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Review Article

Lecture: "First Aid to The Population in Case of Drowning During Accidents, Catastrophes, Natural Disasters and Terrorist Attacks" Of the Subject "Life Safety" For Humanitarian and Tech-Nical Universities for Humanitarian and Technical Universities

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Abstract

To prepare the population to provide first aid for drowning in emergency situations, al-gorithms for modern didactics of the educational topic “Drowning” are proposed. The following educa-tional issues are highlighted: 1) Definition; 2) Mechanisms of death during drowning; 3) Types of drownings; 4) Periods in the development of drowning; 5) Features of drowning in fresh river and salt sea water; 6) Appearance of the drowning victim; 7) Risk factors; 8) Prognosis for survival after drown-ing; 9) First aid for victims of drowning.

Keywords: drowning; first aid; emergency situations; accidents; catastrophes; natural disasters; terrorist attacks; emergencies; didactics.

Introduction

World Drowning Prevention Day, declared in April 2021 by United Nations (UN) General Assembly resolution A/RES/75/273, is observed annually on 25 July. This global campaign provides an opportunity to raise awareness of the tragic and profound impact of drownings on families and communities, and to offer life-saving solutions to prevent them.

All stakeholders - Governments, UN agencies, civil society organizations, the private sector, aca-demia and individuals - are invited to observe World Drowning Prevention Day to highlight the need for urgent, coordinated and multi-sectoral action to prevent drowning using proven interventions such as: 1) Installation of barriers to control access to water; 2) Providing safe places away from water, such as nurseries for pre-school children with childcare facilities; 3) Training in swimming, water safety and safe rescue skills; 4) Training those interested in safe rescue and resuscitation; 5) Establishing and en-suring compliance with the rules of safe navigation on boats, ships and ferries; 6) Improved flood risk management practices.

The UN General Assembly invited the World Health Organization (WHO) to coordinate efforts to prevent drownings within the UN system. In this capacity, WHO leads preparations for World Drowning Prevention Day through promotional materials, global activities and support for national and local activities in countries and communities around the world.

The scale of the problem is enormous. WHO estimates that 236,000 people died from drowning in 2019, with children aged one to four years at highest risk, making drowning a major public health problem worldwide. In 2019, injuries accounted for almost 8% of all deaths worldwide. Drowning was the third leading cause of death from unintentional injuries, accounting for 7% of all injury-related deaths.

The global burden and mortality of drowning affects all countries and regions, however: 1) Low- and middle-income countries account for more than 90% of all unintentional drowning deaths; 2) More than half of the world's drownings occur in the WHO regions for the Western Pacific and South-East Asia; 3) Mortality rates from drowning are highest in the WHO

Western Pacific Region, 27–32 times higher than in the United Kingdom or Germany, respectively.

The tragic consequences of drownings cannot be assessed. In 2015, 15 thousand people drowned in the Russian Federation (RF), of which 4 thousand (27%) were due to the consumption of alcoholic beverages. About 25-30 thousand people drown in the Russian Federation every year. The main cause of accidents when swimming is underestimating the dangers and the inability to get out of a difficult situation. Often a person drowns not because he does not know how to swim, but because he gives in to panic. [1-2]

1) Definition. The two definitions below help us understand the variety of situations in which drowning can occur:

Drowning is a type of mechanical asphyxia (suffocation), in which the airways are closed by any liquid due to accidental or intentional immersion into it.

In addition to water (fresh or salt), the drowning medium can be liquid mud, oil, paint, oils, vari-ous liquids found in open containers or in vats in production (beer, molasses).

Drowning is a terminal condition or death due to aspiration (penetration) of fluid into the respir-atory tract, reflex cardiac arrest in cold water, or spasm of the glottis, leading to a decrease or cessation of gas exchange in the lungs.

When drowning, air does not enter the lungs, resulting in suffocation. Due to oxygen starvation of the brain, a person loses consciousness and death occurs. [2-6]

2) Mechanisms of death from drowning:

2.1. Asphyxia as a result of aspiration of fluid into the respiratory tract of the victim while breathing is preserved (true drowning, “wet” or primary, “blue asphyxia”) is the cause of 30-40% of drownings;

2.2. Asphyxia when pulmonary gas exchange ceases due to laryngospasm when the first portions of water enter the respiratory tract (asphyxial drowning, “dry” or secondary, “white asphyxia”) leads to 20-30% of drownings;

2.3. Asphyxia as a result of primary circulatory arrest: asystole, ventricular fibrillation (syncope or reflex drowning), approximately 10-20% of drownings;

2.4. Asphyxia as a result of “death on water”, when the cause of the terminal condition of the victim in the water is not associated with the entry of liquid into his respiratory tract, but with another cause (secondary drowning) - 5-10% of drownings;

2.5. Mixed asphyxia can combine signs of true and dry drowning, about 20-25% of drownings;

3) Types of drownings. The “blue” type of drowning is observed more often. In this case, water enters the respiratory tract, clogging the lungs. The skin is blue (“blue” death, “blue” asphyxia). A drowning person does not immediately plunge into the water, but tries to stay on its surface, expending a lot of energy. When he inhales, he swallows a large amount of water, which fills his stomach. This makes breathing difficult and increases body weight. After the final immersion in water, a person re-flexively holds his breath, and then, unable to hold it in, takes a breath, while water enters the lungs and breathing stops. After breathing stops, heart activity continues for up to 15 minutes. Oxygen star-vation develops - hypoxia. The bluish tint of the skin is caused by severe oxygen deficiency. “Blue” asphyxia is a severe form of suffocation and is difficult to resuscitate.

