

Resuscitation procedure for fire fighters in case of emergency

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Abstract. In the rescue in emergency situations the humans in distress are always to be focused on and very little attention is paid to rescuers in extreme conditions. The extreme conditions can cause extreme pressure, which can get them into trouble, and in the last resort it can risk their lives. The article focuses on the possibilities of reanimation protocols for firefighters who are exposed to these types of circumstances. During the intervention, beside the suffocation the most common cause of death for firefighters is a cardiac arrest. High-quality complete cardio-pulmonary resuscitation at the right time is crucial not only to survive, but to avoid the later complications. Because of the special environments of fire ground and the heavy and tightly fixed gears of the firefighters we need markedly different procedures of the civil practice for a successful rescue. The author gives examples of these.

Key Words: firefighting, firefighter, first responder, fire ground survival, scene safe, incident safety CPR, FD-CPR, BLS, mayday situation, situational awareness, emergency.

Introduction. Safety of the firefighters depends on many factors. These may include the admission procedure of the preliminary medical examination screening activities (Kóródi 2006), the general and specific safety conditions (Pántya 2012), training and quality of education (Bleszity et al 2014), firefighters theoretical and practical knowledge of fire behaviour (Restás 2014a) and intervention tactics (Restás 2015) and correct decisions during fire fighting (Restás 2013) which not only them but other military or law enforcement decision-makers, so the soldiers or the policemen also refer to (Restás 2014b).

Despite the adequate preparation, unfortunately in many cases can also occur accidents (Figure 1) that cause that firefighters must to intervene in extreme conditions (Pántya 2013). Intervention in extreme circumstances - the firefighters the same way - most of the battlefield military practice examples can be found (Kóródi 2013). Here several situations may arise, usually heart problems dominate, which is solved with their own protocols (Fejes & Kóródi 2014), or even used in a wide variety of modern instruments (Kóródi 2002) like those already in practice to apply special fire rescue methods.

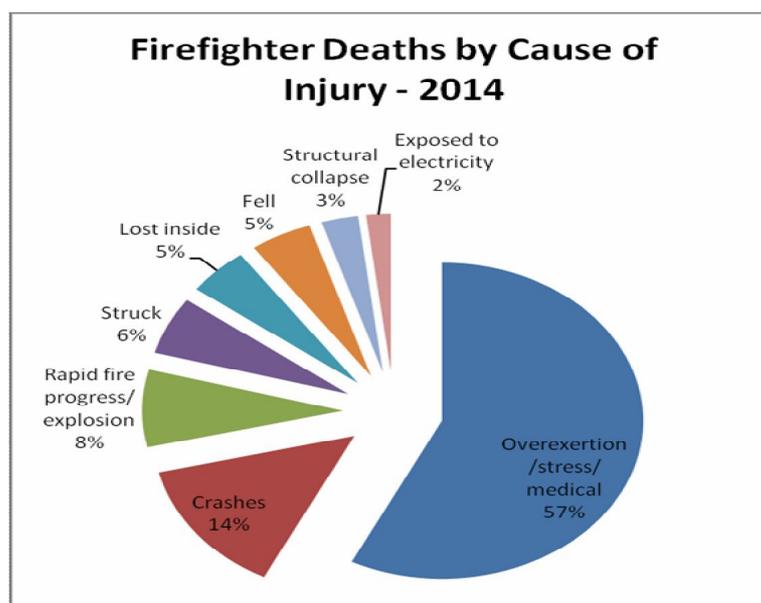


Figure 1. Firefighter's fatalities in the United States (Fahy et al 2015).

According to some studies, the firefighter's work is one of the most stressful jobs. It is important to make a distinction between positive (eustress) and negative (distress) stress. Stress can be beneficial and essential for survival. It improves concentration ability, we will be more alert, we can exert more force and thus activate reserves. These effects are those that will help the animals to survive, but the same positive stress that supported the people in the historic and prehistoric times. Consciously, however, we are not always able to control the deep-rooted survival instincts that determine our responses to specific emergencies. Stress causes the body to prepare for survival.

