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On the Question Concerning the Creation of Unified Accounting Data Form “The Protocol of Cardiopulmonary Resuscitation” for Mobile Teams of Emergency Medical Services

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ABSTRACT Significant decrease in death rates from out-of-hospital cardiac arrest (OHCA) can be achieved by developing and implementing an integrated program of administrative interventions focused on improvements in the provision of the first aid and emergency medical care. However, both identification of the foreground and reasonable components of the program, and evaluation of its efficiency are impossible in the absence of reliable tools for collecting and analysing data on epidemiology of OHCA and performance of the prehospital care system. This paper discusses the development of unified form for collecting data on cases of OHCA with attempted cardiopulmonary resuscitation (CPR), addresses the promising data form “The protocol of CPR” that is recommended by the Specialized Board on Emergency Medical Care of the Ministry of Health of Russia, and offers a set of proposals for optimizing the form with consideration for the international guidelines for uniform reporting of data from OHCA.

Keywords: circulatory arrest, cardiac arrest, cardiopulmonary resuscitation, CPR protocol, registry, Utstein, first aid, emergency medical services, epidemiology

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ALV – artificial lung ventilation

EMC – emergency medical care

FA – first aid

OHSA – out-of-hospital circulatory arrest

SEAMC – station of emergency and acute medical care

PROBLEM OVERVIEW

Due to the high incidence and extremely low survival rates, out-of-hospital circulatory arrest (OHCA) is considered as a serious medical and socio-economic problem worldwide requiring immediate intervention [1–4].

The experience of the health systems of economically developed countries indicates that a multiple increase in survival at OHCA can be achieved through the implementation of comprehensive programs for optimizing prehospital care, some elements of which should be aimed at increasing the effectiveness of both emergency medical care (EMC) and first aid (FA) [5]. At the same time, for the rational organization of such a program and the assessment of the effectiveness of the implemented measures, a reliable statistical control system is required that provides continuous collection and periodic analysis of objective information about the epidemiology of OHCA and the processes of rendering assistance at the prehospital stage — the OHCA register [6–8].

In the Russian Federation today, there is no single functioning system for monitoring the epidemiological parameters of OHCA and the effectiveness of out-of-hospital resuscitation, which on the one hand masks the problem of OHCA and, on the other hand, hinders the identification and implementation of priority measures aimed at improving care and increasing survival during cardiac arrest [9].

An important condition for creating a domestic register of OHCA, corresponding to modern international recommendations [7], is the development, optimization and standardization of primary accounting forms. The current registration forms of the EMC, approved by the Order of the Ministry of Health and Social Development of the Russian Federation No. 942 of 12/02/2009 [10], allow you to collect only a part of the information necessary to describe the case of an OHCA (for example, gender and age of the victim, place of call, time of receiving the call, time arrival at the place of call, diagnosis, etc.), but they do not have fields for recording many key data characterizing the actual process of assisting with OHCA [7, 8]. For registration of detailed information on the provision of assistance to victims with OHCA, the ambulance services use auxiliary forms, protocols of cardiopulmonary resuscitation (CPR) [11, 12], which are still not legally fixed, preventing unified data collection at the state level.

PROSPECTIVE FORM OF CPR PROTOCOL

The original form of the CPR protocol was developed and subsequently tested by the staff of the A.S. Puchkov Station of Emergency and Acute Medical Care (SEAMC) in Moscow, with the participation of employees of the Faculty of Medicine, A.I. Yevdokimov Moscow State University of Medicine and Dentistry (MSUMD)[12].

The form has a convenient modular-block structure, which allows you to logically enter the data on the activities carried out by the base and advanced CPR and contains the general part (including information about the patient, the ambulance team, the time of diagnosis of OHCA, the circumstances of the onset of clinical death — in the presence or before the arrival of the ambulance),

modules for providing airway patency, artificial lung ventilation (ALV), vascular access, CPR timekeeping module, providing for entering data on other components of the basic and extended resuscitation complex and monitoring indicators during the resuscitation process, as well as the final module describing the result of the assistance [12]. The CPR protocol form is accompanied by detailed instructions for completion.

According to the results of testing [12], when using the CPR protocol form in the practice of visiting ambulance service teams, an almost twofold reduction in the time spent on preparing medical documentation for cases of OHCA with resuscitation was observed compared to recording the CPR process in the descriptive part of the ambulance medical record. The time spent on internal audit of medical documentation on cases of resuscitation when using the CPR protocol form was reduced by an average of 1.7 times compared to the traditional description of CPR progress in the special part of the medical card. Employees of the ambulance teams noted the ease of filling out the CPR protocol form in practice. The authors report that from April 2017 to April 2018 the mobile teams of the A.S. Puchkov SEAMC issued 5,523 CPR protocols [12].

According to the results of testing at a meeting of the profile commission in the specialty "Emergency Medical Care" of the Ministry of Health of Russia, the CPR protocol form was approved and recommended for use in the work of mobile ambulance teams. Based on the results of using the form in the work of mobile teams of the EMC, the profile commission also decided to consider the possibility of approving the form by the Ministry of Health of the Russian Federation [13].

