

## Patient in hypothermia - diagnostic and treatment problems in fire department.



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To the Editor,

Accidental hypothermia occurs when, as a result of environmental factors, the central body temperature drops below 35° C. Deep hypothermia is a life-threatening condition, but it is one of the reversible causes of cardiac arrest. At a temperature of 30-28° C, the oxygen demand is 50% normal, at 25° C only 33%, and below 10° C 4-11%. Heart, liver and brain have more requirements in this respect, and the kidneys need most oxygen [1]. In the Deep Hypothermia Treatment Center in Krakow, a system of rapid implementation of extracorporeal circulation (ECMO) was developed, obtaining favorable therapeutic results in non-traumatic patients [2]. The patient in hypothermia accounts for a significant percentage of all intervention services of the emergency services. The analysis of death cards issued in 2009-2012 in Poland showed that exposure to excessive natural cold was the initial cause of death in 1,836 people [3]. Early identification of victims in hypothermia, established algorithm of action and coordination of activities leading to the use of extracorporeal heating techniques can contribute to improved prognosis.

The key parameter that should be taken into account when hypothermia is suspected, is the measurement of body temperature. If the measurement of the deep temperature in the esophagus is not

possible, a thermometer reading from the tympanic membrane [4] can be used. Due to the slowed down metabolism, it is recommended to prolong the assessment of the vital functions of the unconscious patient and lead it to 60 seconds [5]. At this time, it is advisable to monitor the heart rhythm and capnography. In difficult conditions at the place of the event, heart rate assessment may be unreliable in the diagnosis of cardiac arrest. Emergency medical teams usually have a contactless thermometer, but fire departments do not have such equipment. When firefighters take rescue action, they should make an extended assessment of the vital functions of a patient who is unconscious and subcooled to recognize interruption of blood circulation. Beginning resuscitation of a person in hypothermic condition, but with preserved circulation, may result in the induction of the VF rhythm.

In order to verify the degree of preparation of firefighters for providing assistance to people injured in hypothermia, we conducted tests among 96 firemen (86 men and 10 women), within different seniority. Most of the respondents (87%) had adequate training and the title of the rescuer. The average test result was 72.92% of the correct answers. The firefighters showed the most complete knowledge in the matter of threats resulting from the state of hypothermia (92.71%), and the lowest within the field of thermal insulation materials (30.21%). The research shows that firefighters have a high level of knowledge regarding the treatment of people suffering from hypothermia, but do not have experience with appropriate emergency equipment.

If, therefore, the fire brigade is unable to measure life parameters (temperature, ECG, and capnography) in an instrumental way, it must be based on the assessment of the presence of breath and heart rate using the rescuer's own senses. Considering the difficulties in assessing vital functions in an instrumental way, in our opinion we should consider a classic BLS (Basic Life Support) study lasting 10 seconds. The use of hypothermic depth classifications according to the swiss Staging System could be helpful [3]. But despite the classification of particular symptoms of hypothermia (disorders of consciousness and muscle tremors), there is not enough evidence to indicate this method as decisive when diagnosing cardiac arrest. It is necessary to develop a procedure for the diagnosis of cardiac arrest for fire brigades. The aim of the research should be to indicate the optimal behavior of firefighters so that without confirmed deep hypothermia, the initiation of CPR would not be delayed.

### Disclosure statement

No potential conflict of interest was reported by the authors.

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