

СОВЕРШЕНСТВОВАНИЕ ОРГАНИЗАЦИИ ОКАЗАНИЯ МЕДИЦИНСКОЙ ПОМОЩИ ПОСТРАДАВШИМ В ДОРОЖНО-ТРАНСПОРТНЫХ ПРОИСШЕСТВИЯХ НА ФЕДЕРАЛЬНОЙ АВТОДОРОГЕ В РЕГИОНЕ РОССИИ С НИЗКОЙ ПЛОТНОСТЬЮ НАСЕЛЕНИЯ

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Резюме. Цель исследования – на основе разработанной системы организации оказания медицинской помощи пострадавшим в дорожно-транспортных происшествиях (ДТП) на федеральных автодорогах (ФАД) в регионах России с низкой плотностью населения, обосновать необходимость проведения комплекса мероприятий по совершенствованию оказания медицинской помощи указанным контингентам.

Материалы и методы исследования. С использованием метода организационного эксперимента выполнены научное обоснование и разработка мероприятий, реализация которых позволит повысить эффективность оказания первой и медицинской помощи пострадавшим в ДТП на ФАД в регионах Российской Федерации с низкой плотностью населения.

Материалы исследования – выборка 206 медицинских карт пациентов, поступивших по срочным показаниям после ДТП на ФАД М-8 «Холмогоры» в медицинские организации Архангельской области и получивших медицинскую помощь в стационарных условиях (ф.003/у) в периоды с 1 января по 31 декабря 2016 г. и с 1 января по 31 декабря 2018 г. Учетные формы отбирались по критериям ретроспективного сплошного документального наблюдения – отобраны все истории болезни пострадавших в ДТП, получивших стационарное лечение в исследуемые периоды.

Критерии включения в исследование: пол – мужской и женский; пострадавшие в ДТП на участках ФАД М-8 «Холмогоры» в Архангельской области, получившие стационарное лечение; травма получена в указанные периоды.

Критерии исключения из исследования: возраст – менее 18 лет; отсутствие травмы, полученной в ДТП, в анамнезе.

Для статистического анализа использовались категориальные переменные, которые были представлены в виде процентных долей. Для определения наличия взаимосвязи между категориальными переменными использовался тест Хи-квадрат Пирсона. Статистическая обработка данных выполнена с использованием пакета прикладных статистических программ SPSS 22.

Результаты исследования и их анализ. Внедрение новых организационных подходов к организации оказания медицинской помощи пострадавшим в ДТП на ФАД М-8 «Холмогоры» привело к увеличению к 2018 г. по сравнению с 2016 г. доли своевременных (до 1 ч) доездов бригад скорой медицинской помощи (СМП) до места ДТП; доли пострадавших, которым специалисты бригад СМП выполнили обезболивание, транспортную иммобилизацию, внутривенную инфузию протившоковых препаратов, а также к созданию в травмоцентре I уровня регионального центра компетенций и, как следствие, к росту количества консультаций пострадавших с политравмой и количества медицинских эвакуаций пострадавших с политравмой, проведенных в травмоцентр I уровня.

Ключевые слова: Архангельская областная клиническая больница – травмоцентр I уровня, бригады скорой медицинской помощи, время доезда, дорожно-транспортные происшествия, медицинская помощь, медицинская эвакуация, политравма, пострадавшие, региональный центр компетенций, регионы России с низкой плотностью населения, федеральная автодорога М-8 «Холмогоры», федеральные автодороги

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IMPROVING THE ORGANIZATION OF MEDICAL CARE FOR VICTIMS OF ROAD ACCIDENTS ON THE FEDERAL HIGHWAY IN A LOW-DENSITY REGION OF RUSSIA

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Summary. The aim of the study is to substantiate the necessity of a set of measures to improve medical care to the victims of road traffic accidents on federal highways in Russian regions with low population density on the basis of the developed system of medical care provision.

Materials and research methods. Using the method of organizational experiment, we carried out the scientific substantiation and development of measures the implementation of which will improve the efficiency of first aid and medical care to the victims of road accidents on the federal highways in the regions of the Russian Federation with low population density.