The “white” type of drowning occurs in those who do not try to fight for their lives and quickly go to the bottom. With this option, spasm of the larynx occurs due to water entering the vocal cords, which reflexively close, and suffocation occurs, although the water does not penetrate the lungs. Car-diac arrest occurs 5–6 minutes after breathing stops. In such victims, the color of the skin is sharply is pale (“white” asphyxia). This mechanism typical for sudden disasters, when a person plunges into wa-ter in a state of panic. Upon contact with cold water and irritation of the pharynx and larynx, a sudden stop of breathing and heart occurs. Water does not enter the lungs. The “white” type of drowning is also possible if a person in the water has an epileptic seizure or has a head injury during a dive. Water entering the larynx causes a reflex closure of the glottis, and the airways become impassable for water. With “white” asphyxia, if first aid is provided immediately, the possibility of revival is very high.

“Syncopal” (“fainting”) type of drowning. In such cases, a reflex arrest of the heart and breath-ing occurs, caused by the ingress of even a small amount of water into the upper respiratory tract. The skin is pale. The so-called “ice” shock (“cryo” shock), or immersion syndrome, develops as a result of reflex cardiac arrest during sudden immersion in cold water.

"Death on the Water" Occurs during a coronary attack, acute myocardial infarction, acute cere-brovascular accident (stroke), sudden onset status epilepticus or seizure, severe injury received during diving. Water enters the victim’s respiratory tract unhindered when the person is in a state of clinical death, that is, for the second time.

Mixed asphyxia usually combines the first two types of drowning. [7-11]

4) Periods in the development of drowning:

1. Terminal pause.

2. Agony.

3. Clinical death.

5) Features of drowning in fresh river and salt sea water. Fresh river water, due to low osmot-ic pressure, entering the respiratory tract, is quickly absorbed into the lungs and penetrates the blood-stream, causing blood thinning and destruction of red blood cells (hemolysis). In this case, pulmonary edema may develop. A large amount of pink foam is formed, which provokes further disruption of gas exchange. Salty sea water, on the contrary, having other osmotic properties, is not absorbed into the blood, but, on the contrary, promotes the release of fluid from the blood into the alveoli and bronchi.

In this regard, revitalization measures must be different. In particular, those who drown in fresh river water and with the clinical picture of “white” death undergo a quick toilet of the oral cavity and pharynx, after which artificial respiration and external chest compressions are immediately started. Any attempts to “pour the water” out of the lungs are, as a rule, useless, pointless and fraught with the loss of precious seconds. At the same time, those who drown in sea water must quickly clear the airways of water and foam, using gauze and other available materials for this purpose. A good effect is obtained by briefly turning the victim face down and lowering the head. You can also turn the victim over for a few seconds and place him with his head down on his stomach on the thigh of the person providing assistance. When carrying out all these activities, one should not forget that massage and artificial res-piration can only be stopped for a few seconds.

6) Appearance of the drowning victim:

6.1. Respiratory and cardiac activity are sharply reduced or may be completely absent;

6.2. Consciousness is often absent;

6.3. The skin and visible mucous membranes are pale or bluish, “goose bumps”. When drowning, even in warm water (+18-20°C), severe chills often occur;

6.4. Foamy, bloody fluid may be released from the mouth and nose in large quantities. [2, 11]

7) Risk factors:

1) Bathing in the absence of the ability to float and (or) swim;

2) Incorrect organization of mass bathing of children or its complete absence;

3) Swim beyond the buoys enclosing the swimming area;

4) Independent bathing of young children without adult supervision;

5) Bathing adults and children with chewing gum in the mouth;

6) Bathing young children independently in the bath and (or) pampering without adult supervi-sion;

7) Alcohol or other types of toxic intoxication;

8) Fast currents and whirlpools in open waters;

9) Swimming during a storm;

10) Swimming in places where entry into the water is prohibited;

11) Swimming on unequipped beaches and unfamiliar places in questionable bodies of water;

12) Fullness of the stomach with food;

13) Overheating in the sun;

14) A sharp contrast in the temperatures of an overheated human body and cold water;

15) A feeling of fear when a person who does not know how to swim gets into deep places;

16) Psycho-emotional fatigue;

17) Previous heavy physical activity;

18) The traumatic effect of pressure drop in the accessory cavities of the head during rapid im-mersion to great depths;

19) Hitting the stomach or head on the water when jumping from a height;

20) Injuries received during diving (submerged stones, reinforcement, pieces of concrete, metal structures, logs);

21) Hidden infectious diseases (flu, sore throat);

22) Fishing in secluded places alone;

23) Ice fishing in winter or fishing during spring ice drift;

24) Walking on fragile ice in early winter or melted ice in spring;

25) Use of ice holes in reservoirs in winter to provide drinking or technical water.