SUGGESTIONS FOR OPTIMIZING THE CPR PROTOCOL

Many years of foreign experience in the creation and functioning of OHCA registers have demonstrated the need to use a single nomenclature and unified approaches to collecting, analyzing and presenting information on the epidemiology of OHCA and the effectiveness of the functioning of pre-hospital care systems. For this purpose, international Utstein recommendations were developed [6, 7, 14], which, in particular, include a list of the main data elements that make up the generally recognized standard minimum for describing cases of OHCA with CPR.

THE PARTICIPATION OF BYSTANDERS IN ASSISTING PATIENTS WITH OHCA

Several key elements of *Utstein*, the which are not obligatory to fulfill in Russia by the registration forms of the EMC, are used to evaluate the provision of assistance to victims by OHCA bystanders.

Considering that with every minute of delayed CPR during OHCA the chances of surviving the victim are reduced by about 7–10% [15], in cases where OHCA occurs before the arrival of the ambulance team, the final result of the assistance is determined, first of all, by the actions of bystanders. Against the background of bystander resuscitation, the likelihood of recovering life is reduced significantly more slowly by 3–4% per minute [15], and the immediate start of basic CPR by OHCA bystanders as a whole increases the chances of surviving a victim by 2–3 times [16]. In the Russian Federation, it is often the failure of the FA due to the inability of most OHCA bystanders to timely recognize the problem, call for help and start basic CPR, which leads to the fact that the victim is already in a state of biological death by the time the ambulance brigade arrives [17].

FA is an integral component of the assistance process at the Higher Attestation Service, and without taking into account the participation of witnesses in the provision of assistance, it is neither possible to reasonably judge the functioning of the pre-hospital care system as a whole, nor to identify defects and priorities in organizing the FA, nor to evaluate the effectiveness of administrative interventions aimed at involving bystanders in assisting patients with OHCA, such as, for example, programs for mass training of the population or remote monitoring of FA by dispatchers of the EMC [9, 18–20].

Based on the foregoing, it is proposed to use the following fields in the form of CPR protocol for registering key *Utstein* data elements: 1) a field for marking the onset of clinical death "in the presence of a bystander", "in the presence of an ambulance brigade" or "without bystanders and the presence of an ambulance brigade"; 2) a field for marking bystander CPR and its amount (only chest compression or compression combined with artificial respiration) [7]. The possible future consolidation at the legislative level in Russia of the right to use automatic external defibrillators in the provision of FA will require the introduction of an additional field in the form to mark the completion (attempt to perform) defibrillation by OHCA bystanders.

OTHER OPTIMIZATION SUGGESTIONS

According to the original instructions for the CPR protocol form, in case of repeated episodes of clinical death with successful restoration of cardiac activity in one victim, a separate protocol form should be drawn up for each episode of circulatory arrest. At the same time, registration of all episodes of OHCA from one victim with one protocol can reduce the time spent on filling out the primary documentation (since duplication of information from the common part, modules for ensuring airway obstruction, mechanical ventilation and vascular access is eliminated) and simplify data processing and analysis.

Accordingly, to ensure the integrity of the description of the process to assist in the pre-hospital stage, the "successful CPR" is considered not every episode of spontaneous circulation restoration in one victim, but the presence of spontaneous circulation at the time of the transfer of responsibilities to the staff of medical institution that meets the definition "*Survived event*" according to *Utstein* [7].

The module for providing airway patency can be supplemented with a field for recording the number of attempted tracheal intubations. Given the presence in the original form of fields for a general mark on the success (failure) of the manipulations to ensure airway patency, an additional block with details of the signs of success of the manipulations (chest excursions, auscultation data) seems optional, and its exclusion from the form can increase the speed of filling and processing documentation.

In the CPR timekeeping module, it is advisable to supplement the block of indicators for monitoring the state of the victim with a central pulse assessment item. The original electrocardiogram unit includes the item "Organized heart rhythm with pulse", however, the possibility of registering a central pulse as a criterion for the restoration of spontaneous blood circulation should be provided, including cases of CPR without monitoring the electrical activity of the heart [7, 14].

The form of the CPR protocol can be supplemented with the field "Postresuscitation therapy" to describe the measures taken at the prehospital stage aimed at maintaining vital functions in the early period after restoration of spontaneous blood circulation and optimizing the outcome of OHCA [7, 21].

It is appropriate to add a brief description of the electrocardiogram and respiratory function indicators (spontaneous respiration or mechanical ventilation, respiratory rate) to the indicators of the state of the victim in the *Successful CPR* unit of the final form module (level of consciousness, pulse rate, blood pressure, oxygen saturation of hemoglobin).

CONCLUSION

For the different systems of prehospital aid in Europe, North America and Asia for the survival of suffering from out-of-hospital circulation arrest may differ by more than 23 times (from 1.1 to 26.1%). [5] Such a significant difference in survival rates indicates real opportunities for improving the situation through the rational organization of measures to improve systems with initially low

survival rates. The introduction of a single form of protocol for cardiopulmonary resuscitation at the federal level, based on the original development of A.S. Puchkov SEAMC and A.I. Yevdokimov MSUMD will allow uniform collection of data necessary to be performed for effective monitoring of the epidemiology of out-of-hospital circulation arrest, determining reasonable cost-effective ways to optimize the pre-hospital care and control effectiveness to introduce proxy measures. To increase the information content, consistency and comparability of the accumulated data, it is necessary to ensure that the form of the protocol of cardiopulmonary resuscitation is in accordance with Utstein international recommendations, including in the aspect of the mandatory accounting of first aid indicators for circulatory arrest bystanders.

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