

ACTUAL PROBLEMS OF MEDICAL EVACUATION АКТУАЛЬНЫЕ ПРОБЛЕМЫ МЕДИЦИНСКОЙ ЭВАКУАЦИИ

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ROUTING PROBLEMS DURING MEDICAL EVACUATION OF VICTIMS IN EMERGENCY SITUATIONS: RESULTS OF SWOT ANALYSIS OF SOLUTIONS OF SITUATION TASKS IN SUBURBAN AND REMOTE AREAS. MESSAGE 2

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Abstract. The purpose of the study is to analyze and to evaluate the decisions of specialists of the Disaster Medicine Service of the regions on the application of routing principles during medical evacuation of victims in emergency situations and to identify ways to improve the quality and efficiency of medical evacuation measures in emergencies with a large number of victims arisen in suburban – up to 50 km from the city – zone and in remote – more than 50 km from the city – area.

Materials and research methods. The materials of the study were 85 variants of solutions to the situational task "100 affected". The task had different structure of lesions in their localization and severity, different proportion of adults and children and variants of the place of occurrence of emergency situations. The tasks solutions were analyzed using case study technology and SWOT analysis method.

Research results and their analysis. Medical specialists who took part in solving situational tasks-cases and experts from the Headquarters of the All-Russian Disaster Medicine Service revealed a fairly large number of factors affecting the quality of medical evacuation measures in emergencies. These factors in relation to SWOT analysis can be structured into "internal" (strengths and weaknesses) and "external" – enlarging opportunities for high-quality medical evacuation measures and reducing their risks. Analysis of the identified factors in relation to medical evacuations in emergencies revealed strengths and weaknesses of each option:

- prevalence of "internal" strengths during medical evacuation in an emergency in the city, and the presence of certain risks – see Message 1 – option No. 1;

- similar positions are determined during medical evacuation in a suburban area, but with a number of differences affecting routing – Message 2 – option No. 2;

- in an emergency in a remote area, a large number of "internal" weaknesses and "external" risks are compensated by available opportunities – Message 2 – option No. 2.

For all emergency conditions, a weighted score of factors is given.

As a result, the goal of the SWOT analysis was achieved – ways to improve treatment and evacuation measures were identified to develop strategies for "breakthrough", "development", "defense" and "containment" in each scenario of emergencies.

Key words: case method, emergencies, medical evacuation, remote area, routing, suburban area, SWOT analysis, victims

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ПРОБЛЕМЫ МАРШРУТИЗАЦИИ ПРИ ПРОВЕДЕНИИ МЕДИЦИНСКОЙ ЭВАКУАЦИИ ПОСТРАДАВШИХ В ЧРЕЗВЫЧАЙНЫХ СИТУАЦИЯХ: РЕЗУЛЬТАТЫ SWOT-АНАЛИЗА РЕШЕНИЙ СИТУАЦИОННЫХ ЗАДАЧ В УСЛОВИЯХ ПРИГОРОДНОЙ ЗОНЫ И ОТДАЛЕННОГО ОТ ГОРОДА РАЙОНА. СООБЩЕНИЕ 2

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Резюме. Цель исследования – проанализировать и оценить решения специалистов Службы медицины катастроф (СМК) регионов по применению принципов маршрутизации при проведении медицинской эвакуации пострадавших в чрезвычайных ситуациях (ЧС) и выявить пути повышения качества и эффективности проведения лечебно-эвакуационных мероприятий (ЛЭМ) в ЧС с большим числом пострадавших, возникших в пригородной – до 50 км от города – зоне и в отдаленном – более 50 км от города – районе (далее – отдаленный район).

Материалы и методы исследования. Материалами исследования были 85 вариантов решений актуальной задачи «100 поражённых» с различной структурой поражений по их локализации, степени тяжести, доле взрослых и детей и по вариантам места возникновения ЧС с применением технологии кейс-метода (Case study) и проведением SWOT-анализа ЛЭМ при ликвидации медико-санитарных последствий ЧС.

Результаты исследования и их анализ. Медицинские специалисты, принимавшие участие в решении ситуационных задач кейсов, и эксперты Штаба Всероссийской службы медицины катастроф (ВСМК) выявили достаточно большое количество факторов, влияющих на качество ЛЭМ, проводимых в ЧС. Указанные факторы применительно к SWOT-анализу можно структурировать на «внутренние» (сильные и слабые) и «внешние» – повышающие возможности качественного проведения ЛЭМ и снижающие их риски.

Анализ выявленных факторов применительно к проведению медицинских эвакуаций в ЧС выявил сильные и слабые стороны каждого варианта:

- превалирование сильных «внутренних» сторон при проведении медицинской эвакуации в ЧС, возникшей в городской черте, и наличие при этом определенных рисков – см. Сообщение 1 – вариант №1;
- аналогичные позиции определены при проведении медицинской эвакуации в ЧС, возникшей в пригородной зоне, но с рядом отличий, влияющих на маршрутизацию – Сообщение 2 – вариант №2;
- в ЧС, возникшей в отдаленном районе, большое количество слабых «внутренних» факторов и «внешних» рисков компенсируется имеющимися возможностями – Сообщение 2 – вариант №3.

Во всех условиях возникновения ЧС дана взвешенная оценка факторов.

В результате достигнута цель SWOT-анализа – выявлены направления совершенствования лечебно-эвакуационных мероприятий для разработки стратегий «прорыва», «развития», «обороны» и «сдерживания» в каждом варианте возникновения ЧС.

