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Experience of international cooperation in developing epidemic control measures during COVID-19 spread in the Republic of Moldova

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Abstract

The purpose of the study — to identify the factors contributing to the spread of the novel coronavirus infection within the territory of the Republic of Moldova and to develop measures aimed at their elimination.

Materials and methods. In May 2020, experts of Rospotrebnadzor (the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing), together with leading employees of institutions participating in planning and implementing measures aimed at prevention of COVID-19 spread, conducted a detailed analysis of epidemic control and curative measures in 10 healthcare organizations in the Republic of Moldova. They assessed the effectiveness of the undertaken actions in in-patient facilities, in laboratories, and in the country in general.

Results. The existing approaches to treatment of patients with COVID-19 and to laboratory diagnostics were in line with the common practices; the adequacy of measures was evidenced by the hospital bed capacity and the stock of artificial lung ventilation machines. In the meantime, the experts came across the factors that obviously contributed to the infection spread. Their elimination could intercept some paths of infection and improve the situation.

Conclusion. The analysis of the current measures and their results is important for planning and implementing actions aimed at improvement of the epidemic situation in different regions. The collaborative efforts helped slow down the outbreak in the Bender psychoneurological residential facility; outbreaks were prevented in other limited-access institutions; the incidence among healthcare workers decreased; the daily number of new COVID-19 cases decreased to 0–5 during the summer months in the Dniestrian Moldovan Republic. Presently, there is a clear picture of approaches that should be taken to decrease the incidence. Most likely, the experience obtained in the fight against the novel coronavirus infection will be of great use in future if any new variants of viruses emerge.

Keywords: *COVID-19, SARS-CoV-2, novel coronavirus infection, especially dangerous infection, pandemic, epidemic control measures, epidemic*

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Научная статья
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Опыт международного сотрудничества в организации противоэпидемических мероприятий в условиях распространения COVID-19 на территории Республики Молдова

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Аннотация

Цель работы — определить факторы, способствующие распространению новой коронавирусной инфекции на территории Республики Молдова, и разработать план мероприятий по их устранению.

Материалы и методы. В мае 2020 г. экспертами Роспотребнадзора совместно с руководством учреждений, принимающих участие в организации и реализации мер, противодействующих распространению COVID-19, был проведён детальный анализ противоэпидемических и лечебных мероприятий в 10 медицинских организациях Республики Молдова. Была дана оценка эффективности предпринимаемых действий как в отдельных стационарах и лабораториях, так и в стране в целом.

Результаты. Имеющиеся подходы к лечению больных COVID-19 и лабораторной диагностике вполне соответствовали общепринятым, резерв коечного фонда и аппаратов для проведения искусственной вентиляции лёгких свидетельствовал об адекватности мероприятий. Тем не менее были установлены факторы, очевидно способствовавшие распространению инфекции, исключение которых могло прервать ряд путей передачи инфекции и тем самым улучшить эпидемическую ситуацию.

Заключение. Анализ результатов проводимых мероприятий позволяет наметить и реализовать пути для улучшения эпидемической ситуации на отдельных территориях. В результате проведённой совместной работы была приостановлена вспышка в Бендерском психоневрологическом интернате; предотвращены вспышки в других учреждениях закрытого типа; сократилась заболеваемость среди медицинских работников, а число новых случаев заболевания COVID-19 снизилось до 0–5 в сутки в летние месяцы в Приднестровской Молдавской Республике. К настоящему моменту стали понятны подходы, обеспечивающие снижение заболеваемости. Имеется высокая вероятность того, что опыт, приобретённый в борьбе с новой коронавирусной инфекцией, понадобится и в последующие годы при появлении новых вариантов различных возбудителей.

Ключевые слова: *COVID-19, SARS-CoV-2, новая коронавирусная инфекция, особо опасная инфекция, пандемия, противоэпидемические мероприятия, эпидемия*

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

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Introduction

In May 2020, a group of Rospotrebnadzor experts, together with employees of healthcare institutions of the Republic of Moldova, evaluated the established and implemented epidemic control measures preventing the spread of infection caused by the SARS-CoV-2 virus.