Materials of the study — a sample of 206 medical records of patients admitted for urgent indications after an accident on the federal highway M-8 "Kholmogory" to medical organizations of the Arkhangelsk region and who received medical care in hospital conditions (form 003/u) in the periods from January 1 to December 31, 2016 and from January 1 to December 31, 2018. Record forms were selected according to the criteria of retrospective continuous documentary observation — all medical histories of accident victims who received inpatient care during the study periods were selected.

Inclusion criteria for the study were: 1. Gender — male and female. 2. Victims of road accidents on the sections of the federal highway M-8 "Kholmogory" in the Arkhangelsk region who received in-patient treatment. 3. Trauma was got in the specified periods.

Exclusion criteria for the study: 1. Age — less than 18 years. 2. No previous traffic accidents trauma.

Categorical variables were used for statistical analysis and presented as percentages. The Pearson Chi-square test was used to determine if there was a relationship between the categorical variables. Statistical processing of the data was performed using a package of applied statistical programs SPSS 22.

Study results and their analysis. Implementation of new approaches to the organization of medical care for victims of traffic accidents on the federal highway M-8 "Kholmogory" led to an increase by 2018 compared with 2016: of share of timely (up to 1 hour) delivery of ambulance crews to the place of the accident; of share of victims to whom specialists of ambulance crews performed anesthesia, transport immobilization, intravenous infusion of antishock drugs, as well as the creation of a regional competence center in the Level I trauma center and, consequently, an increase in the number of consultations for victims with polytrauma and in the number of medical evacuations of victims with polytrauma, performed to the Level I trauma center.

Key words: ambulance crews, Arkhangelsk Regional Clinical Hospital — Level I trauma center, federal highways, M-8 "Kholmogory" federal highway, medical care, medical evacuation, polytrauma, regional center of competence, road accidents, Russian regions with low population density, time of arrival, victims

Conflict of interest. The authors declare no conflict of interest

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Introduction

Road traffic injuries (RTA) is one of the most acute medico-social problems the global significance of which is undoubted, especially in the aspect of the most severe traumatic injuries [1-3]. One of the leading transport arteries of the Russian European part of the Arctic is the federal highway M-8 "Kholmogory" (hereinafter — FAD M-8), which has features inherent to almost all such highways: a large total length and a significant length of runs between settlements and medical treatment organizations, often — poor visibility, due to climatic and geographical features of the region. Together, these features significantly increase the risk of road traffic accidents (RTAs) with medical and sanitary consequences, including polytrauma, and reduce the possibility of timely medical care for victims of accidents [4]. Failure to provide or poor-quality medical care within the first hour after an accident increases the risk of fatal outcomes in victims with polytrauma by 30%; from one to three hours — by 60; from three to six hours — almost 2-fold [5-7].

The aim of the study is to substantiate the necessity of implementing a set of measures to improve medical care for victims of traffic accidents in the regions of Russia with low population density on the basis of the developed system of organization of medical care on federal highways.

Materials and Methods. Using the method of organizational experiment, we carried out the scientific substantiation and development of measures to improve the effectiveness of medical care to the victims of road traffic accidents at federal highways in the regions of the Russian Federation with low population density.

Study materials: a sample of 206 medical records of patients who received medical care under inpatient conditions (f.003/u), admitted in medical organizations of Arkhangelsk region for urgent indica-

tions after an accident on FAD M-8 in the period from January 1 to December 31, 2016 and from January 1 to December 31, 2018. The record forms were selected according to the criteria of retrospective continuous documentary observation — all case histories of accident victims who received inpatient treatment during the study periods were selected.

Inclusion criteria for the study were:

1. Gender — male and female.
2. Victims of road accidents on the sections of FAD M-8 "Kholmogory" in the Arkhangelsk region who received in-patient treatment.
3. Trauma received in the specified periods.

Exclusion criteria for the study:

1. Age — less than 18 years.
2. No trauma previously got in traffic accidents.

Categorical variables were used for statistical analysis and presented as percentages. The Pearson Chi-square test was used to determine whether there was a relationship between the categorical variables. Statistical processing of the data was performed using the SPSS 22 statistical software package.