Ключевые слова: SWOT-анализ, кейс-метод, маршрутизация, медицинская эвакуация, отдаленный район, пострадавшие, пригородная зона, чрезвычайные ситуации

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The purpose of the study is to analyze and to evaluate the decisions of specialists of the Disaster Medicine Service of regions on the application of routing principles during medical evacuation of victims in emergency situations and to identify ways to improve quality and efficiency of medical evacuation measures in emergencies with a large number of victims in a suburban – up to 50 km from city – zone and in a remote – more than 50 km from city – area (hereinafter referred to as a remote area).

Materials and research methods. When organizing medical evacuation while liquidating medical and sanitary consequences of emergency with a large number of victims, in order to focus on the principles of routing during medical evacuation, we used the case study technology.

As a part of improving the organization of medical evacuation, heads of territorial centers of disaster medicine and of united regional centers of emergency and disaster medicine and of other institutions of Disaster Medicine Service were asked, having input data (case), to form a problem and to find optimal ways to solve it, working in teams with their own staff.

When compiling the cases, the following input data were presented:

- number of victims – 100 people;
- pathology profiles of the victims: neurosurgery, thoracoabdominal trauma, burn trauma, skeletal polytrauma and others – 5–10 options;
- structure of the contingent of victims according to the severity of the condition: severe, moderate, light – 3-7 options;
- options for the proportion of adults and children in the total number of victims – 3-5 options;
- options for the emergency location: in the city; in a suburban area – up to 50 km from the city; in a remote area – more than 50 km from the city.

In addition, when modeling the cases, real infrastructural and natural objects of the regions were mentioned. It

was proposed to take into account season, time of day and weather conditions corresponding to the date of the event specified in the case. When solving the problem, leaders themselves had to determine a possibility of attracting forces and means available in the region, including a possibility of deploying such mobile medical units as emergency response teams, mobile medical teams, field multidisciplinary hospitals (as evacuation receivers in the emergency zone).

The cases were handed over to each manager on electronic media; 7-10 days were allocated for development of solutions and for their submission for evaluation by the specialists-experts of the Headquarters of the All-Russian Service for Disaster Medicine.

In search for a solution to a problem situation specified in the case, each leader took into account from the real conditions in his region:

- personnel, material and technical support;
- number and possibilities of usage of ambulance vehicles and air transport;
- remoteness of medical organizations of the 1st, 2nd, 3rd level, their bed capacity and other characteristics;
- system of information exchange on emergencies available in the region;
- existing schemes of interagency interaction at the regional and interregional levels, etc.

When solving each case, it was necessary:

1. To assess capabilities of available medical forces and means to rescue victims within one day: provision of emergency medical assistance; organization and conduct of medical evacuation from emergency center to medical facilities of the 1st, 2nd, 3rd level, further interhospital medical evacuation.

2. To develop a schedule for carrying out available medical forces and means of medical evacuation in medical facilities of the 1st - 3rd level.

3. To calculate in the table the data reflecting the dynamics of the inflow of victims in each medical organisation for every hour with a cumulative total.

4. To calculate dynamics of medical care, taking into account hourly workload in each medical facility of the 1st - 3rd level, as well as the real data on the number of specialist doctors, operating tables, intensive care units available.

5. To calculate the required volume of interhospital medical evacuation.

6. To calculate the proportion of evacuees for each routing option that was applied.

The solutions to the case were evaluated by the specialists-experts of the Disaster Medicine Service Headquarters.

A total of 85 decisions were presented and analyzed, of which 16 decisions related to an emergency that occurred in a city; 41 — in a suburban area; 28 solutions — to an emergency that occurred in a remote area.

In Message 1, medical and evacuation measures in the elimination of medical and sanitary consequences of emergencies in the city were analysed — Option No. 1; Message 2 presents options for solving cases under the conditions of a suburban area and a remote area — Options No. 2, 3.

Research results and their analysis. The main factors that were analyzed were the remoteness of medical organisations from the emergency site and the duration of medical

evacuation (Tables 1, 2). In almost every federal district, regardless of population density and other conditions, there is a proportional distance from medical organisations of various levels from the emergency location — in a city, in a suburban area and in a remote area.

The dependence of the duration of medical evacuation on the distance between medical organisation and the place of emergency (see Tables 1, 2), as well as other factors affecting the quality of medical evacuation conducted in an emergency, and their grouping into "internal" and "external" types were presented in the Message 1.

Cases for the conditions of a suburban area and a remote area — Options No. 2, 3.

The organization of medical evacuation in an emergency in a suburban area — up to 50 km from the city — is in many ways similar to those in the event of an emergency in a city. At the same time, there are a number of differences:

- forces and means to eliminate medical and sanitary consequences of emergencies in a suburban area are mainly attracted from different regional medical facilities and their branches. They are usually located at a great distance from the place of emergency. That is why the time of arrival of medical teams at the emergency place in a suburban area is longer than in a city. Also, there is often a shortage of medical personnel;

Таблица 1/ Table No 1

Удаленность места ЧС от ЛМО 1-го, 2-го, 3-го уровня, среднее значение, км
Distance of the emergency site from the medical organization (LMO) of the 1st, 2nd, 3rd level, average value, km