The COVID-19 pandemic made it necessary to conduct a thorough analysis and, on many occasions, rectification of measures aimed at safety of patients and healthcare personnel during the spread of the especially dangerous infection. The emergence of a new pathogen transmitted by an airborne route and causing the dis-

ease resulting in severe damage of lungs as well as other organs and systems of the body escalated into a tremendous problem in nearly all countries of the world. A great number of healthcare workers were infected in 2020, during the first months of the pandemic, while they were working in hospitals and other healthcare centers. Quite a few fatal cases were reported. Obviously, an infected healthcare worker can be an infection source for many people both during the incubation period and during the first days of the disease. The risk of infection spread is especially high when the infected person having contact with uninfected patients in outpatient and in-patient facilities is an asymptomatic or silent carrier. It has become a major problem in the fight against COVID-19.

The incidence among healthcare workers was, first of all, connected with the specific characteristics of the new virus; during the first months, there were very few data on the virus that was insufficiently studied. The other factor contributing to the incidence was the fact that healthcare services of most countries were unprepared to deal with a sharp increase in the incidence. The insufficient number of single/isolation rooms, the short supply of personal protective equipment, disinfectants, room disinfection devices and air sanitizers, the poorly organized patients' screening system combining emergency rooms, medical assessment units, and common areas contributed to the spread of infection caused by SARS-CoV-2 among healthcare workers and the population.

Excluding statistics for SARS-CoV-2, the annual economic burden of healthcare-associated infections totals 10–15 billion rubles in the Russian Federation. The actual economic burden is significantly higher and can reach 500–700 billion rubles [1–2]. The novel coronavirus infection has substantially increased an impact on economy in all the countries of the world.

Safety protection in healthcare is one of the top priorities in epidemic control programs.

Epidemiological safety includes a variety of tasks:

- providing epidemiological safety of medical technology;
- providing epidemiological safety of healthcare personnel;
- providing epidemiological safety of hospital settings;
- providing efficient microbiological monitoring;
- providing epidemiological diagnostics;
- training skilled personnel [3].

In Russia, COVID-19 epidemic control measures were built on a number of previously adopted provisions, rules, and regulations:

- Federal Law 52-FZ, On Sanitary and Epidemiological Wellbeing of the Population, 30/3/1999;
- Sanitary Rules and Regulations, SanPiN 2.1.3.2630-10, Sanitary and Epidemiological Requirements for Organizations Participating in Healthcare Activities[1], and other regulatory and procedural documents;
- Code of Practice, SP 1.3.3118-13, Safety in Operations Involving Microorganisms of Risk Groups 1-2;
- National concept of prevention of healthcare-associated infections[2];
- Federal clinical practice guidelines for epidemiological safety[3];
- provisions (practical recommendations) for the healthcare quality control and safety system in a healthcare organization (an in-patient facility); prepared by the Federal Service for Surveillance in Healthcare[4].

The existing regulatory documents were revised and updated, as better knowledge of the COVID-19 pathogen was gained.

It is obvious that to combat the epidemic successfully, we need to analyze and consolidate the results obtained for each individual region. The experience gained by Russia during its fight with the COVID-19 epidemic, most certainly, could be of great help for planning epidemic control measures in other countries.

The purpose of the study is to identify the factors contributing to the spread of COVID-19 in the Republic of Moldova (RM) and to prepare a plan of measures aimed at their elimination.

