

ORGANIZATION OF STAGE MEDICAL CARE TO PATIENTS WITH SUSPECTED AND CONFIRMED NEW CORONAVIRUS INFECTION COVID-19 IN THE VORONEZH REGION

A.N.Artemov¹, G.A.Balabaev¹, I.I.Vorobyov¹, L.E.Mehantieva², Y.V.Struk²

¹ Voronezh Regional Clinical Center of Disaster Medicine, Voronezh, Russian Federation

² Voronezh state medical University. N.N. Burdenko, Voronezh, Russian Federation

Abstract. The purpose of the study is to analyze the results of the work of the territorial center for disaster medicine of the Voronezh region to improve the organization of medical care for patients with suspected and confirmed new coronavirus infection COVID-19 in 2020.

Materials and research methods. The study was based on: data on the provision of medical care to patients with community-acquired pneumonia of unknown infectious etiology and with a confirmed new coronavirus infection COVID-19, who were hospitalized in medical organizations of the Voronezh region; information about the routing of patients to medical organisations; data on monitoring bed fund and equipment, as well as information on the continuity and outcomes of treatment in patients of these categories.

Research results and their analysis. Analysis of the research results showed:

- creation in the Voronezh region of the system of staged medical care for patients with suspected and confirmed new coronavirus infection COVID-19 and a three-level system of medical care for this category of patients contributed to their early detection and effective treatment;
- monitoring system for patients with COVID-19 allows to determine optimal routing for each patient in order to provide timely specialized, including high-tech, medical care;
- change in the routing of patients with COVID-19 in the region in order to provide high-tech medical care to as many patients as possible fully justifies the use of helicopter with a resuscitation module and a transport isolation box combined with it.

Key words: COVID-19 pandemic, interhospital evacuation, medical care, medical districts, medical evacuation, medical organizations, monitoring, patients, routing, stages of medical care, telemedicine consultations, transport isolation box, Voronezh region

Conflict of interest. The authors declare no conflict of interest

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ОРГАНИЗАЦИЯ ЭТАПНОГО ОКАЗАНИЯ МЕДИЦИНСКОЙ ПОМОЩИ ПАЦИЕНТАМ С ПОДОЗРЕНИЕМ И С ПОДТВЕРЖДЕННОЙ НОВОЙ КОРОНАВИРУСНОЙ ИНФЕКЦИЕЙ COVID-19 В ВОРОНЕЖСКОЙ ОБЛАСТИ

А.Н.Артёмов¹, Г.А.Балабаев¹, И.И.Воробьев¹, Л.Е.Механтьева², Ю.В.Струк²

¹ КУЗ ВО «Воронежский областной клинический центр медицины катастроф», Воронеж, Россия

² ФГБУ ВО «Воронежский государственный медицинский университет им. Н.Н.Бурденко» Минздрава России, Воронеж, Россия

Резюме. Цель исследования – проанализировать результаты работы территориального центра медицины катастроф (ТЦМК, Центр) Воронежской области по совершенствованию организации оказания медицинской помощи пациентам с подозрением и с подтвержденной новой коронавирусной инфекцией COVID-19 в 2020 г.

Материалы и методы исследования. В основу исследования были положены: данные об оказании медицинской помощи пациентам с внебольничными пневмониями неизвестной инфекционной этиологии и с подтвержденной новой коронавирусной инфекцией COVID-19, находившимся на стационарном лечении в лечебных медицинских организациях (ЛМО) Воронежской области; сведения о маршрутизации пациентов в ЛМО; данные о мониторинге коечного фонда и оборудования, а также сведения о преемственности и исходах лечения у пациентов указанных категорий.

Результаты исследования и их анализ. Анализ результатов исследования показал:

- создание в Воронежской области на базе ЛМО медицинских округов системы этапного оказания медицинской помощи пациентам с подозрением и с подтвержденной новой коронавирусной инфекцией COVID-19 и трёхуровневой системы оказания медицинской помощи данной категории пациентов – способствовало их раннему выявлению и эффективному лечению;
- система мониторинга пациентов с COVID-19 позволяет определить оптимальную маршрутизацию каждого больного с целью оказания ему своевременной специализированной, в том числе высокотехнологичной, медицинской помощи;
- изменение в регионе маршрутизации пациентов с COVID-19 с целью оказания высокотехнологичной медицинской помощи как можно большему числу больных полностью оправдывает применение вертолётной техники с реанимационным модулем и с совмещенным с ним транспортировочным изолирующим боксом.