It is called "Fight or flight" reaction. Stress is therefore not a disease that we should cure or suppress. The best response to stress can help to give the best answer for the physical and mental pressure. But, the harmful and excessive stress can negatively affect the survival of the firefighters, so it is important to know and recognize the signs of distress in time. The forgetfulness, weakness, fatigue, indecision, tremors, loss of fine movements, mistakes, anxiety and increased heart rate may be the signs of excessive stress. But, the negative stress has not only signs, but there are also causes. Depending on which area of "life" we are talking about a variety of causes may distress. Other stressors affect a broker, a bus driver or even firefighters. In our case, primarily isolation, fatigue, frustration, anger, anxiety, inexperience, non-realistic training, and lack of management, stress and fear are the causes.

The relationship between stress and heart problems has long been medically proven. This is supported by the National Fire Prevention Association (NFPA) study. In 2014, 64 firefighters have been killed in the line on duty in the United States (Figure 2). The deaths of more than half were sudden cardiac death. The physical overload and stress were responsible for 57% of the root causes. In the view of this data, it would be irresponsible to ignore the possibility that, if necessary professionally we can begin CPR and, more importantly, as soon as possible. Because of the special environments of fire ground and the heavy and tightly fixed gears of the firefighters we need markedly different procedures of the civil practice for a successful rescue. The breathing mask, a hood, a helmet, a protective coat prevents the civil proceedings health survey. But, according to current resuscitation guidelines after the respiratory collapse we have to expect the collapse of the circulatory system and vice versa. So if we don't hear the SCBA typical breathing sounds, we can expect it to have already occurred or to occur soon. In the United States in 2014 it was the first step to prepare the firefighters for these special situations. Unfortunately, there is no information as to whether the above is a direct correlation between the FD-CPR and the downward trend, but it is remarkable. The taught procedure at the Coral Springs Fire Academy can be divided into four main parts. These are: the bail-out, the chest compression, the gear removing and the delivery to the EMS (Special training materials for firefighters (Coral Springs- Fire Academy) Coral Springs FI, USA, 2015).

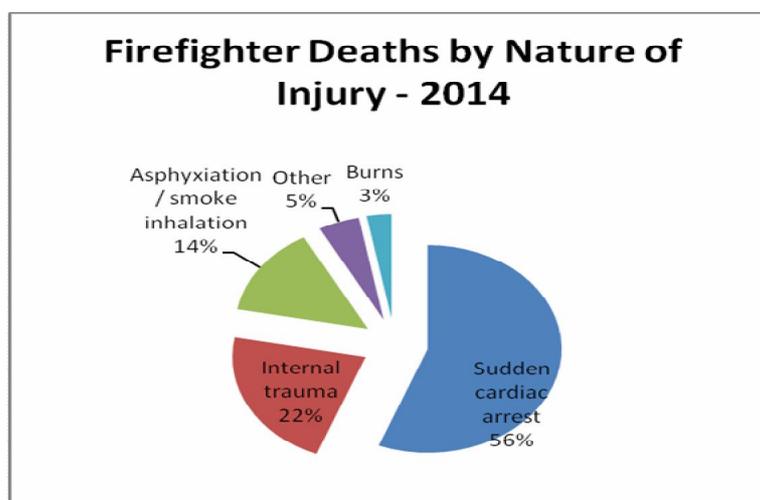


Figure 2. Firefighter CPR (Special training materials for firefighters (Coral Springs- Fire Academy) Coral Springs FI, USA, 2015).

Steps of resuscitation procedure

STEP 0 - The dragging. This step is optional if the situation requires it. The first step is to drag the injured firefighter to a safe place. On the fire ground there are a number of risk factors to be taken into account during the rescue. The heat stress, smoke, falling debris can all threaten both the saved and rescuer firefighter. If you must complete the drag long way (large-area factory buildings, school buildings, etc.) firefighter should take special attention for the rescuing environment too (Figure 3).