Федеральный округ Federal District	В городе/In the city			В пригородной зоне/In the suburbs			В отдалённом районе/Outside the city		
	1-й уровень 1st level	2-й уровень 2nd level	3-й уровень 3rd level	1-й уровень 1st level	2-й уровень 2nd level	3-й уровень 3rd level	1-й уровень 1st level	2-й уровень 2nd level	3-й уровень 3rd level
Центральный/Central	59	96	110	79	43	68	76	173	175
Северо-Западный/Nord-West	35	35	57	70	330	330	172	140	470
Южный/South	33	41	47	41	39	49	80	96	330
Северокавказский*/North-Caucasian*	5	125	124	40	46	224	—	—	—
Приволжский/Volga	5	5	20	110	150	170	67	98	170
Уральский/Uralsky	63	120	380	27	48	136	120	120	386
Сибирский/Siberian	5	100	107	46	15	170	314	191	198
Дальневосточный/Far Eastern	18	32	44	60	75	400	42	1100	1100
Среднее значение/Average	27,8	65,7	111,1	59,1	93,2	193,4	124,4	274,0	404,1

* Специалисты СКФО не принимали участия в решении кейсов, по условиям которых ЧС произошла в отдалённом районе

* Specialists of the NCFD did not participate in solving cases in which an emergency occurred outside the city

Таблица 2/ Table No 2*

Продолжительность медицинской эвакуации с места ЧС до ЛМО 1-го, 2-го, 3-го уровня, среднее значение, ч
Duration of medical evacuation from the emergency site to the medical organization (LMO) of the 1st, 2nd, 3rd level, average values, hour

Федеральный округ Indicator	Медицинская эвакуация/Medical evacuation					
	санитарным автотранспортом by ambulance vehicles			воздушным транспортом** by air transport**		
	1-й уровень 1st level	2-й уровень 2nd level	3-й уровень 3rd level	1-й уровень 1st level	2-й уровень 2nd level	3-й уровень 3rd level
Центральный/Central	1,7	2,1	2,2	—	—	1,2
Северо-Западный/Nord-West	2,8	5,1	3,9	—	—	3,5
Южный/South	1,6	1,8	2,9	—	—	1,1
Северокавказский/North-Caucasian	2,8	3,3	3,6	—	—	2,0
Приволжский/Volga	1,9	2,2	3,5	—	—	3,3
Уральский/Uralsky	1,6	2,3	2,9	—	—	1,5
Сибирский/Siberian	1,2	1,5	2,1	—	—	1,7
Дальневосточный/Far Eastern	1,3	2,3	3,6	—	1,7	2,1
Среднее значение/Average	1,9	2,6	3,1	—	1,7	2,1

* В печатной версии журнала при публикации табл. 2 в Сообщении 1 (Медицина катастроф. 2021. №1. С.60) по вине редакции была допущена ошибка: в табл. 2 содержались неверные данные. Редакция приносит свои извинения автору статьи и читателям журнала

* In the printed version of the journal in Message 1, due to the fault of the editorial board, an error was made: a discrepancy between the name and content of the Table 2. The editorial board apologises for that.

** Санитарные вертолеты/Ambulance helicopters

- distance to medical organisations of the 2nd and 3rd levels depends on the length of medical district: in the event of an emergency in a city, an average distance to the medical organisation of the 2nd and 3rd levels is 65 and 111 km, respectively, in a suburban area — 93 and 193 km, respectively (see Table 1);

- in case of an emergency in a suburban area, in some cases it is advisable to involve the mobile medical units to work at the emergency site as an evacuation receiver;

- in 30.0% of cases of emergencies in a suburban area, helicopters are used for organizing and conducting medical evacuation, which is expedient;

- quality of telephone communication outside cities often does not contribute to a timely information exchange during medical evacuation — this must be borne in mind.

To develop strategies to improve the efficiency and quality of medical evacuation in the event of an emergency in a suburban area, we assigned a weighted score to the factors (Table 3):

Вариант №2/Variant No.2

Схема проведения SWOT-анализа ЛЭМ для ЧС, возникшей в пригородной зоне
Scheme of SWOT analysis of medical and evacuation measures (LEM) for an emergency in the suburban area