8) The prognosis for survival after drowning depends on:

1) Time spent under water;

2) Water temperature of the reservoir;

3) Age of the victim;

4) Concomitant diseases and injuries.

If the water temperature is low, resuscitation efforts may be successful (especially in children) even after being under water for quite a long time. [12-14]

9) First aid for victims of drowning.

1) Assess the situation and your ability to provide water rescue. Attract the attention of others. Follow the rules for your own safety.

2) Extracting a drowning person from the water. It is best to swim up to a drowning person from behind, so that the victim cannot grab onto the rescuer with his hands and interfere with his actions. A drowning person must be turned onto his back so that his face is on the surface of the water.

3) Start artificial respiration as soon as the victim’s head appears above the water, and transport him to the shore or to a floating craft with simultaneous artificial respiration (for an experienced rescuer or professional rescuer).

4) Transportation without artificial respiration (for a rescuer without experience). [9, 13]

IF, WHEN REMOVING A VICTIM FROM THE WATER TO THE SHORE OR A STABLE FLOATING VEHICLE:

A. There is no consciousness. There is no breathing. No pulse. Immediately begin cardiopul-monary resuscitation:

1) Examine the victim. Check the victim’s reaction to a loud call: “What’s wrong with you?” and shake him twice by the shoulders.

2) If there is no reaction to the call and mechanical and irritants - Attract the attention of others. Tilt the victim’s head back and within 10 seconds assess the violation of the victim’s vital functions (cough, spontaneous breathing, heartbeat, ability to move consciously).

3) If they are detected, give the victim a stable lateral position.

4) If there are no signs of life, then call an ambulance and begin resuscitation measures. [5]

The oral cavity is freed from foreign bodies with a finger, preferably wrapped in a cloth or hand-kerchief: silt, sand, algae, mucus, vomit, dentures.

In case of drowning in sea water, the airways are cleared of water and foam by placing the vic-tim stomach down on the rescuer’s thigh, bent at the knee joint. Then the chest is squeezed sharply and vigorously. The child can be lifted by the legs. If there is no effect within a few seconds and the water does not flow out, begin artificial respiration. If the skin is pale, then proceed to artificial ventilation of the lungs immediately after cleansing the oral cavity.

If it is impossible to open your mouth due to a strong spasm of the masticatory muscles, mouth-to-nose artificial respiration is started.

Features of resuscitation in adults and children.

For adults, perform 30 massage pushes (compressions) on the chest and 2 breaths “mouth to mouth” or “mouth to nose” (30:2)

In children, these activities are carried out in a ratio of 15:2. Chest compressions are performed with one hand.

In children under 1 year of age, resuscitation measures begin with 5 small-volume breaths (It is enough to inflate both cheeks and inhale. There is no need to try to take maximum breaths with the full chest of an adult man). Then 15 chest compressions are performed, but not with one palm, but only with 2 fingers. Next 2 breaths. Perform 15 compressions. And they continue to maintain a ratio of 15:2.

Resuscitation in a ratio of 30:2 (in children 15:2) continues until the ambulance arrives or until spontaneous heartbeat and breathing are restored.

B. There is no consciousness. There is no breathing. There is a pulse.

1) Artificial respiration “mouth to mouth” or “mouth to nose”.

2) Warming. Wrap in a blanket and cover with warm heating pads. After exiting the state of clin-ical death, massage the upper and lower extremities from the periphery to the center.

3) Pulse control.

4) When spontaneous breathing appears, the victim is given a stable lateral position.

5) Observe until the ambulance arrives.

C. Consciousness is confused. Breath is bubbling. There is a pulse.

1) On the shore or on a stable floating craft, assess the general condition of the victim.

2) Place the victim on a stretcher with the head end down;

3) Remove wet clothes or unbutton them if they restrict breathing;

4) Let ammonia on a cotton swab be inhaled and rub the temporal areas of the victim’s face with it;

5) Warm by wrapping in warm fabrics (blanket), give a hot drink (tea, coffee).

6) Massage (rubbing) the upper and lower extremities towards the heart;

7) Observe until the ambulance arrives.

8) Constant readiness to begin resuscitation measures: chest compressions and artificial respira-tion.

D. Consciousness is clear. Breathing is correct. There is a pulse.

1) Remove the victim’s wet clothes, wipe dry, and change into dry underwear;

2) Warm by wrapping in warm fabrics (blanket), give a hot drink.

3) Observe until the ambulance arrives.

If the victim is suspected of having a spinal fracture, he must be removed from the water on a shield or wide board. Often, drowning people are in a state of alcoholic or other toxic intoxication, which significantly complicates the provision of first aid and complicates the prognosis for the lives of such patients. [15-21]

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