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DISASTER AND EMERGENCY MEDICINE JOURNAL

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Authors: Assel Murat, Dinara Otargaliyeva, Adlet Tabarov, Timur Saliev, Ildar Fakhradiev

DOI: 10.5603/demj.101057

Article type: Research paper

Submitted: 2024-06-07

Accepted: 2024-08-20

Published online: 2024-09-09

ORIGINAL ARTICLE

EFFECTIVENESS OF PRIMARY HEALTH CARE IN THE REPUBLIC OF KAZAKHSTAN DURING THE COVID-19 PANDEMIC AND FACTORS AFFECTING IT

Primary health care during the COVID-19 pandemic

Assel Murat[1], Dinara Otargaliyeva[1], Adlet Tabarov[1], Timur Saliev[2], Ildar Fakhradiev[2]

[1]Salidat Kairbekova National Research Center for Health Development, Astana, Kazakhstan
[2]Asfendiyarov Kazakh National Medical University, Tole, Almaty, Kazakhstan

ABSTRACT

INTRODUCTION: Investigation of the performance of primary health care in Kazakhstan during the COVID-19 pandemic and analysing the factors influencing it is critical to improving healthcare in the face of global challenges. The purpose of this study was to identify and analyse the factors affecting the efficacy of primary health care in the Republic of Kazakhstan during the COVID-19 pandemic.

MATERIAL AND METHODS: The study design consisted of a two-stage data collection on primary health care in Kazakhstan during the COVID-19 pandemic, including a questionnaire survey of 10,459 participants from different regions and professional groups, and the application of complex statistical methods including correlation and regression analyses.

RESULTS: The study found that nurses' competence was most strongly influenced by interactions with physicians and knowledge of clinical guidelines in an epidemic setting. Statistically significant criteria such as prompt training (r = 0.081) and regular professional development (PD) (r = 0.189) showed no direct relationship with competence. General practitioners' work during the pandemic included prompt training, provision of medicines (r = 0.519), and preventive outreach (r = 0.427). Competence of doctors and nurses was correlated (r = 0.576) with pandemic preparedness (r = 0.497) and effective health staff communication (r = 0.448).

CONCLUSIONS: Organisational management effectiveness was related to the communication skills of managers and adequate resourcing of the clinic, where besides staff competence (r = 0.494), prompt provision of medicines and equipment (r = 0.759) played a

significant role. Practical significance lies in the possibility of using the findings of this study to improve the efficiency of organisational work of primary healthcare institutions in Kazakhstan during pandemic and post-pandemic conditions.
KEYWORDS: coronavirus; health workers; survey; pandemic; professional development

CORRESPONDING AUTHOR:
Assel Murat, Salidat Kairbekova National Research Center for Health Development,
19 Kabanbay Batyr Ave., 010000 Astana, Kazakhstan, e-mail: muratassel84@gmail.com

INTRODUCTION

Against the backdrop of the global epidemic of COVID-19, the effectiveness of primary health care (PHC) has come under increasing scrutiny and research, especially in the context of its delivery in different countries. The Republic of Kazakhstan, like many other countries, has faced the challenges presented by the COVID-19 pandemic, which has led to the need to assess and optimise the effectiveness of PHC. In this context, there is an increase in ambulance calls, funding problems, and a decrease in the number of elective surgeries, which affects the overall healthcare situation. Thus, according to N.O. Omar and Y.L. Stepkina observed a considerable increase in the number of emergency ambulance calls in Almaty region, Kazakhstan, for the period from January to December 2020 [1]. At the beginning of the accounting period, in the first quarter of 2020, the number of recorded ambulance calls was 217.729. However, by the fourth quarter of 2020, that number had risen to 733.003. This increase of more than two and a half times emphasises the significant growth in the need for emergency medical services in the region. This growth could be conditioned by a variety of factors, including population growth, changes in the healthcare system, or possibly the impact of global health-saving events such as the COVID-19 pandemic, which had a considerable impact on the global healthcare system in 2020. Apart from the data provided by N.O. Omar and Y.L. Stepkina, it is worth mentioning the study conducted by A.S. Sagatkali et al. [2]. This study represents a meaningful contribution to understanding the magnitude and impact of the epidemic sweeping many regions of the world in 2021. According to the findings of this study, in October 2021, at the peak of the epidemic, there were about 1 million 15 thousand cases in the region in question, which is a considerable figure. Furthermore, the same study

identified 12.053 deaths, highlighting the gravity of the situation and the significance of adequate responses to healthcare crises.

A.B. Mukhamedyarova et al. [3] pointed out that at that time the system of financing emergency care failed to fulfil its tasks, which worsened the quality and speed of PHC, but staffing and general training of specialists were not considered. Therewith, the problems were observed not only at the pre-hospital stage. In their literature review, N.B. Yerniyazov and A. Aringazina cite data that during the pandemic the number of elective surgical interventions sharply decreased, which could substantially affect the prognosis of people with both benign and malignant neoplasms, but there was no survey among staff about the difficulty of performing elective interventions at that time [4]. According to E.B. Adilbekov et al. [5], the mortality from stroke increased by 30%, without specifying the reasons for this increase, which may be related to the deterioration of staff work due to massive loads and the lack of proper coordination between different departments of hospitals. This situation, however, was observed not only in Kazakhstan but also in other countries [6]. That is why the present study aims at an in-depth analysis of critical aspects including organisational measures, quality of care, training, and education of health personnel.

