv: Zaslavsky A.Yu. (in Russian)

18. Voronenko Yu.V., Shekera O.H., Zozulia I.S. et al. (2016). *Aktualni pytannia medytsyny nevidkladnykh staniv u praktytsi simeinoho likaria* [Actual questions of urgent care medicine in the practice of family physician]. Kyiv: Zaslavsky A.Yu. (in Ukrainian)

19. Kozlova O.F. (2017). Domedychna dopomoha [Premedical care]. Kyiv: Medytsyna. (in Ukrainian)

20. Zozulia I.S., Vershyhora A.V., Bobrova V.I., et al. (2012). Medytsyna nevidkladnykh staniv: Shvydka i nevidkladna medychna dopomoha. [Medicine of urgent states: Fast and emergency medical aid]. Kyiv: Medytsyna. (in Ukrainian)