Materials and methods

The Rospotrebnadzor experts were commissioned to provide advisory and methodological support to healthcare specialists of RM, including the Dniestrian Moldovan Republic (DMR) in developing and implementing epidemic control measures, laboratory diagnostics for the novel coronavirus infection caused by the SARS-CoV-2 virus, treatment of patients with COVID-19, compliance with the biological safety requirements. The experts researched the epidemiological situation and implemented measures. They were interested in the process of detecting infected people and contacts as well as in the process of providing medical care to patients with COVID-19. They checked whether the quantity and quality of diagnostic equipment, pharmaceutical drugs, personal protective equipment, and

[1] Approved by the decision of the Chief Public Health Officer of the Russian Federation, 8/5/2010, No 58; ceased to be in effect on 1/1/2021 following the decision of the Chief Public Health Officer of the Russian Federation, 24/12/2020, No 44.

[2] Approved by the Chief Public Health Officer of the Russian Federation, 6/11/2011.

[3] Approved by the National Association of Specialists in Healthcare-Associated Infection Control; agreed with the Epidemiology Committee of the Health Ministry of the Russian Federation.

[4] Provisions (practical recommendations) for the healthcare quality control and safety system in a healthcare organization (an in-patient facility). Moscow, 2015.

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disinfectants are in line with the real needs and requirements.

When the request for assistance was submitted to Russian authorities, RM reported an increase in the daily number of new COVID-19 cases. As of 8/5/2020, the country reported 4,605 cases of infection (0.13% of the total population), including 574 cases (0.13%) in DMR. The numbers demonstrate that the prevalence in the population of DMR and RM was comparable. The daily number of new COVID-19 cases in DMR continued to increase (**Figure**).

Additional measures were urgently required, as the mortality rates in RM were higher than in Russia: At that time, COVID-19 caused the death of 150 (3.3%) patients in RM. High incidence and death rates were recorded among healthcare workers.

Meetings with the administration of the National Agency for Public Health and with WHO representatives were held so that the experts could have a clear picture of the epidemic situation, look into the adopted measures and prepare plans aimed at stabilization and improvement of the situation.

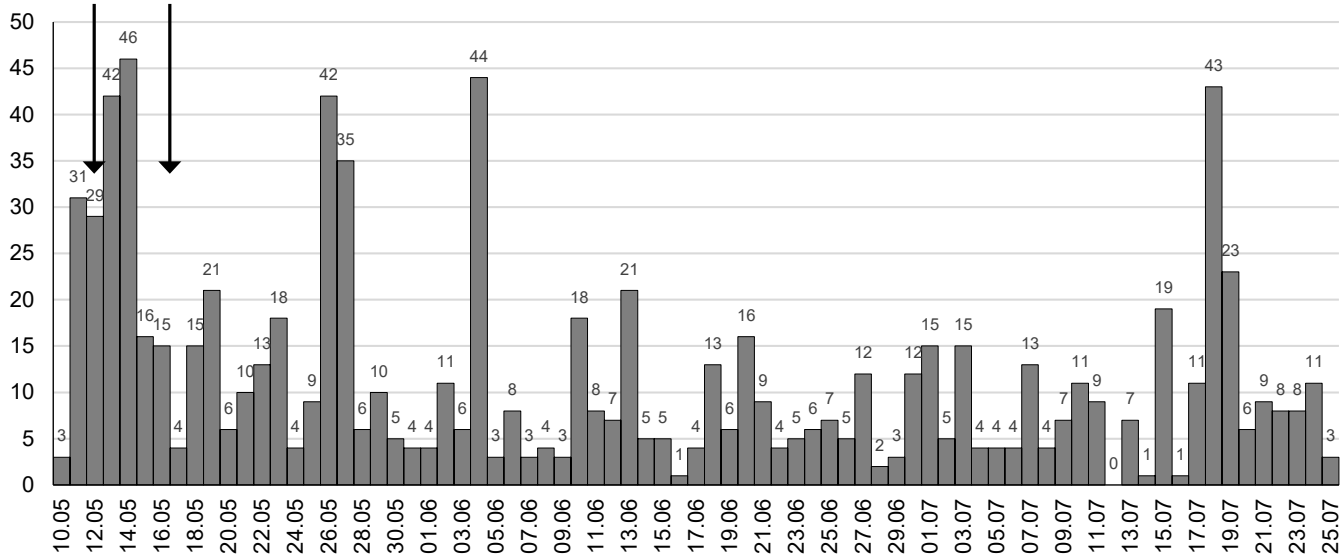
The in-depth analysis of the adopted measures was conducted in 10 facilities providing services and care to patients with COVID-19: in 7 in-patient facilities (3 in Kishinev; 2 in Rybnitsa; 1 in Tiraspol and 1 in Slobodzeya), in Bender psychoneurological residential facility accommodating patients with COVID-19 as well as in 2 laboratories in Tiraspol.