Ключевые слова: Воронежская область, лечебные медицинские организации, маршрутизация, медицинская эвакуация, медицинские округа, межбольничная эвакуация, мониторинг, оказание медицинской помощи, пандемия COVID-19, пациенты, телемедицинские консультации, транспортировочный изолирующий бокс, этапы медицинской помощи

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Contact information:

Aleksandr N. Artemov – Chief Physician of TCMK
Address: 155, Moskovskiy Avenue, Voronezh, 394066, Russia
Phone: +7-(903)-650-29-45
E-mail: mail@vtcmk.zdrav36.ru

Контактная информация:

Артёмов Александр Николаевич – главный врач ТЦМК
Адрес: Россия, 394066, г. Воронеж, Московский проспект, д. 155
Тел.: +7-(903)-650-29-45
E-mail: mail@vtcmk.zdrav36.ru

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Materials and research methods. The study was based on: data on the provision of medical care to patients with community-acquired pneumonia of unknown infectious etiology and with a confirmed new coronavirus infection COVID-19, who were hospitalized in medical organizations of the Voronezh region; information about the routing of patients in medical organisations; data on monitoring the bed fund and equipment, as well as information on the continuity and outcomes of treatment in patients of these categories.

Research results and their analysis. In the Voronezh region, the fight against COVID-19 began in January 2020, when the first medical evacuation of a patient suspected of COVID-19 from the regional infectious diseases hospital to the infectious diagnostic (Melzerovka) box of the Voronezh Regional Children's Clinical Hospital No. 2 was carried out. Medical evacuation using the Lamsystems transport isolation box, acquired in preparation for the 2018 FIFA World Cup, was carried out by the team of the territorial disaster medicine center, whose personnel received the necessary skills to operate the box during exercises and trainings. At the beginning of the first wave of COVID-19 pandemic, the main efforts of the region's Department of Health were aimed at reducing risk of spread of the new coronavirus infection.

The center organized medical support for the reception of passengers arriving from countries with an unfavorable epidemiological situation for COVID-19 at the Voronezh International Airport named after Peter The Great. In total, medical support was organized for four flights. For medical support of each flight, up to six ambulance teams, a bus and a minibus of the Territorial Center for Disaster Medicine were involved. On board the aircraft, all arriving passengers underwent thermometry by the personnel of the airport medical and quarantine points. Employees of Rospotrebnadzor kept a record of arrivals, issued instructions on compliance with quarantine measures at the place of residence. The passengers with fever were evacuated to the COVID departments of medical organizations in Voronezh. Passengers from neighboring regions, for whom the vehicles did not arrive, were sent to the observatory on the Territorial Disaster Medicine Center bus for isolation. The rest of the passengers on the buses, accompanied by the traffic police, were taken to their homes.

In the Ramonsky district, at the recreation center "German Sloboda" by the forces of the Ramon regional hospital, an observator for 90 people was deployed. The observator was provided with the necessary forces and means and is

ready to receive citizens from April 29, 2020. The main categories of persons in need of observation are citizens who arrived from an epidemically unfavorable territory for COVID-19, as well as contacts with patients with coronavirus infection who cannot be isolated at their place of residence. The work of the observatory was organized in accordance with the Temporary Recommendations for organizing the work of the observatory for persons arriving from an epidemically unfavorable territory for a new coronavirus infection. The observation period is 14 days from the moment of arrival / contact with a patient with a new coronavirus infection. In total, during the operation of the observatory — from April 29 to July 1, 2020 — 118 people underwent observation. All patients were examined for a new coronavirus infection in accordance with existing requirements. Over the entire observation period, 6 persons with a positive result for COVID-19 were identified. These patients were transferred by the Territorial Disaster Medicine Center teams to the COVID departments of Voronezh medical organisations.

