

MONITORING OF PATIENTS IN SEVERE CONDITION IN LEVEL 1 AND LEVEL 2 MEDICAL TREATMENT ORGANIZATIONS – A TOOL FOR ORGANIZING MEDICAL CARE FOR PATIENTS AND VICTIMS IN EMERGENCY SITUATIONS

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Abstract. *The objective of the study* was to analyze the effectiveness of the "Monitoring" program for patients with new coronavirus infection and to evaluate its preparedness to work in emergency situations, as well as to substantiate the effectiveness of the program as a monitoring tool for patient care management in level 1 and level 2 medical treatment organizations when there is a shortage of intensive care beds at level 3 medical institutions.

Materials and research methods. Materials of the research: normative legal documents regulating the order of application of telemedicine technologies in Russia and Kuzbass, including in the field of the Disaster Medicine Service, scientific publications, personal work experience in the organization of remote consultations.

The research was based on the data on the provision of consultative medical care to the patients with the diagnoses "new coronavirus infection" and "community-acquired pneumonia", who were hospitalized in the intensive care departments of level 1 and level 2 medical treatment organizations.

Research results and their analysis. The retrospective analysis of the calls to the monitoring center from the patients in severe condition, being treated in level 1 and level 2 medical treatment organizations for the diagnoses of new coronavirus infection and pneumonia, who needed monitoring by the specialists of the consulting center (mainly by intensive care specialists), was performed.

Inclusion criteria in the study: adult patients with new coronavirus infection and pneumonia; receipt of call to the monitoring center during the study period – 01.11.2020-31.01.2022; availability of patient counseling using "Monitoring" program.

Conclusion was made, that the system, linking major hospitals with local hospitals, which have the maximum load in periods of peak morbidity, through conducting emergency and urgent telemedicine consultations was created in Kuzbass. The analysis of the obtained data testifies to the effective work of the monitoring center for severe patients as a type of telemedicine tool when working in high alert mode.

Key words: *emergency situations, Kuzbass Disaster Medicine Center, level 1 and level 2 medical treatment organizations, "Monitoring" patients with new coronavirus infection, pneumonia patients, program, severe patient monitoring center, telemedicine consultations, victims*

Conflict of interest. The authors declare no conflict of interest

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МОНИТОРИНГ ПАЦИЕНТОВ В ТЯЖЕЛОМ СОСТОЯНИИ, ПОСТУПИВШИХ В СТАЦИОНАРЫ 1-го И 2-го УРОВНЯ – ИНСТРУМЕНТ ОРГАНИЗАЦИИ ОКАЗАНИЯ МЕДИЦИНСКОЙ ПОМОЩИ БОЛЬНЫМ И ПОСТРАДАВШИМ В ЧРЕЗВЫЧАЙНЫХ СИТУАЦИЯХ

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Резюме. *Цели исследования* – проанализировать эффективность работы программы «Мониторинг» с пациентами с новой коронавирусной инфекцией в условиях режима повышенной готовности; оценить готовность данной системы к работе в режиме чрезвычайной ситуации (ЧС).

Материалы и методы исследования. Материалы исследования: нормативные правовые документы, регламентирующие порядок применения телемедицинских технологий (ТМК), в том числе в сфере деятельности Службы медицины катастроф (СМК) Минздрава России, в Российской Федерации в целом и в Кузбассе, в частности, научные изыскания коллег в данной области исследования; личный опыт работы по организации проведения дистанционного консультирования. В основе исследования – данные об оказании консультативной медицинской помощи пациентам с диагнозами «новая коронавирусная инфекция» и «внебольничная пневмония», находившимся на стационарном лечении в отделениях реанимации лечебных медицинских организаций (ЛМО) 1-го и 2-го уровня Кемеровской области.

Критерии включения в исследование: взрослые пациенты с пневмонией и новой коронавирусной инфекцией; поступление заявки в центр мониторинга в период с 01.11.2020 г. по 31.01.2022 г.; выполнение консультации пациента через программу «Мониторинг».

