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

_____ Eduard BURYACHKIVSKY

September 1, 2023

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

«EMERGENCY CONDITIONS IN MEDICINE»

Faculty, course: International, 5 year

Educational Discipline: Emergency conditions in medicine

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 _____ Oleksandr ROGACHEVSKYI

(signature)

Authors:
head of the department Oleksandr ROGACHEVSKYI
assistant of professor Olha YEHORENKO
associate professor, PhD Mykhailo PERVAK
associate professor, PhD Vasyl GLADCHUK
associate professor, PhD Yuriy PETROVSKIY
assistant of professor Viacheslav ONYSHCHENKO
assistant of professor Dmytro KARAKONSTANTYN
assistant of professor Svitlana TRISHCHENKO
assistant of professor Hennadii CHEREMNYKH
assistant of professor Andrii DOBROVOLSKYI

Actuality of theme:

The provision of emergency medical care for acute asphyxia depends, first of all, on the causes that caused it, and is aimed at its elimination. One of the most important components of the primary examination algorithm is ensuring patency of the respiratory tract - A(Airways). Assessing the state of the respiratory tract and ensuring its patency is considered an important stage in the treatment of any acutely ill patient. Prompt provision of airway patency followed by adequate ventilation mitigates secondary hypoxic damage to the brain and other vital organs.

2. Learning objectives of the lesson:

Students should know:

o the main symptoms of airway obstruction

o causes of respiratory tract obstruction

o basic methods of restoring airway patency

o symptoms of partial and complete obstruction of the respiratory tract when a foreign body hits, methods of its recovery. Heimlich reception.

o the main indications and contraindications for the use of supralaryngeal devices for the restoration of airway patency o the main indications for the implementation of operative methods of restoring the patency of the respiratory tract at the pre-hospital stage (conicopuncture and conicotomy)

o signs of clinical and biological death o reversible causes of circulatory arrest o errors and complications that occur during cardiopulmonary resuscitation.

master the skills:

o conducting an initial examination according to the ABCDE scheme

o assessment of the state of the respiratory system o restoration of patency of the respiratory tract by manual and instrumental methods

o have the skills to perform cardiopulmonary resuscitation

o assessment of heart rate during cardiac arrest

o be able to (master skills):

o carry out an initial assessment of the victim's condition

o carry out actions to restore the patency of the respiratory tract

o installation of an oropharyngeal and nasopharyngeal airway

o installation of a laryngeal mask

o tracheal intubation techniques (practice skills on a dummy)

3. Topic content:

Asphyxia is a pathological condition caused by a lack of oxygen in the body, which is manifested by a symptom complex of disorders of the vital functions of the body, mainly - the activity of the

nervous system, breathing and blood circulation. Acute asphyxia develops in connection with pulmonary and extrapulmonary factors. Among the pulmonary factors, it is necessary to single out processes that disrupt the patency of the respiratory tract (obturation by foreign objects, mucus, blood, vomitus, as well as swelling of the larynx and vocal cords caused by allergic processes). Neoplasms, thermal and chemical injuries, severe inflammatory processes localized in the trachea and bronchi, as well as a severe degree of bronchial asthma (BA) can also cause acute asphyxia associated with impaired airway patency. The provision of emergency medical care for acute asphyxia depends, first of all, on the causes that caused it, and is aimed at its elimination. One of the most important components of the primary examination algorithm is ensuring patency of the respiratory tract - A(Airways). Assessing the state of the respiratory tract and ensuring its patency is considered an important stage in the treatment of any acutely ill patient. Prompt provision of airway patency followed by adequate ventilation mitigates secondary hypoxic damage to the brain and other vital organs. Acute respiratory failure (ARF) is the main cause of mortality in critical patients at the pre-hospital stage. The development of GDN leads to the complication of the critical condition of patients and victims, the appearance of delayed complications that significantly worsen the prognosis, and is accompanied by high mortality (55–65%).

The symptoms that indicate a probable violation of the patency of the respiratory tract include:

Noisy frequent breathing, stridor

Use of auxiliary muscles in the act of breathing

Abdominal breathing

Cyanosis of the skin

With further growth of respiratory insufficiency, there is motor excitement, convulsions, loss of consciousness.