One of the objectives of this paper was to analyse the effectiveness of PHC in the Republic of Kazakhstan during the COVID-19 pandemic and to identify the factors that have the greatest impact on this effectiveness. Another objective of this study was to provide valuable practical and theoretical findings that can serve as a basis for developing strategies to improve the PHC system, increase its adaptability to new challenges, and effectively respond to future public health emergencies and infectious disease outbreaks in the Republic of Kazakhstan.

MATERIAL AND METHODS

Study design

The present study to assess the organisational performance of primary health care in the COVID-19 pandemic was conducted in 2 phases. The first phase of data collection was conducted in 2022 during the COVID-19 pandemic and the second phase was conducted in 2023 after the quarantine measures for the disease were lifted. Two hypotheses were used:

1. Null hypothesis (H0): The COVID-19 pandemic had no significant impact on PHC performance in the Republic of Kazakhstan. This means that any observed changes in PHC performance can be attributed to random fluctuations or other factors not directly related to the pandemic.

2. Alternative hypothesis (H1): The COVID-19 pandemic had a significant impact on PHC performance in the Republic of Kazakhstan. This suggests that observed changes in PHC performance may be directly related to the impact of the pandemic, including factors such as changing market conditions, supply problems, changes in consumer demand, and government responses to the crisis.

Study sample and participants

The study included 2.252 heads of polyclinics from 17 regions of the republic at the level of cities and districts, 2.595 general practitioners (therapists), and 5.612 nurses in three age categories: 18–39 years, 40–60 years, and above 60 years. The sample was formed according to the method of continuous research among all employees of primary health care in the mentioned regions.

Data collection

The materials were primary data obtained from a questionnaire survey of respondents. Questionnaires were developed and adapted for three groups of respondents — polyclinic managers, doctors, and nurses. A questionnaire survey is a valuable data collection tool to obtain information on respondents' views, opinions, and experiences regarding the performance of the PHC system during the COVID-19 pandemic. The questionnaires were designed to consider the specific needs and perspectives of each of these groups of respondents, which makes the data obtained more representative and informative. The questionnaire responses were collected using a Likert-type scale, which allowed researchers to measure the subjective beliefs and experiences of healthcare workers. Participants were asked to rate various aspects of primary healthcare performance and influencing factors on a 5-point ordinal scale, with 1 denoting "Strongly Disagree" and 5 denoting "Strongly Agree."

Statistical analysis

A comprehensive array of statistical techniques was utilised for data analysis. Descriptive statistics, including frequency distributions, percentages, measures of central tendency, and dispersion, were calculated to summarise both categorical and continuous variables. For inferential statistics, the study employed several methods. In order to identify significant correlations between demographic characteristics and other facets of healthcare performance, the Chi-Square Test of Independence was utilised to investigate links between categorical variables, such as age groups and educational attainment. In order to evaluate the

direction and strength of linear relationships between continuous variables, such as those between years of experience and competence scores, the Pearson Correlation Coefficient was used. Both paired and independent samples Students' t-tests were used to evaluate changes in scores over time and to compare mean scores between groups. To compare means across numerous groups at once, Analysis of Variance (ANOVA) was utilised. Statistical processing of the material was conducted using the licensed version of the IBM SPSS 26 package. The critical level of significance for testing statistical hypotheses was taken as 0.05.

Regression and factor analysis

Regression and factor analyses were performed after the data was checked to make sure it complied with the parametric methods' presumptions. Initially, the Shapiro-Wilk test and other graphical (Q-Q plots and histograms) techniques were used to evaluate the normality of the dependent variables. Although there were a few small deviations from normalcy, the central limit theorem could be relied upon because of the huge sample size (n >10.000). This theorem states when a large enough sample size is taken from a population, the distribution of the sample means will be approximately normally distributed, regardless of the original population's distribution. The Kaiser-Meyer-Olkin (KMO) measure of sample adequacy was used to evaluate the acceptability of the data for factor analysis. The result was a value of 0.89, which was higher than the suggested threshold of 0.6. Factor analysis was warranted since Bartlett's test of sphericity revealed a significant result ($p < 0.001$), proving that the correlation matrix was not an identity matrix.

Regression analysis was used in which R is the correlation between the observed value of the dependent variable and the predicted model in the three age categories. The indicator R-squared (R^2) is called the coefficient of multiple determination and characterises the proportion of variation in the dependent variable explained by the model. R^2 is usually interpreted as the coefficient of determination and can range from 0 to 1. The closer the R^2 value is to 1, the better the model explains the variability of the dependent variable. By keeping the predicted values unstandardised and making a correlation between the dependent variable and the predicted variable, the values were adjusted, and, like R^2 showed the proportion of variability explained by the model. When the regression was constructed on the samples, it was found that they were chosen correctly, as evidenced by the R and R^2 values, and the model in this case had a great level of significance of the criteria. The obtained results of regression analysis helped to evaluate the impact of the criterion "Professional competence

of the clinic staff” for effective management of the organisation’s performance in terms of predicting this criterion.

