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First aid training – investment in the human capital

Abstract. First aid training questions are crucial for different professions, incl professions related to field works – ecologists, geologists, agriculture specialties etc. There are different methodologies on first aid trainings. In modern practice there are already first aid courses which provide first aid certificates after online trainings, what is strange, since real sufferer requires real help, not only certificate. The article is dedicated to first aid training as investment in human capital. Time of arrival of ambulance in some rural regions of Russia may be rather long, despite to official requirements, so presence of the people trained as first aiders can be crucial to save sufferers life. Ideally everyone should be able to assist with first aid before the ambulance arrival. In Russia one of the first aid schools is National center of mass first aid training, which performs training in the form of championships, based on sport excitement – lifewrestling championships. In the article certain algorithms of first aid are given, to show one of the training approaches. During first aid training it is necessary to give the trainees correct logic of priorities, to save sufferers life most effectively, including cases with several sufferers, what is possible during car crash or terrorist act.

Keywords: first aid; legal requirements; clinical death; coma; logic of priorities; first aid training; lifewrestling; sufferer; time of ambulance arrival

While living in rural regions in Russia, there are cases when ambulance may need time to arrive [1]. The similar situation may occur when field works in remote or rural area of HSE specialist (i.e. during performance of environmental audit of green field or Environmental baseline assessments require in case of accident to bring himself or his/her colleague alive to the nearest hospital or till appearance of ambulance [2]. Such knowledge may be also necessary in case of traffic accidents [6; 7; 8] and one may know legal requirements to avoid unnecessary legal consequences [9].

Such situation may need some basic first aid knowledge in advance.

Art. 31. First aid of Federal law “On fundamentals of citizens health protection in the Russian Federation” of 21.11.2011 N 323-FZ gives us following clarification – people ***have the right to provide first aid in the presence of appropriate training and (or) skills.***

So First aid in Russia does not require medical skills, but knowledge and training. There are different activities related to the suffers rescue, but requiring medical knowledge i.e. first medical help (performed by graduated medical officers), first pre-medical help (performed by surgeon’s assistance). Two later activities require medical degree of different level instead of first aid activities.

First aid activities are performed only in certain cases. These cases are listed in Order of Minzdravsocrazvitie of 04.05.2012 N 477н "On approval of conditions list at which the first aid is given, and the list of actions for first aid" Annex 1. and are following:

1. Lack of consciousness.
2. Respiratory and circulatory arrest.
3. External bleeding.
4. Foreign bodies of the upper respiratory tract.
5. Injuries to various areas of the body.
6. Burns Effects of exposure to high temperatures, thermal radiation.
7. Frostbite and other low temperature effects.
8. Poisoning.

In all other cases this is not first aid and sufferer should address to hospital directly. There are different approaches to first training, including online training of first aid, what is not proper, since does not give practical skills necessary for real first aid cases.

Let us review several cases of first aid training according Valery Bubnov methodology – “lifewrestling” – first aid training through sport excitement, while mastering the skills [3; 4]. Training of first aid skills is necessary for professions related to field works – ecologist, geologists, incl. agricultural activities in rural areas. Let us start with logic of priorities, to save life of sufferer or to save more sufferers during group incident.

There is a logic of priorities:

1. *Absence of mind and pulse at carotid artery (apparent death) – Start reanimation activities if not started within 4 minutes from heart stop – nearly no chance to reanimate.*
2. *Absence of mind, but there is pulse at carotid artery (Coma) – Turn face down – if not started within 4 minutes from loop of consciousness not to tern face down – the harmed person can die from asphyxia.*
3. *Severe bleeding – (diameter of blood pool is more than 1 meter) – Apply a tourniquet.*
4. *Wounds – Apply sterile bandage – if ambulance will come within 30–40 minutes – not necessary.*
5. *Suspicion of bones brake – Apply transportation splint – If ambulance will arrive within 40 minutes – not necessary in case of legs breach – if not started within 2 minutes from femoral artery bleeding start – nearly no chance to rescue.*
6. *Certainly not in all cases we may have such sophisticated equipment, but we have knowledge how to perform activities on first aid and creative resources.*

Let us review in detail some topics, including coma and clinical death.

Definition of craniocerebral trauma and coma.

Two veracious signs of coma:

- Loss of consciousness.
- Presence of pulse in carotid artery.

Remember! If pulse is present, you should perform 4 following actions as soon as possible.