During their visits to infectious diseases hospitals and facilities repurposed for patients with COVID-19, Rospotrebnadzor experts, together with employees of the facilities, moved along the staff routes in *green* and *red* zones, took part in examinations and consultations of patients, assessed the implemented epidemic control measures. During their work, they identified potential sources of infection and offered measures for their elimination.

Results

During the meetings with the representative of the National Agency for Public Health and WHO, it was confirmed that the work in different areas of surveillance and prevention of importation of COVID-19 to RM started in January 2020 in accordance with the applicable recommendations. In-patient facilities had been repurposed; the network of laboratories and personnel had been built (**Table 1**). Information is communicated to people through mass media, flyers, posters promoting the importance of distancing, using face masks, gloves, and disinfectants when running essential errands, and contacting with potentially infected individuals. Personal Protective equipment (PPE), equipment, and sanitizers were bought. Most of the institutions, except for those that participate in initiation and implementation of epidemic control measures, treatment of patients with COVID-19, and provision of basic necessities for population, were placed on lockdown to limit the spread of infection. The operation of public transport was also on lockdown. The experts were shown around streets and public areas to confirm that all the recommended lockdown measures are abided by people.

The assessment of the laboratory diagnostics status showed that the daily number of tests in RM is around 1500–1600, including 350–1200 primary tests. Around 25 thousand tests had been completed by the end of the first ten-day-period in May. The laboratory diagnostics quality control is performed in compliance with the WHO program. The main groups subject



Dynamics of the daily number of new COVID-19 cases in DMR.
The arrows indicate the period of work of Rospotrebnadzor experts.
Source: https://novostipmr.com/ru/news/20-04-25/tempy-rasprostraneniya-covid-19-v-pridnestrove

to testing include people with symptoms typical of COVID-19, with community-acquired pneumonia, and risk groups of people over 65. There is an infection risk assessment program for healthcare workers, depending on the extent of their exposure; however, healthcare workers having contacts with COVID-19 patients do not go through regular tests; testing is mandatory for people with signs or symptoms consistent with the infectious disease. People with severe and moderately severe form of the disease, as well as elderly people over 65, pregnant women and children are immediately hospitalized. People with a mild form of infection can stay at home and separate themselves from others; they receive treatment under the physician's supervision. There is a temporary hospital where patients stay waiting for the results of their diagnostic test, and if tested positive, they are transferred to specially designated departments. Patients are discharged from hospital only after they have clinically recovered and are tested negative based on one SARS-CoV-2 RNA test result for their respiratory swabs. The exclusion includes pregnant women and children who are discharged only after they have taken two tests both with negative results.

After being discharged, the patients stay at home for 14 days under supervision of their primary physician and being monitored by the police or are transferred to a health care center for after-treatment. The policy requiring the discharge after one negative result is obtained helps increase the availability of beds for other patients. Yet, there are cases of repeat hospitalization of such patients.

Contacts must stay at home. They communicate with their supervising physician over the phone. It has been found that people who had contacts with COVID-19 patients go through tests for detection of SARS-CoV-2 RNA only if they have clinical symptoms. This approach is applied to healthcare workers.

In RM, there are 430 artificial lung ventilation (ALV) machines. Currently, around 100 of them are put in service, including 29 ALV machines for patients with COVID-19.