Results of the study and their analysis. A large number of fatalities and injured, including those with severe polytrauma, in accidents on federal highways indicates the need to organize the provision of quality and timely medical care, especially in the Russian regions with low density and uneven distribution of the population. Most of these territories are part of the Arctic Zone of the Russian Federation or regions equated to it with very difficult climatic, geographical and socio-economic conditions. It should be noted that these regions currently play a strategic role in the geopolitics of our country. In connection with the above, in 2017 a special system of organization of medical care for victims of road accidents on FAD

M-8 (hereinafter referred to as the System) in the studied subjects of the Russian Federation (hereinafter referred to as the subjects) was developed (figure).

One of the principles of the developed system includes the distribution of trauma centers on the federal highway, which ensures the availability of medical care to victims of road accidents through an equal distribution of medical forces and resources. The zones of responsibility of medical organizations for providing emergency medical assistance to victims on specific sections of FAD M-8 have been established; EMT teams are on duty to provide medical assistance in the pre-hospital period. Implementation of the mentioned technologies resulted in reduction of the time of arrival of ambulance crews to the place of accident on FAD M-8 (tab. 1).

In 2018 compared with 2016 there was an increase in the proportion of timely (up to 1 hour) arrival of ambulance crews to the scene of an accident — from 69.6 to 89.3%.

One of the organizational measures of the developed System was the scientific justification and creation of the Regional Center of Competence (Center of Competence) as part of the Arkhangelsk Regional Clinical Hospital — Level I Trauma Center and the leading medical organization of the region. The work of the Center of Competences implies mandatory forwarding of full information about a patient who has suffered in an accident with severe multiple or combined trauma (polytrauma) and who was admitted to any medical organization of the region — to the Level I Trauma Center for telemedicine consultation by the leading specialists of the Trauma Center. This information must be sent to the Level I Trauma Center by the regional medical institution that received the patient in an accident with polytrauma within twenty-four hours of the patient's admission. After the consultation, a decision is made on the tactics for managing the patient or organizing his/her emergency medical evacuation to a Level I trauma center.