1. Make sure that pulse is present in carotid artery, but sufferer is out of consciousness.
2. Raise sufferer's closest arm over his head. Raised arm will not only secure cervical spine but will also significantly ease body turning. It is impossible to identify cervical spine damage when person is in coma. Raised arm secures cervical spine from hazardous lateral offset during turnover [5].
3. Turning just the head while leaving sufferer lying on his back is **UNACCEPTABLE!**

In that pose contents of oral cavity will still leak into airways, and tongue wouldn't move away from the back side of throat. Moreover, in case of cervical spine damage that wrong movement would cause lateral offset of cervical vertebrae and that would lead to paralysis or even to death.

Any incautious touch to tongue when sufferer is lying on his back can provoke vomiting reflex and can lead to death due to vomit aspiration.

4. After turning sufferer face down put two fingers into his mouth and empty his oral cavity from foreign bodies, vomit and mucus. Then press on tongue root and provoke vomit reflex. If sufferer makes distinctive vomiting sounds and vomiting moves start, that is most convincing evidence that he is alive!

That way you are able to not only clean the airways but also to make sure that sufferer is alive. Moreover, harsh push on tongue root provokes inhalation and cough reflex. Putting your fingers into someone's mouth is nasty, of course. But you have to overcome your disgust to save man's life. Wrap your fingers with nose-rag or bandage and empty his oral cavity.

But be careful. If sufferer's teeth are clenched you shouldn't try unclenching them with force. It usually ends in failure for both the sufferer and the rescuer: sufferer can choke on broken teeth, bitten off fingers of rescuer would surely lead to disability. If sufferer's jaws are clenched you shouldn't try unclenching them. Clenched teeth don't block airflow.

Unclenching sufferer's teeth with force is **UNACCEPTABLE!**

Teeth can't be water- and airtight when sufferer is lying face down.

5. After cleaning airways and provoking vomiting reflex, you should leave sufferer lying face down and make sure his limbs are lying along his body, turn sufferer's face towards you so you could control pulse in carotid artery and the type of breathing. Apply cold to sufferer's head if possible. Leave him in that posture until ambulance arrives. Applying cold significantly decreases development speed of cerebral edema and protects brain from death.

UNACCEPTABLE!

- Leaving sufferer in coma lying on his back.
- Putting pillow (bag, twisted clothes) under his head.
- Carrying or dragging sufferer from mishap site without emergency (explosion threat, fire etc.).
- Transporting sufferer on your own.

Summing up emergency aid actions in case of coma:

1. Make sure that pulse is present in carotid artery.
2. Turn sufferer face down.
3. Insert two fingers into sufferer's mouth and empty oral cavity, press on tongue root.
4. Apply cold to sufferer's head, if possible.

Life treatment bleeding and limb bone fracture.

In what cases one can suspect life-threatening bleeding?

- If blood is exuded in a pulsating stream.
- Blood pool is more than 1meter in diameter.

In what cases one can suspect limb bone fractures.

- Unnatural limb position (twisted heel or hand).
- Limb deformation and edema.
- Bone fragments sticking out of the wound (inarguable sign of open fracture).

Rules of controlling sufferer's condition until ambulance arrival.

You must check sufferer's condition until medics arrive: check on his breath and check pulse in carotid artery every 2 or 3 minutes.

Remember! It is necessary to clean sufferer's oral cavity every 5 minutes using nose-rag or napkin, constantly control his breath and pulse in carotid artery.

How to control condition of sufferer in coma?

- Breath: clean oral cavity in case of respiratory disorder.
- Pulse: if it is absent then put the sufferer on his back and hit his breastbone, start reanimating if your blow had no effect.

Algorithm of giving first aid to a sufferer in coma.

Make sure pulse in carotid artery is present.



Quickly turn sufferer face down.



Apply a tourniquet if there is bleeding.



Put sterile dressing on wounds.



Immobilize limbs if fracture is suspected.



Call an ambulance.

Leaving sufferer lying on his back is **UNACCEPTABLE!**

Putting a pillow (bag, convoluted clothes) under sufferer's head is **UNACCEPTABLE!**

Carrying or dragging the sufferer from accident site without an emergency is **UNACCEPTABLE!**

Transporting sufferer on your own is **UNACCEPTABLE!** You should call emergency services if possible.

Clinical death.

The main task of reanimation is to prevent social death (cortex death).

Concept of sudden cardiac arrest.