The laboratory diagnostics techniques and the approaches to treatment of patients with COVID-19 were in line with the applicable recommendations from epidemiologists and WHO (Table 1); the available bed capacity and the stock of ALV machines proved the adequacy of measures. However, the experts identified factors, which could contribute to infection spread. Most of the shortcomings related to the measures aimed at prevention of infection spread were detected in in-patient facilities and in the preventive policies applicable to healthcare workers. Their elimination would help intercept some transmission routes and improve the epidemic situation.

When looking into details of providing medical care to people infected with COVID-19, the experts pointed out the following factors that could lead to transmission of infection to healthcare workers and, consequently, to other people:

1. Some facilities did not have specially equipped rooms (personnel airlocks) between the *red* and *green* zones, where healthcare workers take off and disinfect the used personal protective equipment.

2. Disposable PPE were in short supply. The protective clothing, face masks, respirators and eyewear did not provide complete protection of respiratory organs, eyes, and skin.

3. The supply of ready-to-use disinfectants and sanitizers was insufficient for proper disinfection of used PPE and for skin.

4. Healthcare workers were not required to go through regular laboratory tests for COVID-19.

5. No double testing was routinely required for people who did not have any symptoms of respiratory infection, but who had contact with patients infected with SARS-CoV-2.

6. There were no designated airtight rooms for handling non-disinfected materials; the sorting and primary treatment area was not separated from the nucleic acid extraction area in some laboratories re-purposed and re-equipped for SARS-CoV-2 detection tests.

The communication among the patients of the psychoneurological residential facility, where cases of COVID-19 were detected, was not restricted. There were no designated routes for the personnel moving between the rooms accommodating infected or potentially infected patients and the rooms of healthy people. Some maintenance or service employees did not wear proper PPE.

Lacking intensive care units, ALV equipment, and computed tomography, some infectious diseases hospitals had to transport patients to other hospitals, when the patients' condition worsened or when they needed additional diagnostic tests or additional treatment involving high-tech equipment.

During their work, all the participants used disposable PPE sets. The emphasis was placed on airtightness, compliance with the application instructions, and disinfection intended to enhance safety for healthcare workers and to minimize the risk of infection.

The identified factors contributing to infection spread prompted the following decisions (**Table 2**):

1. All healthcare facilities dealing with diagnostic testing and COVID-19 treatment must have designated rooms (airlocks) between the *red* and *green* zones so that healthcare workers could take off their used PPE and have it disinfected. Healthcare personnel need training in the use of PPE and the compliance with the PPE safety rules must be monitored.

2. Healthcare workers must be provided with high-quality disposable or, if or when not available, reusable PPE, which would be comfortable to wear and would provide total protection of respiratory organs, eyes, and skin. The personnel must use full face masks

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Table 1. Pandemic preventive measures and their detected shortcomings in RM

Objects, groups of people	Implemented measures	Required rectification of the implemented measures
Population	1. Communication of information	No
	2. Isolation, travel restriction, and only authorized essential errands	No
	3. Recommendations on the use of face masks, gloves, disinfectants	No
Contacts	Isolation	Yes
Patients with COVID-19	1. Laboratory testing by using PCR when infection is suspected	No
	2. Home isolation (for people of 18–65 and mild cases) or hospitalization (other groups of people), after which patients can be discharged when they have clinically recovered, have negative results from the PCR test, and stay at home for 14 days under the doctor's supervision	No
Educational institutions	Closed	No
Transport	1. The scheduled operation of public transport is placed under lockdown	No
	2. Authorized travel in personal vehicles	No
	3. Regular railway and air operations are on lockdown	No
Stores, institutions and factories, public areas, parks, playgrounds	Closed, except for the stores selling basic consumer goods and the institutions participating in epidemic control measures	No
In-patient facilities	1. Re-purposing	Yes
	2. Changes in the patient flow	Yes
	3. Zoning	Yes
	4. Supply of disinfectants	Yes
	5. Training of personnel	Yes
Diagnostic laboratories	1. Equipped with additional new equipment	Yes
	2. Equipped with test systems	No
	3. WHO-program-based quality control	No
Healthcare workers	1. Training	Yes
	2. Supply of disposable PPE	Yes
	3. Supply of reusable PPE	No
	4. Testing for SARS-CoV-2 in accordance with the assessed risk and in presence of clinical symptoms	Yes

with replacement filters of high protection level (P2–3 rating).