Сильные стороны – S/ Strengths – S	Слабые стороны – W /Weaknesses – W
Достаточная численность медицинского персонала – S1 Sufficient number of medical personnel – S1	Фельдшерские бригады W2 /Paramedic teams, W2
Высокая мотивация медицинского и немедицинского (водители) персонала к работе – S5 High work motivation of medical and non-medical (drivers) personnel – S5	Недоступность телемедицинских технологий, W3 Unavailability of telemedicine technologies, W3
Достаточное количество санитарного автотранспорта – S6 Sufficient number of sanitary vehicles – S6	Отсутствие системы трассовых пунктов, W4/Lack of a system of highway points, W4
Наличие санитарных вертолетов – S7 Availability of ambulance helicopters – S7	Несвоевременность информационного обмена, W9 Absence of timeliness of information exchange, W9
Наличие мобильных медицинских формирований –ММО, БЭР, ПМГ* – S8 Availability of flexible medical units – MMF, MMO, REM, PMG* – S8	Отсутствие ЕДДС** догоспитального и госпитального периодов, W10 Absence of EDDS** of pre-hospital and hospital periods, W10
Хорошая материально-техническая база – S11 Good material and technical base – S11	–
Возможности – O/ Opportunities	Риски – T /Threats – T
Развитие интернета, улучшение покрытия сотовой связью, 3G, 4G, в перспективе – 5G – O1 Development of Internet, improvement of cellular coverage, 3G, 4G, in future – 5G – O1	Бездорожье – T2 Off-road – T2
Обеспечение транспортных, в том числе немедицинских, средств системой Глонасс – O2 Provision of transport facilities, including non-medical, with the Glonass system – O2	Водные препятствия – островные территории и др. – T3 Water obstacles – island territories, etc. – T3
Проведение регулярных учений и тренингов медицинского персонала, в том числе межведомственных учений и др. – O4 Conducting regular exercises, training of medical personnel etc including on interdepartmental level – O4	Перегруженность ближайших больниц – T4 Capacity overload of nearby hospitals – T4
Разработка регламентов межведомственного взаимодействия на региональном и межрегиональном уровнях – O5 Development of regulations for interagency cooperation at the regional and interregional levels – O5	Ошибки при проведении эвакуотранспортной медицинской сортировки – T5 Mistakes during aviatransport medical triage – T5
Развитие системы дистанционного обучения – доступность образования – O6 Development of the distance learning system-accessibility of education – O6	Неблагоприятные погодные условия и время суток – T6 Adverse weather conditions and time of day – T6
Развитие системы менеджмента качества и безопасности медицинской деятельности при выездных формах работы – O7 Development of the quality and safety management system for medical activities in field-work environmen – O7	Сложности при определении: точного числа пострадавших и их местонахождения – завалы и др.; лечебно-эвакуационной характеристики пострадавших – профиль патологии, тяжесть состояния – T7 Difficulties in determining the exact number of victims and their location – blockages, etc.; difficulty in medical and evacuation characteristics of victims-pathology profile, severity of the condition – T7
Объединение ТЦМК и СМП и создание РЦ СМП и МК позволяет объединить организационные, кадровые и материально-технические ресурсы для проведения более эффективных ЛЭМ – O9 Merger of Territorial Centres for Disaster Medicine with Emergency Medicine Centers and creation of Regional Centers for Emergency and Disaster Medicine allows to combine organizational, human, material and technical resources for more efficient medical evacuation measures – O9	Отсутствие/недостаточное развитие нормативной базы для создания мобильных медицинских формирований в субъектах РФ*** – T9 Lack / insufficient development of regulatory framework for creation of mobile units in regions of Russia*** – T9
Развитие проекта по использованию санитарных вертолетов в регионах – O10 Development of the project for the use of medical helicopters in the regions – O10	–
Возможность использования железнодорожного и водного транспорта для проведения медицинской эвакуации – O11 Possibility of using rail and water transport for medical evacuation – O11	–
Развитие идеологии трехуровневой системы здравоохранения и др. – O12 Development of a three-tier health care system ideology, etc. – O12	–

* ММО – мобильный медицинский отряд, БЭР – бригада экстренного реагирования, ПМГ – полевой многопрофильный госпиталь / ММО – mobile medical detachment, REM – emergency response team, PMG – field multidisciplinary hospital

** ЕДДС – Единая дежурно-диспетчерская служба / EDDS – Unified Duty Dispatch Service

*** Субъекты РФ – далее – субъекты / Regions of Russia – regions

Based on the results of the analysis of "external" and "internal" factors affecting the medical provision of victims of emergencies in a suburban area, it is possible to formulate the following strategies for improving medical evacuation.

1. Strategy for improving the quality of medical evacuation, based on the development of internal strengths using external opportunities (S + O). According to the analysis, the main strengths are: sufficient number of medical personnel, availability of well-equipped ambulance vehicles and ability to use ambulance helicopters in most constituent entities of the Russian Federation (hereinafter referred to as the constituent entities) and deployment of mobile medical units

in the emergency zone. The task of the leader is to use the available opportunities for the rational and effective use of the available forces and means. Thus, regular exercises and trainings of medical personnel and management personnel, including with the involvement of interdepartmental forces and means, as well as the development of regulations for interdepartmental interaction will make it possible to competently use personnel, material, technical and other resources of the region and to send the required amount of forces and funds to the site of emergency in a timely manner. The formation of the united regional centers of emergency and disaster medicine and the development of the ideology

Вариант №3/Variant No.3

Схема проведения SWOT-анализа ЛЭМ для ЧС, возникшей в отдаленном от города районе
Scheme of SWOT analysis of medical and evacuation measures (LEM) for an emergency in a remote area from the city