If the first question that comes to your mind, when looking at the sufferer is: "Does he breathe?" – then you have to assume the worst—a sudden death. Under sudden cardiac arrest, that requires immediate reanimation, one should understand blood circulation stopping in cases, when a person loses consciousness without any visible reasons, and loses pulse in carotid artery (in case of heart diseases). Or when heart stops due to electric shock, drowning, road accident, falling from height etc. This condition is identified rather easily by a trained witness.

Three different stages of death develop consequently after blood circulation stops: clinical death, social death and biological death.

Concept of social death.

Social death occurs when brain cortex dies—human turns into a plant-organism. He can breathe by himself, he has heartbeat, but intelligence and personality are dead. In that case all reanimation efforts turned out to be vain.

Reanimation loses its meaning even though it is sometimes continued by health care professionals to preserve donor organ viability. Social death can be diagnosed only after loss of cortex activity is registered using special diagnostic equipment.

Concept of clinical death.

Phrase "clinical death" – isn't a diagnosis, it is more like a tactical designation of an extremely hazardous condition. This condition is an early stage of death at its core, it is reversible and it guides witness to start doing reanimation.

Precise diagnosis of clinical death can only be made after a successful reanimation (lat. "re" – return, "anima" – soul): revivification of a dead person.

It is assumed that clinical death doesn't last more than 4–5 minutes after heart stopping. During that time irreversible changes can occur in brain cortex that could lead to its death. It is impossible to make an accurate diagnosis of clinical or social death in situ.

It is important to pay attention to duration of clinical death. It starts when blood circulation stops, which is rarely documented in reality, and ends with first reanimation procedures.

Irreversible changes in brain cortex can occur in 4 minutes after blood circulation stops. Witness' tactics is to prevent death of brain cortex and social death.

Reanimation time is counted since the moment resuscitation started, more specifically – supporting brain cortex vitality in hopes of spontaneous heart activity resumption, or blood circulation renewal after medicamental or electropulse effect.

Remember! There are a lot of cases of successful resuscitation after more than 1 hour long reanimation process.

Therefore, you definitely should use a chance of resuscitation in case of sudden cardiac arrest before signs of biological death appear.

Remember! There is not a single Art. of Penal or Civil code that declares life-saving illegal in case of failure.

Moreover, if sudden cardiac arrest occurred in presence of sufferer's relatives, you might start reanimation out of humanitarian considerations even if there are early signs of biological death. Later on you must state in your evidence that signs of biological death were detected before the beginning of resuscitation.

Concept of biological death. When reanimation is powerless.

Unfortunately, coming to the rescue in time isn't always possible. Irreversible changes occur in brain tissues and in many organs. BIOLOGICAL DEATH happens and no efforts can revitalize the sufferer. Surely it is very important to know how long vital signs were absent. But no one can pinpoint exact time in that kind of situations.

Remember! Eye appearance can give reliable information about lost time. Biological death is suspected if pupil is deformed and cornea is dried.

To prove that awful conclusion you need to carefully squeeze pupil with your thumb and forefinger. If perfectly circular pupil changes its form and turns into cat's eye, then you see a human that died more than 10–15 minutes ago. Eyes also lose their natural shine. Lacrimation is lost after brain death and eye cornea dries. That's what fish eyes look like after it is extracted from water.

Remember! Seeing dried cornea, deformed pupil and making sure that there is no pulse in carotid artery of unconscious man is enough to make a decision that resuscitation is pointless.

Three early signs of biological death.

1. Loss of consciousness.
2. Dried cornea and deformed eye pupils.
3. Absence of pulse in carotid artery.

Warning!

Sufferer should be left invariant if signs of biological death are detected in explosion, caving or flood zone and you must leave the hazardous zone as quickly as possible.

Remember! Leaving the casualty at mishap site is not a sign of fear, it is a vital necessity. Survivor shouldn't have pangs of conscience because that human was already dead.

Signs of clinical death.

Wasting precious seconds delaying start of reanimation is **UNACCEPTABLE!**

What resuscitation outcome depends on.

1. Wasted time.
2. Resuscitation execution.
3. Severity of brain and internal organ injures.

Latter factor – damage severity – is often determined by an unlucky train of events, while the first two factors – wasted time and resuscitation execution – entirely depend on bystanders. You shouldn't waste time trying to find out details of the accident, calling emergency services or waiting for someone to start giving first aid.

You can spend a long time peering at chest movement, listening to breath.