3. Healthcare facilities must have an adequate supply of ready-to-use disinfectant solutions for proper disinfection of PPE after their application and for disinfection of healthcare workers' skin. Touch-free sensor sprayers/dispensers and enclosed germicidal lamps (recirculators) were recommended for continuous sanitization of air in airlocks between *red* and *green* zones.

4. Regular (at least once a week) PCR-based diagnostic tests for COVID-19 must be mandatory for healthcare workers.

5. Scheduled routine double testing procedures must be adopted to check mucous membranes of the upper respiratory tract for presence of the SARS-CoV-2 virus among people who do not have symptoms of respiratory infection, but who had contact with infected people. Such tests should be scheduled for the last days of the assumed incubation period; tests must be taken two times, at least one day apart. At the same time, to increase the availability of beds, the discharge from the hospital after improvement of the patient's condition and only one negative result of the PCR test can be seen as admissible, provided that the patient rigorously follows the isolation and disinfection recommendations until the second negative test result is obtained.

6. Healthcare facilities must have airtight rooms for handling non-disinfected materials as well as des-

ignated areas for sorting and primary treatment of materials as well as nucleic acid extraction areas (in compliance with the requirements for PCR laboratory premises).

7. Healthcare facilities must have *red* and *green* zones with airlocks between them as well as designated routes for the personnel and patients in the limited-access institutions where SARS-CoV-2 was detected. Rooms, furniture, clothing, bed linens and any existing waste materials must be properly disinfected. Healthcare workers and maintenance/service personnel working in such institutions must use disposable or reusable PPE.

8. The transportation of patients to other regions must be minimized; patients infected with the SARS-CoV-2 virus must stay in hospitals, which have intensive care units and skilled healthcare personnel; institutions and hospitals must have equipment for timely diagnosis and therapy (CT scanners, extracorporeal membrane oxygenation (ECMO), ALV and plasmapheresis machines). Electronic wireless stethoscopes were recommended for auscultation of lungs to reduce the repeat application of computed tomography of thoracic organs to find out what has caused the worsening of the condition and to evaluate the extent of damage to the lung tissue.

An important component of epidemic control measures is proper organization of examination and tests of patients suspected of COVID-19 or patients with the confirmed diagnosis to exclude additional tests or treatment involving the equipment available in other sections, buildings or remote locations. If a patient must be transported to another facility, all the necessary precautions should be taken to prevent any contact between healthy people and patients, and to perform through disinfection of equipment, rooms, and vehicles where the patient stayed or was transported.

Discussion

Thus, potential factors leading to the spread of coronavirus infection were identified, taking into consideration specific characteristics of the pathogen. First of all, it should be remembered that the virus can be present in the indoor air of the rooms accommodating patients with COVID-19; the virus can travel to neighboring rooms, especially when the viral load is high. High-risk zones are intensive care units where there can be a lot of patients at the same time. The number of infected and sick healthcare workers from these units reaches almost 100%. It should also be remembered that healthcare workers can be asymptomatic carriers of the virus and, as such, transmit infection through their contacts outside working hours: in public areas, in crowded streets, and at home. This route of transmission can be intercepted through regular diagnostic testing for viruses among healthcare workers who must be suspended from work and receive active antiviral therapy if tested positive.

A big mistake is exclusion of healthcare workers having a history of COVID-19 from the list of people who have to be retested. The circulation of strains different in their antigenic composition, the risk of emerging mutations, the risk of reinfection or recurrent viral shedding some time later demonstrated the importance of tests for those with past coronavirus infection. Regardless of the past history, people must use PPE, as the virus can be transmitted via clothes, skin, and hair, or by any other contact route.