Результаты исследования и их анализ. Проведен ретроспективный анализ заявок, поступивших в центр мониторинга пациентов в тяжелом состоянии, находившихся в ЛМО 1-го и 2-го уровня с диагнозом «пневмония» и «новая коронавирусная инфекция», нуждавшихся в контроле специалистов консультативного центра по различным профилям – в основном, по профилю «реаниматология».

Анализ результатов исследования позволяет говорить об эффективной работе центра мониторинга тяжёлых пациентов как разновидности телемедицинской системы при работе в режиме повышенной готовности.

Крупные стационары в лице врачей-консультантов могут оказывать значимую организационно-методическую поддержку при лечении большого числа пациентов ЛМО 1-го и 2-го уровня.

Оценку работы профильных консультативных центров в режиме повышенной готовности в системе мониторинга тяжелых пациентов можно считать подтверждением возможности использования данного инструмента в чрезвычайных ситуациях.

Ключевые слова: больные, Кузбасский центр медицины катастроф, лечебные медицинские организации 1-го и 2-го уровня, медицинская помощь, новая коронавирусная инфекция, пациенты в тяжелом состоянии, пневмония, пострадавшие, программа «Мониторинг», режим повышенной готовности, режим чрезвычайной ситуации, телемедицинские консультации

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The relevance of the problem of "complex" patients, especially when they are admitted to a hospital with an insufficient level of equipment or staffing capacity is of no doubt. Timely medical evacuation to the appropriate medical treatment organization certainly plays a significant role in the outcome of the disease [1-3].

Health care in Kuzbass (Kemerovo region) has a number of peculiarities. In the densely populated region there are only two major cities with a population of more than 600 thousand people — Novokuznetsk and Kemerovo. Patients from small towns are routed according to the agglomeration principle — patients in severe condition need to be transferred for treatment to medical treatment organisations of these cities. At the same time, neither in Kemerovo, nor in Novokuznetsk there are multidisciplinary hospitals, which would take a patient with a complex diagnosis without prior approval. The organizer of the transfer of such patients is the Emergency Consultative Medical Care (ECMC) department of the Kuzbass Center for Disaster Medicine, whose staff often encounter situations in which the patient's diagnosis or condition does not comply with existing regulations on routing. Often such a patient remains in the district hospital and his condition requires special monitoring by Level 3 medical organisation specialists until the patient is transferred or his condition improves.

In the conditions of health care reform and against the background of staff shortages in small hospitals, this period of patient care requires the solution of a strategically important task. That is the remote provision of highly qualified medical care using modern information technologies and the intellectual potential of specialists of large multidisciplinary hospitals [4, 5].

In order to solve this problem and to monitor patients requiring special attention, in 2018 on the basis of the Kuzbass Disaster Medicine Center the project "Monitoring center for patients in serious condition" (hereinafter — "Monitoring", Program) was created and put into practice as a type of telemedicine [6]. When developing the Program, the following requirements were taken into account: 24/7 accessibility, ease of use for all participants of the process,

including the ordinary medical staff of Level 1 — Level 2 hospitals. The program was installed in all inpatient units of Kuzbass, accepting patients for emergency indications ^{1,2}.

With the beginning of the pandemic of a new coronavirus infection COVID-19 "Monitoring" has become even more relevant, especially during the periods of peak waves of morbidity and organization of treatment of patients in re-assigned hospitals with a small number of transfers to large ones. With the development of the epidemiological process, approaches to the treatment of new coronavirus infection have changed and continue to change, placing new demands on specialists [7, 8]. The software product is also capable of change. For example, the latest change in the Program was a simplified form of telemedicine consultation protocol with the possibility of uploading and attaching it to the patient history.

Thus, in order to monitor the condition of critically ill patients in the intensive care unit of a Level 1 to Level 2 hospital, a system was created in Kuzbass, which ensures the collection of information in a short time according to specified parameters with the ability to assess the condition of patients by Level 3 medical organisation specialists, to conduct telemedicine consultations with protocol execution and determination of subsequent tactics.