It should be remembered that persons with impaired consciousness often need to maintain the patency of the respiratory tract. Stridor occurring only during inhalation indicates the localization of the obstruction at the level of the larynx or above it. Biphasic stridor heard on both inspiration and expiration suggests the location of the obstruction in the trachea, whereas expiratory stridor usually indicates the location of the obstruction below the tracheal bifurcation. The main goal of adequate patency of the respiratory tract is to ensure sufficient access of air to the lungs for their ventilation and, accordingly, sufficient oxygenation of the blood. There are many modern methods, among which two main groups are distinguished - actually manual and instrumental.

The actual manual methods include:

Heimlich reception

Reception of Safar

Distraction of the jaw (without overextension of the head in the cervical spine, especially if a spinal injury is suspected)

Instrumental methods include:

Nasopharyngeal airway

Oropharyngeal region

Instrumental methods include:

Nasopharyngeal airway

Oropharyngeal airway

Laryngeal mask

Tracheal intubation

Conicopuncture and conicotomy

When choosing a method of ensuring patency of the respiratory tract, it is worth using the principle - from simple to more complex. The choice of the method of restoring the patency of the respiratory tract depends on: the knowledge and training of the medical staff, the situation at the scene, the severity and characteristics of the victim's condition, and the available resources.

Tracheal intubation

Tracheal intubation is the gold standard for ensuring patency of the respiratory tract, but the decision regarding its implementation is sometimes quite difficult. Clinical experience is required to recognize the signs of probable respiratory failure.

Patients who are likely candidates for intubation have at least one of the following indications:

° inability to maintain airway patency

° inability to protect the respiratory tract from aspiration

° failure of previous ventilation

° failure of previous oxygenation

° anticipated deterioration leading to respiratory failure Various techniques are available, including visualization of the vocal cords using a laryngoscope or video laryngoscope, direct placement of an endotracheal tube into the trachea using a cricothyrotomy, and fiberoptic visualization of the vocal cords via the nasal or oral route.

Anatomy and physiology:

The upper respiratory tract consists of the oral cavity, the pharynx, which in turn is divided into the nasopharynx, oropharynx and larynx, and the larynx. These structural units moisten and heat the air flow, receiving blood supply from the external and internal carotid arteries. The trigeminal nerve provides sensory innervation to the nasopharyngeal mucosa, while the facial nerve and the glossopharyngeal nerve innervate the oropharynx. The trachea has a membranous membranous structure behind and a cartilaginous semicircular structure in front. The diameter of the trachea of an adult varies from 15 to 20 mm. These signs are very important as clinical markers distinguishing the trachea from the esophagus during laryngoscopy. At the level of the fifth thoracic vertebra, the trachea divides into left and right main bronchi. The angle between the trachea and the left main

bronchus is sharper, which affects the lower risk of foreign bodies entering the left main bronchus. The obtuse angle between the trachea and the right main bronchus affects the more frequent unilateral right-sided intubation of the main bronchus during the dislocation of the intubation tube. The larynx above the glottis is innervated by the upper laryngeal branch of the n.vagus, which provides afferent innervation of the root of the tongue and the vallecula (the depression between the larynx and the root of the tongue). These weight-bearing fibers provide circulatory changes during direct laryngoscopy. The cricoid cartilage has the shape of a semi-ring and is located below the thyroid membrane, which is a reference point for emergency cricothyrotomy. Identification of the parietal cartilage and manipulation to maintain airway patency always facilitates visualization of the glottis during intubation. The hypoepiglottic ligament connects the hyoid bone with the larynx, and ends at the base of the vallecula. This ligament helps to lift the epiglottis forward during intubation and visualize the glottis. These anatomical landmarks can also be identified in a child with some special differences. Compared to an adult, a child's head is proportionally larger, which leads to a bent neck position when lying down. Therefore, to facilitate the removal of the airways in a position convenient for intubation, it is necessary to raise the chest of the child by placing a roller under the shoulders. A larger tongue in children often leads to blocked airways and asphyxiation. A sharper angle between the epiglottis and glottis in children makes it difficult to visualize the vocal cords when using a laryngoscope. Children also have a shorter trachea, which makes intubation of the right main bronchus more frequent.