At the start of the first wave, all COVID-19 patients were hospitalized. In the future, in accordance with the recommendations of the Russian Ministry of Health, patients with COVID-19, including those with community-acquired pneumonia in mild or moderate form, were treated at home. The exceptions were made for persons from the risk group — over 65 years old, as well as for those suffering from chronic diseases of bronchopulmonary, cardiovascular and endocrine systems and for pregnant women.

The dynamics of the deployment of hospital beds in the region was in direct proportion to the epidemiological situation. Minimum number of beds — 1069, including 807 — with oxygen supply, of which 190 — in intensive care units, was deployed on the basis of 12 medical organisations in mid-August. As of December 1, 2020, 4550 beds were deployed on the basis of 37 medical organisations, including 2139 with oxygen supply, of which 1515 were in the intensive care units. The estimated standard of bed capacity for the Voronezh region is 1686 beds.

The dynamics of hospitalization of patients has a wave-like character. The peak of hospitalizations of the first wave of cases was in the beginning of June, the second wave — in mid-October.

On the basis of the medical districts created in the region, the stages of providing medical care to patients with COVID-19 were organized. A three-level system of medical care was created for patients with community-acquired pneumonia of unknown infectious etiology and with a confirmed new coronavirus infection.

The 1st stage included the medical organisations of the districts of Voronezh, Clinical Hospital No. 33 of the FMBA of Russia, 27 district hospitals; the 2nd stage included

5 large regional hospitals — medical organisations of the 2nd level; the 3rd stage — ambulance hospitals No. 1, 8, 10 and Voronezh Regional Clinical Hospital No. 1 — medical organisation of the 3rd level. Medical organisations of the 2nd stage ensured interaction with attached medical organisations to manage patient routing.

The primary diagnosis "community-acquired pneumonia" was made at the 1st stage in the medical organisation at the place of attachment of the patient. After that the patient was evacuated to the medical organisation of the 2nd stage. Medical evacuation was carried out — depending on the severity of the patient's condition — either by means of the 1st stage medical organisation transport, or by the ambulance team.

The final diagnosis of "new coronavirus infection" or its exclusion was determined in the medical organisation of the 2nd stage.

At all stages, until the patient has been diagnosed with a new coronavirus infection, medical assistance to a patient with community-acquired pneumonia is provided in accordance with the temporary orders and instructions regulated by the order of the Ministry of Health of Russia "On the temporary procedure for organizing the work of medical organizations in order to implement measures to prevent and reduce the risk of the spread of new coronavirus infection COVID-19" dated March 19, 2020 No. 198n.

The transfer of a patient from the district hospitals of the 2nd stage — Bobrovskaya, Pavlovskaya, Rossoshanskaya, Borisoglebskaya and Liskinskaya — to the 3rd stage is carried out after a telemedicine consultation with specialists of the Voronezh Regional Clinical Hospital No. 1, taking into account the severity of the patient's condition, by transport of the medical organisation of the 2nd stage or by the Territorial Disaster Medicine Center brigade. Before the medical evacuation, a telemedicine consultation is held with the specialists of the Territorial Disaster Medicine Center to clarify the level of the patient's transportability and his preparation for medical evacuation.

Patients with community-acquired pneumonia in extremely serious condition are hospitalized in specially allocated ICU beds of medical organizations at the place of treatment in compliance with the rules provided for by the order of the Ministry of Health of Russia dated March 19, 2020 No. 198n.

If it is impossible, due to the severity of the patient's condition, to transfer him/her to medical organisation in accordance with the established routing procedure, after a telemedicine consultation, if necessary, the specialists of the Territorial Center for Disaster Medicine are sent out with the involvement of specialists from the Voronezh Regional Clinical Hospital No. 1.

Patients whose diagnosis of community-acquired pneumonia is not confirmed, depending on the profile of the identified disease, are evacuated in accordance with the approved routing.

Interaction of Voronezh medical organisations in the treatment of patients with COVID-19. For a more effective use of specialized beds at the stage of recovery, patients are transferred for further treatment from the medical center of the 3rd level to the so-called "aftercare hospitals". And, conversely, when the condition of patients in aftercare hospitals becomes worse, they are transferred to the medical organisations of the 3rd level. Inter-hospital medical evacuation is carried out by the Territorial Disaster Medicine Centers teams.