Сильные стороны – S/ Strengths – S	Слабые стороны – W /Weaknesses – W
Наличие системы трассовых пунктов – S4 Availability of a system of highway points – S4	Недостаток медицинского персонала – W1 Lack of medical staff – W1
Наличие санитарных вертолетов – S7 Availability of ambulance helicopters – S7	Фельдшерские бригады – W2 Paramedic teams – W2
Наличие мобильных медицинских формирований –ММО, БЭР, ПМГ – S8 Availability of flexible medical units – MMF, MMO, REM, PMG* – S8	Недоступность телемедицинских технологий – W3 Unavailability of telemedicine technologies – W3
Наличие ЕДДС догоспитального и госпитального периодов – S10 The presence of EDDS of the prehospital and hospital periods – S10	Низкая мотивация медицинского и немедицинского (водители) персонала к работе –W5 Low work motivation of medical and non-medical (drivers) personnel – W5
Хорошая материально-техническая база – S11 Good material and technical base – S11	Недостаточное количество санитарного автотранспорта – W6 Insufficient number of sanitary vehicles – W6
–	Несвоевременность информационного обмена – W9 Absence of timeliness of information exchange – W9
–	Отсутствие ЕДДС догоспитального и госпитального периодов – W10 Absence of EDDS of pre-hospital and hospital periods – W10
Возможности – O/ Opportunities	Риски – T /Threats – T
Обеспечение транспортных, в том числе немедицинских, средств системой Глонасс – O2 Provision of transport facilities, including non-medical, with the Glonass system – O2	Бездорожье – T2 Off-road – T2
Наличие новых медицинских технологий (оборудования), позволяющих снизить численность медицинского персонала – O3 Availability of new medical technologies (equipment), allowing to reduce the number of medical personnel – O3	Водные препятствия – островные территории и др. – T3 Water obstacles – island territories, etc. – T3
Проведение регулярных учений и тренировок медицинского персонала, в том числе межведомственных учений и др. – O4 Conducting regular exercises, training of medical personnel etc including on interdepartmental level – O4	Перегруженность ближайших больниц – T4 Capacity overload of nearby hospitals – T4
Разработка регламентов межведомственного взаимодействия на региональном и межрегиональном уровнях – O5 Development of regulations for interagency cooperation at the regional and interregional levels – O5	Ошибки при проведении эвакуотранспортной медицинской сортировки – T5 Mistakes during aviatransport medical triage – T5
Развитие системы дистанционного обучения – доступность образования – O6 Development of the distance learning system-accessibility of education – O6	Неблагоприятные погодные условия и время суток – T6 Adverse weather conditions and time of day – T6
Развитие системы менеджмента качества и безопасности медицинской деятельности при выездных формах работы – O7 Development of the quality and safety management system for medical activities in field-work environmen – O7	Сложности при определении: точного числа пострадавших и их местонахождения – завалы и др.; лечебно-эвакуационной характеристики пострадавших – профиль патологии, тяжесть состояния – T7 Difficulties in determining the exact number of victims and their location – blockages, etc.; difficulty in medical and evacuation characteristics of victims-pathology profile, severity of the condition – T7
Объединение ТЦМК и СМП и создание РЦ СМП и МК позволяет объединить организационные, кадровые и материально-технические ресурсы для проведения более эффективных ЛЭМ – O9 Merger of Territorial Centres for Disaster Medicine with Emergency Medicine Centers and creation of Regional Centers for Emergency and Disaster Medicine allows to combine organizational, human, material and technical resources for more efficient medical evacuation measures – O9	Низкая заинтересованность органов исполнительной власти в развитии СМК субъектов – T8 Low interest of executive authorities in the development of Disaster Medicine Service of constituent entities – T8
Развитие проекта по использованию санитарных вертолетов в регионе – O10 Development of the project for the use of medical helicopters in the regions – O10	Отсутствие/недостаточное развитие нормативной базы для создания мобильных медицинских формирований в субъекте – T9 Lack / insufficient development of regulatory framework for creation of mobile units in region – T9
Возможность использования железнодорожного и водного транспорта для проведения медицинской эвакуации – O11 Possibility of using rail and water transport for medical evacuation – O11	Слабая нормативная база для проведения госпитализации пациентов на межрегиональном уровне – при близости очага ЧС к больницам соседнего субъекта – T10 Weak regulatory framework for hospitalization of patients at interregional level – when an emergency is close to hospitals of a neighboring subject – T10
Развитие идеологии трехуровневой системы здравоохранения – O13 Development of a three-tier health care system ideology – O13	Межведомственные разногласия при организации ЛЭМ – T11 Interdepartmental differences in the organization of LEM – T11

of a three-tier health care system will allow combining the potential of different medical facilities, creating a united duty dispatch service of the region for timely information exchange both in pre-hospital and in hospital periods, etc.

2. Strategy of "development" (W + O) - increasing the efficiency of medical evacuation in the elimination of med-

ical and sanitary consequences of emergencies in a suburban area — can be aimed at training field medical personnel, mainly paramedics for acquiring competencies in carrying out evacuation triage, at increasing their general level of knowledge, including by means of distance learning. Hindered information exchange, lack of a single infor-

Таблица 3/Table No 3

Значимость факторов и их оценка (баллы) при возникновении ЧС в пригородной зоне
Significance of factors and their assessment (points) in emergency in the suburban area