At the same time, mouth-to-mouth doesn't threaten life of human breathing by himself. Otherwise the very first kiss of lovers would end with their funeral. Moreover, if the pulse is absent

for more than a minute, then self-sustained breathing is almost absent. That's why detecting signs of breathing is not necessary for resuscitation start.

Finding out if sufferer is conscious by asking ridiculous question: "Dude, are you okay?", "Do you need my help?" or "Do you want to talk to me?" – and wasting time waiting for the answer is more than absurd. It is necessary to apply four fingers to carotid artery as soon as possible to find pulse. Squeezing carotid artery causes extreme pain.

If sufferer throws your hand away and asks: "What do you want?" then his action inform you about his vital signs and consciousness. But if he doesn't then you have to read following chapter really carefully.

You need to put four fingers on sufferer's neck in between larynx cartilage and sternomastoid muscle and push them towards spine.

Pulse should be examined for 10 seconds because you can mistake your pulse for sufferer's due to worry. This mistake might cost sufferer's life: not starting reanimation in 3–4 minutes after cardiac arrest means losing any chance for rescue.

Second mistake is not noticing sufferer's pulse due to importunate or careless pulse examination. If sufferer has infrequent pulse, it might be unnoticed. Then cardiopulmonary resuscitation is going to be performed on living human and it might lead to his death.

Remember! Absence of pulse in carotid artery is the main sign blood circulation stop.

There are other spots on human body that can be used to check pulse: wrist (radial artery) and groin (femoral artery). In practice absence of pulse in wrist isn't always connected to cardiac arrest and blood circulation stop and an attempt at checking pulse in groin isn't always correct.

UNACCEPTABLE!

Wasting time on checking signs of breathing and checking pulse in radial and femoral arteries. Time is the decisive factor in human rescue.

UNACCEPTABLE!

Wasting time trying to find out details of the accident, calling emergency services and waiting for someone to start giving first aid.

Preparing for resuscitation.

Remember! It is necessary to put sufferer onto firm and flat ground and to free his chest from clothes.

Following activities should be performed:

- If sufferer wears sweater, than raise it and move it towards the neck.
- Belt must be loosed or unstrapped. There are known cases of liver getting damaged because of belt.
- If the shirt is worn, then it should be unbuttoned.
- T-shirt, jersey or any other thin underwear don't need to be taken off. But you make sure there is no cross or pendant under t-shirt before hitting breastbone.

Conclusion.

So first aid training is a real investment in the human capital. Logic of priorities allows to save the life of the sufferer un case of emergency before the ambulance arrives. Being capable to define different first aid situations allows to understand what kind of first aid is needed first. During

lifewrestling championships one can easily train first aid skills through sport excitement. Certainly sometimes one has to use improvised equipment for first aid [10].

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Обучение навыкам оказания первой помощи – инвестиции в человеческий капитал

Аннотация. Вопросы обучения навыкам оказания первой помощи актуальны для всех профессий, особенно для профессий, связанных с полевыми работами, например экологи, геологии, аграрии и др. Существует значительное количество методик обучения навыкам оказания первой помощи. В настоящее время появились даже курсы обучения первой помощи онлайн, что не вполне корректно так как оказание первой помощи реальному пострадавшему требует не только и не столько удостоверения, но и реальных навыков оказания первой помощи. Статья посвящена вопросу обучения навыкам оказания первой помощи, как инвестиции в человеческий капитал. Время прибытия скорой помощи в некоторых, особенно в сельских регионах России может быть достаточно продолжительным, несмотря на официальные требования по времени прибытия, поэтому присутствие людей, обученных навыкам оказания первой помощи рядом с пострадавшим может быть критичным. Одна из первых организаций в России, занимающаяся обучением навыкам оказания первой помощи – Национальный центр массового обучения навыкам оказания первой помощи – осуществляет обучение посредством спортивного азарта – в рамках чемпионатов по оказанию первой помощи – лайфрестлингу. В данной статье представлен алгоритм оказания первой помощи, для описания одного из подходов к обучению навыкам оказания первой помощи. При обучении навыкам оказания первой помощи важно снабдить обучающегося четкой логикой приоритетов, для максимально эффективного спасения пострадавшего, в том числе и в случае наличия нескольких пострадавших, что вполне вероятно, например при автомобильной аварии или террористическом акте.

Ключевые слова: первая помощь; нормативные требования; клиническая смерть; кома; логика приоритетов; обучение навыкам оказания первой помощи; лайфрестлинг; пострадавший; время прибытия скорой помощи

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