Indications for tracheal intubation:

decrease (saturation) p02 below 60-70 mmHg. Art., growth of PaC02 to the level of 55-60 mm Hg. Art. and above;

respiratory rate less than 7 or more than 40 per minute (bradypnea and tachypnea);

apnea;

dyspnea;

progressive swelling of the upper respiratory tract, which is not corrected by conservative methods;

uncontrolled salivation and bronchorrhoea (alcohol intoxication, FOS poisoning);

loss of consciousness (≤8 points on the Glasgow scale and as a result the absence of protective reflexes (swallowing and coughing) with the exception of hypoglycemic coma in case of its rapid regression;

the risk of aspiration of gastric contents in an unconscious patient;

the threat of respiratory and cardiac arrest

general anesthesia;

impossibility of ensuring airway patency by other methods;

the need for artificial lung ventilation;

cardiopulmonary resuscitation.

Contraindications to tracheal intubation:

Absolute contraindications:

° total obstruction of the upper respiratory tract, which requires surgical methods of ensuring patency of the respiratory tract

° massive maxillofacial injury with violation of the anatomical integrity of the oropharyngeal area

° Ruptures, tears of the trachea, traumatic damage to the trachea.

Relative contraindications:

° Patients whose respiratory status can improve with less invasive techniques should be tried with techniques such as noninvasive positive pressure ventilation or other oxygenation regimens.

° Manipulation of the cervical spine during intubation can be harmful for patients with spinal cord injuries

° There is a well-known "difficult airway", which makes it difficult to perform tracheal intubation, especially in the limited time and resource framework of emergency medical care and, as a result, prolongs the time of underoxygenation of the patient.

Preparation for intubation:

The first stage of preparation is to conduct an assessment of the respiratory tract. Assessment of external anatomy can help identify a difficult airway. Patients with limited cervical spine motion, obesity, facial or neck trauma may present a difficult airway, and healthcare providers should consider alternative intubation modes in these situations. There are several methods of rapidly assessing the probability of success during tracheal intubation. One of the tools for rapid evaluation is the algorithm with the amnemonic LEMON, which is described below. It is not always possible to assess a patient in an emergency condition according to all sections of the LEMON assessment. L: Look externally Physical features such as a small lower jaw, a large tongue, and a short bull's neck are all red flags for a difficult airway. In addition, it is worth paying attention to the severity of the injury, especially maxillofacial; large incisors; deformed teeth, jaw, etc. E: Evaluate the 3-3-2 rule Interincisor distance: The patient's mouth is open enough to allow three fingers to be placed between the upper and lower incisors Hyomental distance: A distance between the hyoid bone and the chin of less than three patient fingers may indicate “heavy airway" Thyrohyoid distance: the distance between the hyoid bone and the thyroid cartilage is less than two fingers of the patient may indicate a "difficult airway" M : Mallampati classification The Mallampati classification is ideally performed when the patient is sitting with the mouth open and the tongue protruding without phonation . In many patients who are intubated for emergency indications, this type of assessment is not possible. A rough assessment can be performed with the patient in the supine position to understand the size of the oral opening and the likelihood that the structure of the tongue and oropharynx may be factors in successful intubation. Class I. The soft palate, pharynx, tonsils and uvula are visualized. Class II. The soft palate, pharynx and uvula are visualized Class III. The soft