Effective etiotropic therapy is essential for decreasing the level of virus circulation, resulting in virus elimination on the 3rd day of the treatment[5]. By contrast, the available research data prove that the time to virus elimination is 7-11 days and longer when ineffective antiviral drugs, pharmaceuticals with unspecified mechanism of action or only pathogenetic and symptomatic therapy are used [5]. The patient continues to shed the virus, thus creating the risk of transmitting infection to the healthcare personnel, especially to new employees, the risk of transmitting infection through contact or airborne route, through the personnel or after the patient has been discharged, showing improvement and positive changes in his condition in the absence of a double negative test, especially, if he has a wave-like undulating pattern of the infection with recurrent viral shedding.

The assessment of the provision of medical care to patients with novel, dangerous coronavirus infection helped to make the list of required additional equipment, diagnostic products, disinfectants, and pharmaceutical products. Three conferences were held, addressing specific characteristics of the SARS-CoV-2 virus, clinical progression of COVID-19, approaches to its treatment and diagnosis, diagnostic products available in Russia, methods of sampling of biomaterials, biosafety requirements.

The situation with the infection caused by the SARS-COV-2 virus has demonstrated the importance of the assessment of effectiveness of implemented epidemic control measured, timely identification and elimination of the factors contributing to the spread of infection. Undoubtedly, characteristics of a new pathogen, which emerges unexpectedly and starts spreading rapidly, are extremely difficult to predict.

Conclusion

The analysis of the current measures and their results is important for planning and implementing actions aimed at improvement of the epidemic situation in different regions. The collaborative efforts helped slow down the outbreak in the Bender psychoneuro-

[5] Ministry of Health of the Russian Federation. Interim Methodological Recommendations. Prevention, Diagnostics, and Treatment of the Novel Coronavirus Infection (COVID-19). Revision 9 (26/10/2020).

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Table 2. Factors leading to COVID-19 spread in RM healthcare institutions and measures aimed at their elimination

Factors leading to COVID-19 spread	Elimination measures
Absence of double testing for detection of the virus on mucous membranes of the upper respiratory tract among people who do not have symptoms of respiratory infection, but who had contact with infected people	Regular two-time diagnostic tests for detection of the SARS-CoV-2 virus on mucous membranes of the upper respiratory tract among people who do not have symptoms of respiratory infection, but who had contact with infected people
Absence of properly equipped airlocks where healthcare personnel can take of their PPE and have it disinfected	Designated adequately equipped areas with the sufficient quantity of containers with disinfectants; installed disinfection equipment for personnel. Equipment for air disinfection (recirculators). Signage, marking, and proper insulation of *red* and *green* zones
Ventilation grilles installed between the zones	Airtight partitions and doors between the zones
Absence of intensive care units, ALV equipment, computed tomography, other high-tech equipment in repurposed hospitals	Availability of equipment (CT scanners, ECMO, ALV, and plasmapheresis machines) in hospitals for patients with COVID-19; electronic wireless stethoscopes for auscultation of lungs when the CT scanner is not available
Shortage of disposable PPE. Using of clothing, face masks, respirators and eyewear, which do not provide proper protection of respiratory organs, eyes, and skin	High-quality disposable or reusable PPE providing total protection of respiratory organs, eyes, and skin. Full face masks with replacement filters of high protection level (P2–3 rating)
Improper use of PPE and disinfectants	Training of healthcare workers
Absence of regular laboratory diagnostic tests among healthcare workers for detection of the virus on mucous membranes of the upper respiratory tract	Regular (at least once a week) laboratory diagnostic PCR-based tests for healthcare personnel for detection of the virus on mucous membranes of the upper respiratory tract

logical residential facility; outbreaks were prevented in other limited-access institutions; the incidence among healthcare workers decreased; the daily number of new COVID-19 cases decreased to 0–5 in DMR during the summer months. Presently, there is a clear picture of approaches that should be taken to decrease the incidence. Most likely, the experience obtained in the fight against the novel coronavirus infection will be required in future when new variants of viruses may emerge. Undoubtedly, the tradition of interstate collaboration in the fight with viral infections, from the eradication of smallpox and combat on poliomyelitis to international efforts in monitoring of influenza strains, provides the basis for quick response in matters of global biological safety.