Between the first and the second waves of COVID-19 diseases, there was a negative trend in the severity of the patient's condition during hospitalization:

— on saturation — in June 2020, 3% of patients with saturation below 90% were admitted, in November 2020 — 16%;

— on computed tomography (CT), 5% of patients with CT 3–4 were admitted in June 2020, in November 2020 — 19%.

In accordance with the order of the Ministry of Health of Russia dated March 19, 2020 No. 198n, the following remote regional advisory centers of anesthesiology and resuscitation for the diagnosis and treatment of new coronavirus infection COVID-19 and pneumonia were created:

— Remote regional advisory Center for adults — on the basis of the regional coordination center of the Territorial Disaster Medicine Center;

— Remote regional advisory Center for children — on the basis of the regional coordination center of the Regional Children's Clinical Hospital No. 2;

— Remote regional advisory Center for pregnant women — on the basis of the obstetric remote consulting center of the Voronezh Regional Clinical Hospital No. 1.

A total of 480 telemedicine consultations were held with the Federal remote regional advisory Center for adults. There were no problems during the telemedicine consultations. The protocols of telemedicine consultations were provided in a timely manner (Fig. 1).

An information resource has been created on the basis of the Territorial Disaster Medicine Center for the monitoring of: deployed and occupied beds; patients with pneumonia, including those on artificial lung ventilation, who are hospitalized; medical equipment. Medical organizations enter this program on a daily basis and fill in the appropriate tables. The summary information is presented daily to the Governor and to the Government of the Voronezh Region, to the Main Directorate of the Ministry of Emergency Situations of Russia and to the Main Directorate of the Ministry of Internal Affairs of Russia in the Voronezh Region, to the Russian Guard, to Rosreestr, and to the media.

In addition, 3 times a day in a specially created chat medical organizations provide operational information about free beds, including those with oxygen support and mechanical ventilation. That allows for point routing of patients with COVID-19.

Interhospital medical evacuation of patients with COVID-19 in a state of moderate severity is carried out by the emergency medical teams, patients in severe condition are

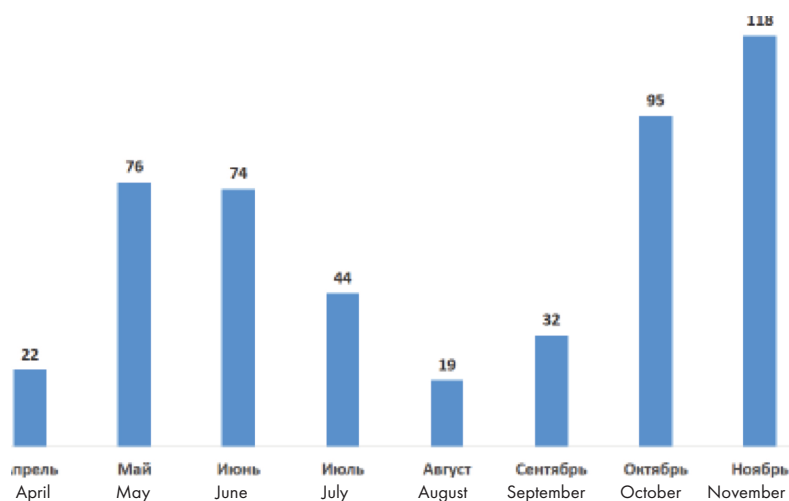


Рис. 1. Динамика количества телемедицинских консультаций, проведенных с федеральным региональным консультативным центром для взрослых в апреле – ноябре 2020 г., абс.

Fig. 1. Dynamics of the number of telemedicine consultations conducted with the federal regional advisory center for adults in April – November 2020

evacuated by the resuscitation teams of the Territorial Disaster Medicine Center (Fig. 2).

Territorial Disaster Medicine Center specialists have experience in conducting air ambulance evacuation of patients with COVID-19. At present, the Ansat ambulance helicopter with a resuscitation module is used for these purposes in the region. Air evacuation of patients with COVID-19 is carried out in a transport isolation box, in which the patient can be ventilated during the flight. A preliminary study was made of the possibility of placing the transport isolation box in the helicopter cabin and of combining it with the equipment of the resuscitation module. Specialists of the medical team in protective clothing enter the "red zone" of COVID compartment, transfer the patient to the isolation box, connect the tracking equipment and respiratory support, and close the box hermetically. When leaving the "red zone", the protective clothing of the team members and the outer surface of the box are completely disinfected, protective clothing is removed. The box is installed in the helicopter cabin. Due to the complete tightness of the box, the helicopter crew is not exposed to the risk of infection. The helicopter pilot does not wear personal protective equipment, but only uses a three-layer medical mask. During the flight, the specialists of the resuscitation team, using chamber gloves, provide the patient with all the necessary assistance, including respiratory support.