During the COVID-19 pandemic about 70 patients with a new coronavirus infection who were in a serious condition were monitored through "Monitoring" at one time, which proved the effectiveness of its work in the emergency preparedness mode that was in effect in Kuzbass. The authors believe that in the emergency situation mode, this

¹ On the Approval of the Development Concepts of the Telemedicine Technologies in the Russian Federation and its Implementation Plan. Decree of the Ministry of Health of the Russian Federation, Russian Academy of Medical Sciences dated August 27, 2001, No. 344/76 (In Russ.) URL: <https://base.garant.ru/4177911/> (Date of access 17.03.2022).

² On the Approval of the Procedure for the Organization And Providing of Medical Care Using Telemedicine Technologies. Decree of the Ministry of Health of the Russian Federation, Russian Academy of Medical Sciences dated November 30, 2017, No. 965n (In Russ.). URL: <https://www.garant.ru/products/ipo/prime/doc/71751294/> (Date of access 17.03.2022).

product will be able to adjust to the specific features of the event and to provide comprehensive organizational and methodological support in solving complex clinical issues during the elimination of medical and sanitary consequences of emergency situation.

The aim of the study was to analyze the effectiveness of the "Monitoring" program with patients with new coronavirus infection COVID-19 in conditions of high readiness and to assess the readiness of this system to work in emergency situations.

Study Objectives:

1. To analyze the effectiveness of profile advisory centers in the conditions of high readiness mode — under the threat of emergency.

2. To substantiate the effectiveness of "Monitoring" as a tool to control the organization of treatment of patients in medical organisations of level 1 and 2 in conditions of shortage of intensive care beds in medical organisation of level 3.

Materials and methods. Materials of the study are the normative legal documents regulating the order of application of telemedicine technologies, including in the field of the Disaster Medicine Service of the Russian Ministry of Health — in the Russian Federation as a whole and in Kuzbass, in particular; scientific researches in this field; personal experience in organization of consultations. The study was based on the data on the provision of consultative medical care to patients with diagnoses of "new coronavirus infection" and "community-acquired pneumonia" who were hospitalized in the intensive care units of medical organisations of Level 1 and Level 2 of Kemerovo region. Inclusion criteria for the study: adult patients with pneumonia and new coronavirus infection; submission to the monitoring center in the period from 01.11.2020 to 31.01.2022; patient consultation through the monitoring program.

Results of the study and their analysis. A retrospective analysis of the monitoring center applications received from patients in a serious condition, who were in medical organisations of Level 1 and Level 2 with diagnoses "pneumonia" and "new coronavirus infection", who needed monitoring by specialists of the consulting center in different profiles — mainly in the profile "resuscitation" was carried out.

A total of 32 patients were enrolled in "Monitoring", of which 17 were Level 1 medical organisation patients and 15 — Level 2.

Patients were monitored according to the following scheme: when a patient meeting the criteria regulated by the order of the Ministry of Health of the Kemerovo region was admitted to the hospital, a Level 1 or Level 2 medical organisation physician entered his data into a special program (developed by the Kuzbass Medical and Analytical Center). A monitoring center paramedic (a disaster medicine center employee) determined the patient's profile and sent the patient's chart to the appropriate profile center. According to the current bicenter agglomeration model of Kuzbass health care, to help patients with new coronavirus infection, 5 profile advisory centers were organized on the basis of large re-profiled hospitals in the cities of Kemerovo and Novokuznetsk. The responsible consulting physician determined the tactics of patient management, the frequency of data entry, the advisability of a face-to-face consultation and transfer to a higher level hospital. In addition to leading intensive care specialists, consultations were conducted by "narrow" specialists — infectious disease specialists, pulmonologists, cardiologists and neurologists. A mechanism for paying consultants was developed and implemented. If necessary, a telephone conference call with recording of the conversation was conducted. In addition, a full-time employee of the monitoring center, an anesthesiologist and resuscitator, competently and timely resolved issues related to the patient's clinical condition and routing. In particularly complicated or controversial cases, the chief out-of-staff specialist, a departmental employee, or other competent persons could be involved in consultations.