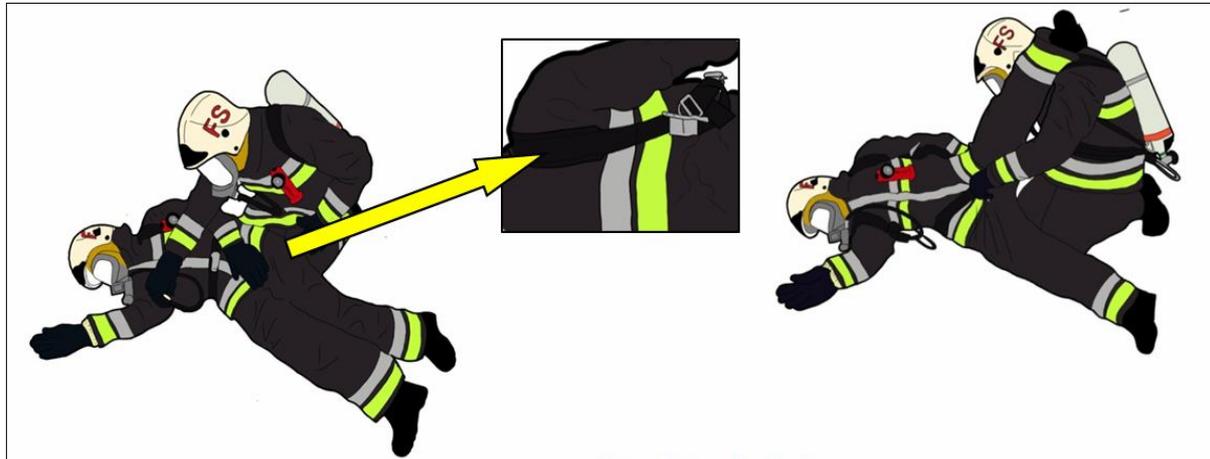


Figure 3. Preparing injured firefighter for the drag. Illustration by the author.

STEP 1 - Preparing the procedure. The injured has to be secured against slippage out of the SCBA. After that the air volume must be checked. Connect the waist strap between the legs like "thigh strap". The shoulder straps stitched to assure itself of unwanted release. If necessary first loosening the shoulder straps so that safety can grip. Of course, if they must be performed for rescue only in the short way, we don't packaging the injured firefighter. It is preferred that the dragging is performed by grasping the shoulder straps. Not only do we provide ourselves good grip points, but we will be in the second step's sitting position without grip change (Figure 4).



Figure 4. The dragging. Illustration by the author.

STEP 2 - The stripping and the chest compression I. After the bail-out the rescuer firefighter sits down, pulls the injured into his „lap" and holds both side of SCBA tank with his legs, thus preventing a sideways tilt of the victim. The pulling in was carried out correctly if the victim is practically parallel to the soil surface. Avoid the half-sitting position. Adding the correct position is very important because without body stabilization we cannot start the CPR. Another firefighter starts the chest compression through the

bunker gear. At the same time the sitting firefighter starts the stripping. First remove the helmet and the hood, SCBA mask. The firefighter jackets have tight cuff. My experience is that during the stripping pull the cuff on the wrist, because later it prevents the pulling out of the injured from the gear (Figure 5).



Figure 5. The stripping and the chest compression I. Illustration by the author.

STEP 3 - The stripping and the chest compression II. The chest compression is continued. 3rd firefighter releases the waist strap (now it's thigh strap), and loosen the shoulder straps. On command of the sitting firefighter the chest compression stops for a moment, while the protective jacket zipper is pulled (Figure 6).



Figure 6. The stripping and the chest compression II. Illustration by the author.

STEP 4 - The gear removing. Continue the chest compression. If there is a 4th firefighter then he, if not then the firefighter who released the straps grabs the injured's trouser and pulls out of the whole gear (SCBA and jacket). The Fire medic service or the EMS continues the CPR with ALS (Figure 7).



Figure 7. The 3rd firefighter pull the victim out of the whole gear. Illustration by the author.

Conclusions. In the 20th century, the temperature increase was larger than any of the last thousand years of the century. According to data of the Intergovernmental Panel on Climate Change (IPCC) the average ground level temperature of the air is increased by 0.74 ± 0.18 °C between 1905 and 2005. Climate change is a result of more extreme weather anomalies. The firefighters are bound to do everything that keep step with developments for successful rescues in extreme conditions. In conclusion knowing the firefighter fatalities, we can say the FF-CPR is an easy-to-learn and pragmatic solution for the interveners. In the United States and Canada more and more training of the firefighters use this procedure so there are sufficient experiences to use in the European firefighter training materials.

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