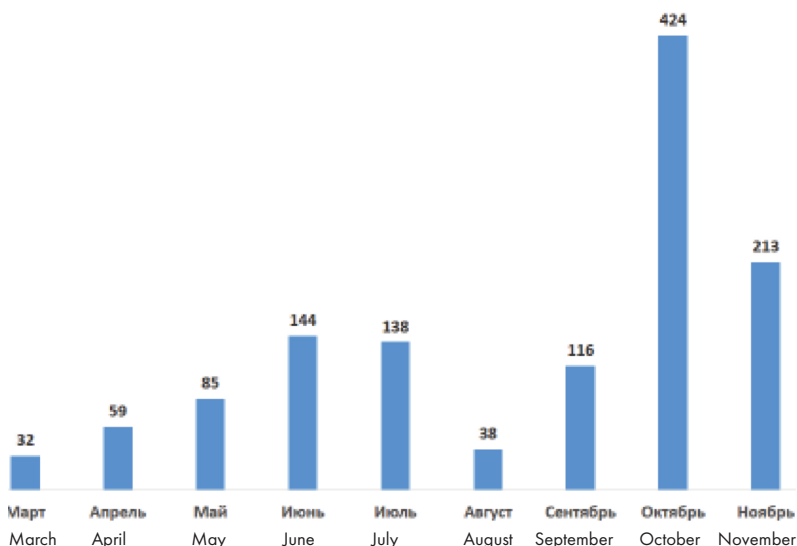


Рис. 2. Динамика межбольничной медицинской эвакуации пациентов с COVID-19 бригадами территориального центра медицины катастроф в марте–ноябре 2020 г., чел.

Fig. 2. Dynamics of interhospital medical evacuation of patients by teams of territorial center of disaster medicine in March – November 2020, people

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For the final disinfection of ambulances and of a transport box, a special box is equipped in the garage of the Territorial Disaster Medicine Centre. A paramedic in personal protective equipment disinfects with 6% hydrogen peroxide using a Nocospray aerosol disinfection apparatus and then uses an open-type ultraviolet irradiator in the passenger compartment.

During 2020, the material and technical base of medical facilities providing medical care to patients with COVID-19 was strengthened. The fleet of ambulances was significantly updated. In accordance with the Orders of the Government of the Russian Federation dated April 18 and July 11, 2020, 39 ambulances were delivered to the region, including 24 — of class "C"; in the Territorial Disaster Medicine Center — 10 reanimobiles. Currently, the Territorial Disaster Medicine Center park has 23 ambulances, including 19 reanimobiles, 70% of which are ambulances with a service life of up to 5 years.

At the expense of the reserve fund (2.37 million rubles), the Government of the Voronezh Region purchased personal protective equipment for the respiratory and skin organs, antiseptics, consumables for sampling, antiviral drugs, and equipment for carrying out disinfection measures. For these purposes, Territorial Disaster Medicine Centre made purchases for a total amount of 3.13 million rubles. Strengthening the material and technical base of medical organizations made it possible to organize the provision of medical care to patients with COVID-19 in accordance with the requirements of guidelines [1-5].

Conclusion

1. The creation in the Voronezh region on the medical organisations basis of medical districts of a system of staged medical care for patients with suspected and confirmed new coronavirus infection COVID-19 as well as the creation of a three-level system of medical care for this category of patients contributed to their early detection and effective treatment.

2. The monitoring system for patients with COVID-19 allows to determine the optimal routing of each patient in order to provide him/her with timely specialized, including high-tech, medical care.

3. The change in the routing of patients with COVID-19 in the region in order to provide high-tech medical care to as many patients with a new coronavirus infection as possible fully justifies the use of helicopter technology with a resuscitation module and with a transport isolation box.

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