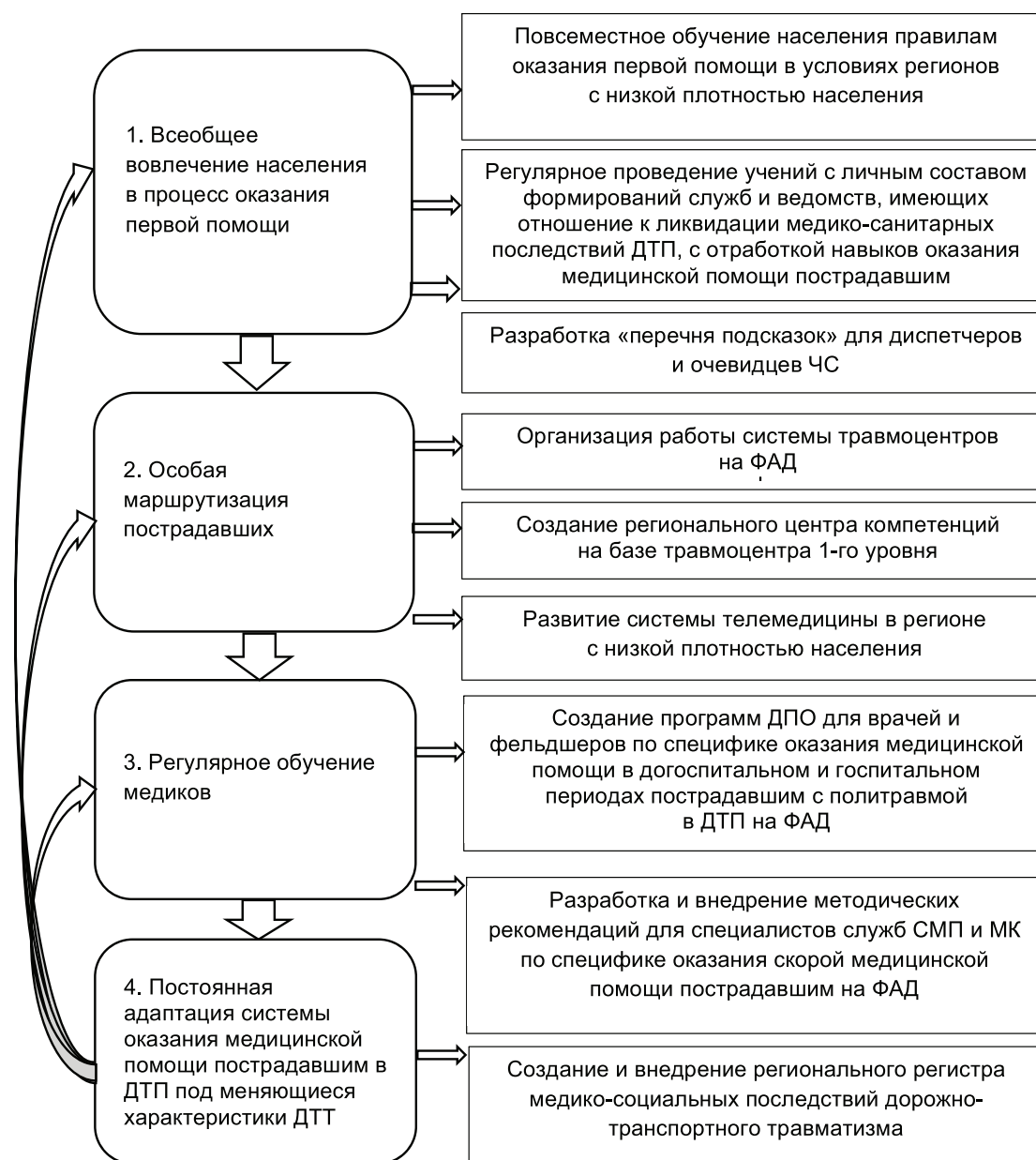


Рисунок. Структурно-функциональная модель Системы организации оказания первой и медицинской помощи пострадавшим в ДТП на ФАД в регионах России с низкой плотностью населения; ДПО – дополнительное профессиональное образование, МК – медицина катастроф, ЧС – чрезвычайные ситуации

Figure. Structural and functional model of the System of organization of medical care for road traffic victims on federal highways in Russian regions with low population density

Таблица 1/ Table No. 1

Время доезда бригад СМП до места ДТП в 2016 и 2018 гг.
Time of arrival of ambulance crews to the place of an accident in 2016 and 2018

Время доезда, мин Time of arrival, min	Количество ДТП, абс./% Number of traffic accidents, abs./%	
	2016	2018
< 20	7/5,7	8/9,5
21–40	40/32,8	35/41,7
41–60	38/31,1	32/38,1
> 60	37/30,4	9/10,7
Всего ДТП Total of traffic accidents	122/100,0	84/100,0

Примечание. Статистически значимые различия в процентном соотношении определялись попарно с помощью критерия χ^2 Пирсона; $p = 0,002$

Note. Statistically significant differences in percentages were determined in pairs using Pearson's χ^2 test; $p = 0.002$

Prior to the creation of the Competence Center, counseling of victims with polytrauma sustained in a car accident was not mandatory and was done sporadically. For example, in 2016, 68 (66.7%) of 102 victims were counseled; 44 (43.1%) were evacuated to a Level I trauma center. After implementing the principles of the developed System in 2018, out of 60 people injured in accidents on FAD M-8, 52 people (86.7%) were evacuated to a Level I trauma center; 59 people (98.3%) were consulted.

Another principle of the System is regular training of medical and nursing staff in the specifics of providing emergency, including specialized emergency, medical care to victims of traffic accidents on FAD M-8, especially to victims with severe polytrauma or cold injuries. Since 2017, the Northern State Medical University of the Russian Ministry of Health (Arkhangelsk) has been training medical and paramedical staff of ambulance teams to provide specific emergency medical care to victims with multiple and combined trauma (polytrauma), who are in a state of traumatic or hemorrhagic shock, as well as the implementation of the algorithm of actions when there is a large number of victims, when they are threatened with accident hazardous or toxic substances, fire and other possible contingencies. Refresher cycles are held on an ongoing basis. The result of implementation of the above technology was an increase in 2018 compared to 2016 in the proportion of casualties who received anesthesia and transport immobilization, as well as intravenous infusion of antishock drugs (Table 2).

Discussion.