Фактор Factor	Значимость Significance	Оценка Evaluation	Взвешенная оценка Weighted estimation of the factor	Уд. вес фактора- Specific weight of the factor
Сильные стороны – S /Strengths – S				
Достаточная численность медицинского персонала – S1 Sufficient number of medical personnel – S1	5	3	15	0,25
Высокая мотивация медицинского и немедицинского (водители) персонала к работе – S5 High work motivation of medical and non-medical (drivers) personnel – S5	5	2	10	0,16
Достаточное количество санитарного автотранспорта – S6 Sufficient number of sanitary vehicles – S6	5	3	15	0,25
Наличие санитарных вертолетов – S7 Availability of ambulance helicopters – S7	4	2	8	0,13
Наличие мобильных медицинских формирований – ММО, БЭР, ПМГ – S8 Availability of flexible medical units – MMF, MMO, REM, PMG* – S8	3	1	3	0,05
Хорошая материально-техническая база – S11 Good material and technical base – S11	5	2	10	0,16
Всего/Total	–	–	61	1,0
Слабые стороны – W /Weaknesses – W				
Фельдшерские бригады W2 /Paramedic teams, W2	4	4	16	0,23
Недоступность телемедицинских технологий, W3 Unavailability of telemedicine technologies, W3	4	3	12	0,17
Отсутствие системы трассовых пунктов, W4/Lack of a system of highway points, W4	3	2	6	0,09
Несвоевременность информационного обмена, W9 Absence of timeliness of information exchange, W9	5	3	15	0,22
Отсутствие ЕДДС догоспитального и госпитального периодов, W10 Absence of EDDS** of pre-hospital and hospital periods, W10	5	4	20	0,29
Всего/Total	–	–	69	1,0
Возможности – O /Opportunities – O				
Развитие интернета, улучшение покрытия сотовой связью, 3G, 4G, в перспективе – 5G – O1 Development of Internet, improvement of cellular coverage, 3G, 4G, in future – 5G – O1	5	2	10	0,08
Обеспечение транспортных, в том числе немедицинских, средств системой Глонасс – O2 Provision of transport facilities, including non-medical, with the Glonass system – O2	4	5	20	0,15
Проведение регулярных учений и тренировок медицинского персонала, в том числе межведомственных учений и др. – O4 Conducting regular exercises, training of medical personnel etc including on interdepartmental level – O4	5	3	15	0,11
Разработка регламентов межведомственного взаимодействия на региональном и межрегиональном уровнях – O5 Development of regulations for interagency cooperation at the regional and interregional levels – O5	4	2	8	0,07
Развитие системы дистанционного обучения – доступность образования – O6 Development of the distance learning system-accessibility of education – O6	3	4	12	0,09
Развитие системы менеджмента качества и безопасности медицинской деятельности при выездных формах работы – O7 Development of the quality and safety management system for medical activities in field-work environment – O7	5	2	10	0,08
Объединение ТЦМК и СМП и создание РЦ СМП и МК позволяет объединить организационные, кадровые и материально-технические ресурсы для проведения более эффективных ЛЭМ – O9 Merger of Territorial Centres for Disaster Medicine with Emergency Medicine Centers and creation of Regional Centers for Emergency and Disaster Medicine allows to combine organizational, human, material and technical resources for more efficient medical evacuation measures – O9	5	3	15	0,11
Развитие проекта использования санитарных вертолетов в регионах – O10 Development of the project for the use of medical helicopters in the regions – O10	5	3	15	0,11
Возможность использования железнодорожного и водного транспорта для проведения медицинской эвакуации – O11 Possibility of using rail and water transport for medical evacuation – O11	3	2	6	0,05
Развитие идеологии трехуровневой системы здравоохранения и др. – O12 Development of a three-tier health care system ideology, etc. – O12	5	4	20	0,15
Всего/Total	–	–	131	1,0

Фактор Factor	Значимость Significance	Оценка Evaluation	Взвешенная оценка Weighted estimation of the factor	Уд. вес фактора- Specific weight of the factor
Риски – Т /Threats – T				
Бездорожье – T2 / Off-road – T2	3	3	9	0,10
Водные препятствия – островные территории и др – T3 Water obstacles – island territories, etc. – T3	2	1	3	0,04
Перегруженность ближайших больниц – T4 Capacity overload of nearby hospitals – T4	4	5	20	0,22
Ошибки при проведении эвакуационной медицинской сортировки – T5 Mistakes during aviation medical triage – T5	5	3	15	0,16
Неблагоприятные погодные условия и время суток – T6 Adverse weather conditions and time of day – T6	4	5	20	0,22
Сложности при определении: точного числа пострадавших и их местонахождения – завалы и др.; лечебно-эвакуационной характеристики пострадавших – профиль патологии, тяжесть состояния – T7 Difficulties in determining the exact number of victims and their location – blockages, etc.; difficulty in medical and evacuation characteristics of victims-pathology profile, severity of the condition – T7	5	3	15	0,16
Отсутствие/недостаточное развитие нормативной базы для создания мобильных медицинских формирований в субъекте – T9 Lack / insufficient development of regulatory framework for creation of mobile units in region – T9	3	3	9	0,10
Всего/Total	–	–	91	1,0

mation space in many regions are compensated by the unification of emergency and disaster medicine stations, by the development of regulations for interdepartmental interaction and by other activities. While the absence of route points in the suburban area in most subjects is compensated by the mobile medical units' prompt departure to the emergency site for deployment of evacuation receivers.

3. Strategy of "defense" — the use of strong "internal" sides to minimize the "external" risks (S + T) and to improve medical evacuation in emergencies in a suburban area — can be based on the following. In off-road conditions, in presence of water or other natural obstacles (mountains, etc.), the only option is to use air, water, in some cases — railway, transport. Under these conditions, the project for development of helicopter ambulance aviation provides an additional opportunity to use helicopters for medical evacuation in most regions. Risk factors associated with violation of evacuation triage, with unfavorable weather conditions, with disruption of medical evacuation routing and with "overloading" of the nearest medical facilities, can be compensated by working out the regulations for involving mobile medical units, by deploying evacuation receivers in the emergency zone and by using ambulance helicopters for medical evacuation to remote medical facilities of the 2nd and 3rd level, etc.

4. Strategy of "containment" — minimizing the influence of "internal" weaknesses and of "external" risks of medical evacuation — in this case can be aimed at intensifying the process of merging the emergency and disaster medicine stations, at a joint work to create a unified information space, at the formation of a regulatory framework for the functioning of mobile medical units, at the development of interdepartmental interaction and at the training of personnel through exercises, distance and full-time education.

Elimination of medical and sanitary consequences of an emergency in a remote area has its own essential features. According to the results of case studies, in such conditions an average distance is: to the 1st level medical organisation — 120 km; 2nd level — 270; to the 3rd level medical organisation — 400 km and more (see Table 1). Thus, before arriving at the scene of an emergency, medical forces and means attracted from the nearest medical facilities must first cover the indicated distances. As a result, both the time needed for the arrival of medical specialists at the emergency site and the time for medical evacuation of victims to medical organisations increase significantly.