All 3,159 patients diagnosed with pneumonia and/or new coronavirus infection who underwent "Monitoring" during the study period received full remote consultative assistance from specialists at consultative centers (Figure 1). The dynamics of severe patients' need for counseling had a wave-like character and coincided with the growth of the number of patients in the region. The number of monitored patients peaked in November 2020, July, and November 2021.

During the entire period of monitoring, as a result of the effective work of the specialists from the profile counseling centers: 1081 patients with persistent positive dynamics (34%) were transferred to somatic departments; 541 patients (17%) were transferred to a higher level organisation.

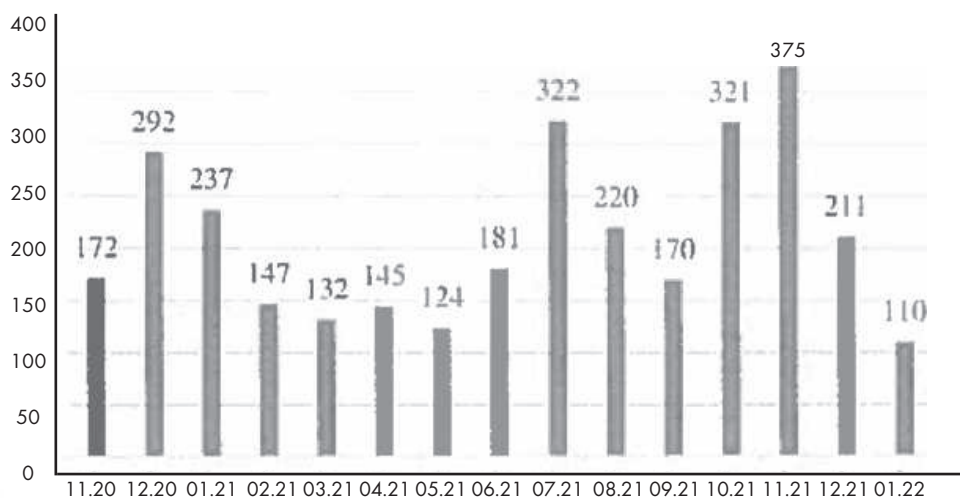


Рис. 1 Динамика числа тяжёлых пациентов (чел.), поступивших в ноябре 2020 – январе 2022 гг. в Единый центр мониторинга (ЕЦМ) для проведения дистанционного консультирования
Fig. 1. Dynamics of the number of patients with severe severity admitted to the UMC for remote consultation for November 2020 - January 2022

The proportion of patients removed from the monitoring due to death was 48% — 1,537 people. The high proportion of lethal outcomes was due to the fact that the following patients were monitored: initially in a serious condition; with polymorbid background; on high-flow ventilation; resistant



Рис.2 Результаты работы единого центра мониторинга за ноябрь 2020 - январь 2022 гг, %
Fig. 2. Results of the work of the unified monitoring center for November 2020 - January 2022

to treatment and conditionally untransportable. Expert work with chief out-of-staff specialists showed that only 5% of cases were "conditionally preventable" of lethal outcomes (Fig. 2).

Conclusion

1. The analysis of the results of the study allows us to speak about the effective work of the center for monitoring severe patients as a kind of telemedical system when working in high readiness mode.

2. In the Kemerovo region there is a system that links large hospitals with small hospitals, which have the maximum load in the periods of peak morbidity, by carrying out urgent and emergency telemedicine consultations.

3. Large hospitals, represented by consulting physicians, can provide meaningful organizational and methodological support in treating a large number of patients in medical organisations of Level 1 and Level 2.

4. Evaluation of the work in high availability mode of profile advisory centers in the system of monitoring of severe patients allows to judge about its effectiveness and readiness to work in conditions of emergency.

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