palate and the base of the tongue are visualized Class IV. Only the hard palate is visualized O: Obstruction Upper airway obstruction is a marker for a difficult airway. Patients are evaluated for stridor, foreign bodies, and other forms of sub- and supraglottic obstruction, including tumors, abscesses, epiglottic inflammation, and more. N: Neck mobility Impossibility of movements in the cervical spine affects optimal visualization of the glottis during direct laryngoscopy. Immobilization of the cervical spine from injury can disrupt normal mobility, as can intrinsic immobility of the cervical spine due to conditions such as Bekhterev's disease or rheumatoid arthritis. Preparation for tracheal intubation: The following equipment may be required for direct tracheal intubation: Intravenous access Hemodynamic monitoring Stethoscope Pulse oximeter Rapid sequence intubation medication (paralytic, sedative and/or dissociative agent) Defibrillator For direct intubation using direct laryngoscopy: Laryngoscope handle with batteries Laryngoscope blades of various sizes and shapes Endotracheal tubes of various sizes + Guide-stylet Syringe 10 ml Tape (to fix the intubation tube) Laryngoscope There are two main designs of blades for direct laryngoscopy, curved (Macintosh) (A) and straight (Miller) (B). Each has different sizes for adults and children. Small variations in laryngoscopic technique arise from the choice of blade design, and this is often a matter of personal preference. The tip of the straight Miller blade passes under the epiglottis and elevates it directly, whereas the curved McIntosh blade descends into the valleculus and indirectly elevates the epiglottis through engagement of the hyoepiglottic ligament to visualize the larynx. Endotracheal tube A standard adult endotracheal tube (ET) is approximately 30 cm long. The size of the tube is usually printed prominently on the tube and is based on the inside diameter (ID) and is measured in millimeters. The range is 2.0-10.0 mm in 0.5 mm increments. The outer diameter of the tube is 2-4 mm larger than the inner diameter. The tubes are also printed with a centimeter scale indicating the distance from the distal tip of the tube. Usually, an 8.5–9 mm inner diameter tube is chosen for an adult man of average build, and a tube with an inner diameter of 7.5–8 mm for an adult woman of average build. In children 2 years of age and older, the following formula is a highly accurate method for determining the correct ET tube size: A standard tracheal tube uses a high-volume, low-pressure cuff to avoid necrosis of the tracheal mucosa. Many clinicians use pilot balloon control as a guide for cuff inflation. Insignificant compressibility at low external pressure indicates sufficient inflation for most clinical situations. For long-term use, you should measure the pressure in the cuff and maintain it at the level of 20-25 mm Hg. Capillary blood flow is disturbed in the mucous membrane of the trachea when the pressure in the cuff exceeds 30 mm Hg. In emergency situations, the cuff can simply be inflated with 10 ml of air and adjusted when the patient's condition stabilizes. Positioning After the external examination of the patient is completed, the head position should be optimized to obtain the best possible view of the vocal cords. The "sniffing position" is traditionally considered the optimal position for direct laryngoscopy because it aligns the oral, pharyngeal, and laryngeal axes. This position is achieved by raising the patient's

head, stretching the head in the cervical spine and aligning the external auditory canal horizontally with the jugular notch of the sternum. In obese patients, any means (rolled blanket, clothing, head of bed, etc.) may be used to elevate the head, neck, and upper body until the external auditory meatus is aligned with the jugular notch.

Procedure and technique of direct laryngoscopy

Grasp the laryngoscope with your left hand, pressing the back end of the blade against the hypothenar side of your hand. Pull the patient's lower lip down with the big toe and insert the tip of the laryngoscope into the right side of the patient's mouth. Slide the blade along the right side of the tongue, gradually moving the tongue to the left, moving the blade toward the center of the mouth. As you move the tip of the blade toward the base of the tongue, apply force along the axis of the laryngoscope handle, lifting up and forward at a 45-degree angle. The direction of this force is critical because if the force is too horizontal or too vertical, it will result in poor visualization. The epiglottis should come into view with this maneuver. Avoid bending the wrist as this can cause injury to the teeth if the teeth are used as a fulcrum for the blade. The step after visualization of the epiglottis depends on which type of laryngoscope blade is used. McIntosh Bent Blade: Place the tip of the blade in the valeculus, the space between the base of the tongue and the epiglottis. Continued anterior elevation of the base of the tongue and epiglottis will expose the vocal cords. If the tip of the blade is inserted too deeply into the glottis, the epiglottis may be pushed down and close the glottis. When using a straight Miller blade: insert the tip under and slightly behind the epiglottis and lift it straight up. If the straight blade is placed too deep, the entire larynx may be lifted forward and out of sight. Gradually withdraw the blade so that the entrance of the larynx descends into the field of view. If the blade is inserted, but there are no recognizable structures, this indicates that the blade was inserted into the esophagus; gradually withdraw the blade until the larynx is visualized. After visualizing the vocal cords, the final step is to pass the tube under direct vision through the vocal cords into the trachea. A flexible stylet is best used for all emergency intubations. The best stylet shape is straight with a 35-degree hockey stick bend at the proximal cuff (“straight to the cuff”). Hold the tube with your right hand and insert it into the right side of the patient's mouth. Advance the tube to the patient's larynx below direct vision with the bend up. When advanced in this way, the tube does not obstruct the view of the larynx until the last possible moment before the tube enters the larynx. An endotracheal tube is placed in the trachea as the cuff disappears through the vocal cords. Push the tube 3-4 cm beyond this point. Direct observation of the passage of the tube through the vocal cords is the best way to immediately confirm correct placement. If part of the glottis can be visualized but the tube is difficult to pass, consider the use of a bougie (tracheal tube introducer). If direct laryngoscopy does not bring the vocal cords fully into view, a tracheal tube introducer may be used to facilitate intubation. This aid is a long, thin, semi-rigid tube that is passed through the entrance of the larynx with the help of a laryngoscope and through which the ET tube,