The staff of a number of territorial centers for disaster medicine and first-aid stations of the regions of Russia have carried out scientific researches on road traffic traumatism and peculiarities of medical aid rendering to the injured. These studies proposed options for improving and optimizing the existing systems of medical care for the injured in road traffic accidents taking into account the climatic, geographical and social features of a particular region of the country [8-12].

The studies by D.A. Tolkachev, H.H. Ruzanov, E.V. Popova (2009); I.V. Rebikov, A.M. Levin, A.A. Gushchin, S.V. Purusov (2016) presented the experience of emergency response teams (ERT) of the territorial centers for disaster medicine and assessed the effectiveness of assigning track points (TP) to specific sections of federal and major regional highways [13, 14]. The aforementioned authors noted that the competent location of these teams in assigned areas is the basis for an effective rapid response of medical forces and facilities in emergencies.

I.V. Petchin (2019) found that in the prehospital period anesthesia adequate to the severity of the injury was performed in 40.0-50.0% of victims; transport immobilization — in 30.0-40.0% of victims. The

Таблица 2/ Table No. 2

Распределение пострадавших в ДТП по видам медицинских вмешательств, выполненных специалистами бригад СМП в 2016 и 2018 гг.

Distribution of victims of traffic accidents by type of medical interventions, performed by specialists of ambulance teams in 2016 and 2018

Вид медицинского вмешательства Type of medical intervention	Число пострадавших, чел./% Number of victims, people/%.		p
	2016	2018	
Обезболивание Pain relief	74/60,6	68/80,9	0,002
Иммобилизация Immobilization	75/61,5	55/65,5	0,559
Внутривенная инфузия Intravenous infusion	35/28,6	26/31,0	0,727
Всего пострадавших Total number of victims	122/100,0	84/100,0	—

Примечание. Статистически значимые различия в процентном соотношении определялись попарно с помощью критерия χ^2 Пирсона; $p = 0,002$

Note. Statistically significant differences in percentages were determined in pairs using Pearson's χ^2 test; $p = 0.002$

author notes the severe nature of injuries in traffic accidents, which require special professional knowledge and the ability to quickly make verified clinical decisions from the medical specialists of the ambulance crews working in the pre-hospital period [15]. In his dissertation work A.V. Koldin (2010) points out that only 20.0-25.0% of the citizens traumatized in car accidents received in the prehospital period medical care that was adequate to the severity of the trauma; this is associated with unsatisfactory professional training of the emergency medical teams and the Disaster Medicine Service [16]. A.V. Peshkun (2013) notes that the quality of medical care provided by specialists of EMT teams in the pre-hospital period can be reduced if it is provided by specialists of linear medical or paramedic teams, rather than specialized teams [17]. The same author draws attention to the fact that these specialists are insufficiently trained to provide medical care at the scene of the accident to two or more victims, especially — with severe multiple and combined trauma, as well as those in a state of traumatic or hemorrhagic shock [17]. Thus, the data we obtained in the study on the organization of emergency medical care at federal highway in the region of the Russian Federation with low population density are quite consistent with the results of similar studies performed earlier in other regions of our country, and testify to the need for further study and practical elaboration of the raised issue.

Summarizing the results of the study, it should be stated that the implemented organizational measures have led to:

- increase in 2018 compared to 2016 of the share of timely (up to 1 hour) arrivals of ambulance crews to the scene of an accident on FAD M-8 from 69.6 to 89.3%, $p = 0.002$;

- increase in 2018 as compared with 2016 of the share of victims to whom specialists of the emergency medical teams performed: anesthesia — from 60.6 to 80.9%; transport immobilization — from 61.5 to 65.5; intravenous infusion of antishock drugs — from 28.6 to 31.0%;

- creation of an advisory competence center in a subject I trauma center and, as a consequence, an increase ($p < 0.001$) in the number of consultations for victims with polytrauma;

- increase ($p < 0.001$) in the number of medical evacuations of polytrauma victims performed from central district hospitals on FAD M-8 to the Level I trauma center.

Implementation in the practical healthcare of the subject of the developed set of proposals for the provision of specialized medical care to victims of road accidents on federal highways in regions with low population density and irregularity has reduced the mortality rate among the injured with polytrauma in the hospital period from 6.7 to 3.6% by 2018.

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