It should be added that in this case, medical forces and means — most often, paramedic teams — will arrive at the

emergency site in the required quantity not at once, but gradually. The competence of medical specialists who would be the first to arrive at the scene of an emergency will determine: further distribution of information about the number of victims, about the necessary forces and means; about medical and evacuation triage; about organization of medical evacuation routing.

While waiting for the arrival of the first and subsequent teams of medical specialists to the place of emergency, factors such as unfavorable weather conditions, night time, terrain, water obstacles, lack of telephone communications, etc., are of great importance. In such situations, implementation of interregional agreements will play an important role. It would allow to attract medical forces and means, including airmobile medical complexes on Mi-8 and Mi-38 helicopters, from neighboring subjects for the provision of emergency medical care and for the deployment of evacuation receivers near the emergency site. It will also provide a possibility of routing medical evacuation taking into account the location of medical organisations of the nearest subject.

According to the heads of territorial disaster medicine centers and to the members of their teams who took part in solving the cases, as well as to the experts of the Headquarters of the Disaster Medicine Service, who analyzed the decisions, the organization of medical evacuation in an emergency at a great distance from a city is much more difficult in the regions of the Far North. This explains the mistakes often made while organizing medical evacuation, which resulted in a large number of losses among the victims, and requires constant readiness of medical units, taking into account the specific characteristics of the territory of each subject.

To develop strategies to improve the efficiency and quality of medical evacuation in an emergency in a remote area, a weighted score of was assigned to the factors (Table 4).

The assessment of the proportion of factors influencing the organization of medical evacuation in the event of an emergency in a remote area, carried out by specialists-experts of the Headquarters of the Disaster Medicine Service, shows a significant excess of weak "internal" sides and of existing threats. At the same time, in this case, a correct development of strategies for improving medical evacuation would allow managers and their teams to competently dispose of the available human, material and technical resources, using all the "external" opportunities to maximize risk prevention.

Based on the analysis of case solutions, the following "averaged" variants of medical evacuation improvement strategies can be identified.

Значимость факторов и их оценка (баллы) при возникновении ЧС в отдаленном районе
Significance of factors and their assessment (points) in emergency in a remote area

Фактор Factor	Значимость Significance	Оценка Evaluation	Взвешенная оценка Weighted estimation of the factor	Уд. вес фактора- Specific weight of the factor
Сильные стороны – S /Strengths – S				
Наличие системы трассовых пунктов – S4 Availability of a system of highway points – S4	5	3	15	0,23
Наличие санитарных вертолетов – S7 Availability of ambulance helicopters – S7	5	4	20	0,31
Наличие мобильных медицинских формирований – ММО, БЭР, ПМГ – S8 Availability of flexible medical units – MMF, MMO, REM, PMG* – S8	5	3	15	0,23
Хорошая материально-техническая база – S11 Good material and technical base – S11	5	3	15	0,23
Всего/Total	–	–	65	1,0
Слабые стороны – W /Weaknesses – W				
Недостаток медицинского персонала – W1/Lack of medical staff – W1	5	4	20	0,22
Фельдшерские бригады – W2/Paramedic teams – W2	4	5	20	0,22
Недоступность телемедицинских технологий – W3 Unavailability of telemedicine technologies – W3	4	3	12	0,12
Низкая мотивация медицинского и немедицинского (водители) персонала к работе – W5 Low work motivation of medical and non-medical (drivers) personnel – W5	4	2	8	0,09
Недостаточное количество санитарного автотранспорта – W6 Insufficient number of sanitary vehicles – W6	5	3	15	0,15
Несвоевременность информационного обмена – W9 Absence of timeliness of information exchange – W9	5	2	10	0,11
Отсутствие ЕДДС догоспитального и госпитального периодов – W10 Absence of EDDS of pre-hospital and hospital periods – W10	4	2	8	0,09
Всего/Total	–	–	93	1,0
Возможности – O /Opportunities – O				
Обеспечение транспортных, в том числе немедицинских, средств системой Глонасс – O2 Provision of transport facilities, including non-medical, with the Glonass system – O2	3	4	12	0,09
Наличие новых медицинских технологий (оборудования), позволяющих снизить численность медицинского персонала – O3 Availability of new medical technologies (equipment), allowing to reduce the number of medical personnel – O3	4	2	8	0,06
Проведение регулярных учений и тренингов, в том числе межведомственных учений, медицинского персонала и др. – O4 Conducting regular exercises, training of medical personnel etc including on interdepartmental level – O4	4	2	8	0,06
Разработка регламентов межведомственного взаимодействия на региональном и межрегиональном уровнях – O5 Development of regulations for interagency cooperation at the regional and interregional levels – O5	4	4	16	0,14
Развитие системы дистанционного обучения – доступность образования – O6 Development of the distance learning system-accessibility of education – O6	4	3	12	0,09
Развитие системы менеджмента качества и безопасности медицинской деятельности при выездных формах работ – O7 Development of the quality and safety management system for medical activities in field-work environment – O7	5	2	10	0,08
Объединение ТЦМК и СМП и создание РЦ СМП и МК, позволяющее объединить организационные, кадровые и материально-технические ресурсы для проведения более эффективных ЛЭМ – O9 Merger of Territorial Centres for Disaster Medicine with Emergency Medicine Centers and creation of Regional Centers for Emergency and Disaster Medicine allows to combine organizational, human, material and technical resources for more efficient medical evacuation measures – O9	5	4	20	0,16
Развитие проекта по использованию санитарных вертолетов в регионе – O10 Development of the project for the use of medical helicopters in the region – O10	5	4	20	0,16
Возможности использования железнодорожного и водного транспорта для проведения медицинской эвакуации – O11 Possibility of using rail and water transport for medical evacuation – O11	3	3	9	0,07
Развитие идеологии трехуровневой системы здравоохранения – O13 Development of a three-tier health care system ideology – O13	4	3	12	0,09
Всего/Total	–	–	127	1,0