like a conductor, passes through the glottis into the trachea. After passing the endotracheal tube through the vocal cords, the cuff is inflated using a 5 or 10 cc syringe filled with air. The stylet is removed and the proximal end of the endotracheal tube is connected to a ventilator and, if possible, a carbon dioxide monitor. Traditionally, the preferred depth from the incisors to the distal tip of the endotracheal tube is 21 and 23 cm in women and men, respectively. After placement of the endotracheal tube, it is important to confirm its placement in the trachea and its location closer to the tracheal bifurcation. The doctor should listen for the absence of breath sounds over the stomach and symmetrical bilateral breath sounds over the lung fields.

Complications of tracheal intubation:

° Hypoxemia is a complication of intubation that can be caused by multiple attempts with poor oxygenation between attempts, improper placement of the endotracheal tube, and failed intubation. To avoid an unrecognized misplaced endotracheal tube, the position of the tube should be confirmed immediately.

° Cardiovascular complications can occur as a result of direct manipulation of the pharynx, as well as the administration of drugs. Bradycardia may be a consequence of stimulation of the vagus nerve during direct laryngoscopy. Some sedative drugs can cause hypotension, which can lead to hemodynamic disturbances and cardiac arrest during intubation of critically ill patients. Patients should have reliable intravenous or intraosseous access for administration of drugs for intubation and resuscitation, if necessary.

° Other complications include laceration of the oropharynx from direct manipulation, trauma to the teeth, and aspiration of gastric contents or objects from the oropharynx, such as prostheses.

° Complications after intubation are necrotic damage to the tongue and mucous membrane of the larynx and trachea from the pressure of the endotracheal tube on these anatomical structures.

° Tracheal rupture is extremely rare, but may result from tracheal necrosis from cuff overinflation or direct trauma to the tube or stylet. Using manometry to inflate the cuff to a 20-30 cm water column can prevent some of these complications.Література: Джерела літератури:

1. Наказ МОЗ України від 05.06.2019 року №1269 «Про затвердження та впровадження медико-технологічних документів зі стандартизації екстерної медичної допомоги»
2. Закон України від 5 липня 2012 року № 5081-VI “Про екстрену медичну допомогу”.
3. Постанова Кабінету Міністрів України від 5.11.2007 № 1290 “Про затвердження Державної програми створення єдиної системи надання екстреної медичної допомоги на період до 2010 року“.
4. Наказ МОЗ України від 18 квітня 2012 року № 366 “Про затвердження Загальних вимог щодо проведення медичного сортування постраждалих і хворих та форм медичної документації”

5. Анестезіологія та інтенсивна терапія: підручник / Ф.С. Глумчер, Л.П. Чепкий, Л.В. Усенко, В.Ф. Москаленко та ін.; за ред. Ф.С. Глумчера . – К.: ВСВ «Медицина», 2010. – 412 с.
6. Екстрена медична допомога травмованим на до госпітальному етапі: навчальний посібник для студентів вищих навчальних закладів / Крилюк В.О., Гурєв С.О., Іскра Н.І. – К.: «БІ ТУ БІ ГРУПА» Київ – 2017. – 400с. 7
7. https://www.oxfordmedicaleducation.com/clinicalskills/procedures/nasophar yngeal-airway/ 8. https://www.youtube.com/watch?v=vgqOrmBskaw