REFERENCES

1. Aslanov B.I., Zueva L.P., Lyubimova A.V., Kolosovskaya E.N., Dolgiy A.A., Os'mirko T.V. Federal clinical (methodological) recommendations. Epidemiological surveillance of infections associated with the provision of medical care. Moscow; 2014. (in Russian)
2. Brusina E.B., Zueva L.P., Kovalishena O.V., Stasenko V.L., Fel'dblyum I.V., Briko N.I., et al. Healthcare-associated infections: modern doctrine of prophylaxis. Part II. Basic concept. *Epidemiologiya i vaktsinoprofilaktika.* 2018; 17(6): 4–10. https://doi.org/10.31631/2073-3046-2018-17-4-10 (in Russian)
3. Popova A.Yu. Epidemiological safety is an integral component of the system for ensuring the quality and safety of medical care. *Vestnik Roszdravnadzora*. 2017; (4): 5–8. (in Russian)
4. Briko N.I., Brusina E.B., Zueva L.P., Kovalishena O.V., Stasenko V.L., Fel'dblyum I.V., et al. The strategy of ensuring epidemiological safety of medical activity. *Vestnik Roszdravnadzora.* 2017; (4): 15–21. (in Russian)
5. Ruzhentsova T.A., Chukhlyaev P.V., Khavkina D.A., Garbuzov A.A., Ploskireva A.A., Oseshnyuk R.A., et al. Efficacy and safety of favipiravir in the complex therapy of mild and moderate COVID-19. *Infektsionnye bolezni: novosti, mneniya, obuchenie.* 2020; 4(9): 8–19. https://doi.org/10.33029/2305-3496-2020-9-00-0 (in Russian)

СПИСОК ИСТОЧНИКОВ

1. Асланов Б.И., Зуева Л.П., Любимова А.В., Колосовская Е.Н., Долгий А.А., Осьмирко Т.В. Федеральные клинические (методические) рекомендации. Эпидемиологическое наблюдение за инфекциями, связанными с оказанием медицинской помощи. М.; 2014.
2. Брусина Е.Б., Зуева Л.П., Ковалишена О.В., Стасенко В.Л., Фельдблюм И.В., Брико Н.И. и др. Инфекции, связанные с оказанием медицинской помощи: современная доктрина профилактики Часть 2. Основные положения. *Эпидемиология и вакцинопрофилактика*. 2018; 17(6): 4–10. https://doi.org/10.31631/2073-3046-2018-17-4-10
3. Попова А.Ю. Эпидемиологическая безопасность — неотъемлемый компонент системы обеспечения качества и безопасности медицинской помощи. *Вестник Росздравнадзора*. 2017; (4): 5–8.
4. Брико Н.И., Брусина Е.Б., Зуева Л.П., Ковалишена О.В., Стасенко В.Л., Фельдблюм И.В. и др. Стратегия обеспечения эпидемиологической безопасности медицинской деятельности. *Вестник Росздравнадзора*. 2017; (4): 15–21.
5. Руженцова Т.А., Чухляев П.В., Хавкина Д.А., Гарьузов А.А., Плоскирева А.А., Осешнюк Р.А. и др. Эффективность и безопасность применения фавипиравира в комплексной терапии COVID-19 легкого и среднетяжелого течения. *Инфекционные болезни: новости, мнения, обучение.* 2020; 4(9): 8–19. https://doi.org/10.33029/2305-3496-2020-9-00-0

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