The strategy of "breakthrough" (S + O) in improving the quality of medical evacuation in this case will be facilitated by the maximum implementation of the available opportunities for the development of the strengths. Thus, development of regulations for interdepartmental and interregional

interaction; unification of emergency and disaster medicine stations; participation in the development of medical aviation in the regions; development of the ideology of a three-level healthcare system — all this would allow to cumulate forces and means, including the personnel component,

ambulance vehicles and helicopter medical aviation of various medical organisations of the region, "in the same hands". If necessary, the possibility of involving the aviation of other ministries and departments — of the Ministry of Defense, of the Ministry of Emergencies of Russia, etc. — can be applied. In those regions where this is not applicable, it is advisable to consider the use of railway and water transport.

Regular joint exercises will allow maintaining various mobile medical units in constant readiness, increasing the competence of medical personnel in conducting medical evacuation trials, and strengthening interdepartmental cooperation.

The strategy of "development" (W + O) — increasing the efficiency of medical evacuation in the elimination of the health consequences of emergencies in remote areas — can be aimed at using: new types of medical equipment with the ability of online transmission of data on the state of victims, support systems for organizational and clinical decisions, which would allow conducting telemedicine consultations in the prehospital period, compensating for the shortage of medical personnel, etc.

The trend towards the formation of regional centers of emergency and disaster medicine will allow to link various medical organisations in one information space, while the installation of the Glonass system on medical vehicles will allow to monitor their movement and to use them if necessary in order to move into the emergency zone at once.

The development of a quality management system for off-site work would help managers, using a process approach, to develop a number of standard operating procedures, taking into account specific characteristics of their subject, identifying and preventing possible risks in a timely manner.

Continuous training, through full-time or distance learning, of management staff and of medical specialists of mobile medical units — first of all, for actions on the spot of an emergency — would allow to effectively use the medical personnel under conditions of specialists shortage, etc.

The "defense" strategy — use of "internal" strengths to minimize "external" threats (S + T) to improve medical evacuation in an emergency in a remote area — should be based on the following principles of "approaching" medical care to the emergency zone:

- obligatory involvement of helicopter ambulance aviation with the use of medium-class helicopters of increased range — such as Mi-8, Mi-38 - of the Ministry of Defense and of the Ministry of Emergencies of Russia will allow to overcome off-road conditions, to reduce the time of delivery of medical teams as well as the time for medical evacuation of victims immediately to specialized medical treatment facilities, avoiding multi-stage;

- usage of medical mobile units, including airmobile medical complexes, with a possibility of early initiation of emergency medical care, deployment of an evacuation receiver in the emergency zone, will help to reduce the impact of adverse weather and of other factors, to create conditions for

provision of emergency medical assistance to victims, for medical evacuation triage, etc.;

- development of a system of route points will reduce the time of arrival of teams of medical specialists for organizing and providing emergency medical care, for conducting triage, for attracting necessary forces and means (by accelerating information exchange).

The "containment" strategy consists in minimization of threats and the leveling of "internal" weaknesses (W + T). Taking into account the fact that a large number of predictable unfavorable factors impact the organization and conduct of medical evacuation, a lot would depend on an active position of the leader and on a professional motivation of his team. As practice shows (according to the analysis of case solutions), an emergency with a large number of victims in remote areas provokes a misunderstanding from a higher management, which does not support the expediency of maintaining readiness and the need for expensive equipment of mobile medical units, the development of a system of route points, the active use of medical helicopter aviation and the adoption of other measures. This is accompanied by a deficit in the regional regulatory framework, especially in the context of the reorganization of the health care system. In such cases, the head of the Disaster Medicine Service of the region should take a proactive role in the development of a regulatory framework, demonstrating a leadership example to his team, developing relations, concluding contracts and signing agreements on interregional and interdepartmental interaction that would underlie prevention, identification and minimization of risks during medical evacuation in case of emergencies with a large number of victims in remote areas, building up internal personnel, material and technical potential, which ultimately forms the basis for development of a quality management system for field work in emergencies [1-3].

Conclusion

The presented SWOT-analysis of medical evacuation in the framework of elimination of medical and sanitary consequences of emergencies was carried out on the basis of solutions of the situational tasks "100 victims" by teams from 85 subjects of the Russian Federation. The data obtained as a result of the analysis of case solutions were summarized by specialists-experts of the Disaster Medicine Service Headquarters. As a result, approximate strategies were developed to improve quality and efficiency of medical evacuation for three variants of the emergency location. At the same time, on the basis of the outlined SWOT analysis methodology, each interested leader can put into practice team exercises with situational problems, taking into account specifics, personnel, material, technical, climatic-geographical, social and other features of a respective region. The results obtained will allow the leaders to make decisions, to form a team of like-minded people, to motivate their leadership, to work proactively, to prevent risks, thereby reducing severity of irrecoverable and sanitary losses in various emergencies.

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