The next stage of this study was to conduct factor analysis to identify the most significant factors affecting the criterion. The analysis used the principal component method for factor extraction, with Varimax rotation and Kaiser normalisation. As is well known, the purpose of factor analysis is to find such complex factors that explain the observed relationships between the available variables as fully as possible. Many eigenfactors with values greater than one were first found by the study. However, the researchers concentrated on the most important components for interpretation. For instance, only the top three eigenfactors from the examination of clinic managers' responses were chosen for the further examination out of the six that were found. The researchers named each component in accordance with the recurring themes among the highly loaded variables, and they interpreted these factors based on the loadings of different criteria. Thus, this approach helped to obtain reliable results and form valid conclusions about the factors of the effectiveness of the organisation of PHC during the pandemic.

RESULTS

A comparative analysis of the answers to the questions among the three groups revealed some differences in the priorities and significance of the issues of proper organisation of work during the pandemic, and attitudes towards preventive approaches during the peak of infectious disease incidence.

The first question of this study was to determine the age composition of health personnel living in different regions of the country during the pandemic. For this, it was necessary to establish whether the selected samples drawn from the survey of respondents had a normal distribution. This, in turn, was needed to determine the possibility of conducting adequate statistical research in this perspective, with this category of people. Next, conditional table, Chi-square, Pearson’s test, and Spearman’s correlation were used to determine the number of respondents in the mentioned above age categories. It turned out that the correctness of the Chi-square test acceptable for the calculations ($p \leq 0.001$) is significant and hence the null hypothesis (H0) of the independence of variables is rejected. The region of residence of the respondents and their age were dependent on each other. For managers, an increase in the number of young respondents aged 18–39 years old was noted (here the exception was such regions as Turkestan, Aktobe, Pavlodar, East-Kazakhstan region, and Astana). It was accompanied by a continuing decline in the number of older professionals

aged over 60 years old (the exception was East-Kazakhstan, West-Kazakhstan, North-Kazakhstan, Aktobe, Zhambyl Pavlodar, and Kostanay regions).

For general practitioners, an analogous study also showed a trend towards “youthification” of specialists in this profile (exceptions were Turkestan, Aktobe, West Kazakhstan, and North Kazakhstan) and a continuing decline in the number of older specialists (exceptions were Aktobe, Zhambyl region, and Astana and Shymkent) (Table 1).

Considering the standardised residuals for the individual fields of the contingent population table, it can be concluded that this significance is mainly determined by the fields in which the variable of respondents works. That is, the hypothesis about the decrease in the number of elderly respondents among general practitioners took place in all regions of the Republic of Kazakhstan. For polyclinic nurse respondents, according to the comparison of means, and t-test for independent samples, there was no significant dependence on age composition in 17 regions of the Republic of Kazakhstan ($p = 0.766$, CI 95%). However, the expected numbers, as well as the age composition of the nurse respondents, differed from the age composition prevailing among the medical staff. There was also a tendency to “rejuvenate” the staff, but at a slower pace, the ratio of the age structure of 18-39 years and 40–60 years was almost 1.1:1 (51.3% and 45.9%, respectively). Furthermore, some areas predicted an increase in older respondents rather than younger respondents. These include such regions as Turkestan, East Kazakhstan, West Kazakhstan, North Kazakhstan, Almaty, and Karaganda. Next, the task was to predict the criteria under study among the executive respondents using regression analysis, where R amounted to 0.634, indicating a fairly strong correlation (Table 2).

The values were adjusted and like R^2. As there are no precise requirements for this indicator, the obtained value of R^2 — 0.402 — was considered to be an agreed value in this case. Table 3 prompts strong conclusions about this model. It tests the hypothesis of equality $R^2 = 0$, and therefore a high level of significance of the criterion is required ($p \leq 0.001$).

Table 4 shows the prediction for the variables, i.e., the beta weights show how much “Y” will change when “X” changes by 1 unit. As in the example above, a 1 unit change in organisational management effectiveness would change general practitioner’s competence by 0.169 and effective medical staff interaction by 0.14 ($p \leq 0.001$). If the sign of correlation is negative, an inverse relationship is observed, which means that organisational management effectiveness will increase if the number of male managers also increases by 0.066 units ($p \leq 0.01$). Thus, it was possible to obtain a prediction on these criteria for clinic managers.

Thus, when the regression was constructed on the samples of this study, it was found that the samples in this study were chosen correctly as evidenced by the R and R-squared values, and the model in this case has a high level of criterion significance. The obtained results of regression analysis helped to evaluate the impact of the criterion “Professional competence of clinic staff” for effective management of the organisation’s performance in terms of predicting this criterion. The next stage of this study was to perform a factor analysis to determine the key factors affecting the criterion “Organisational effectiveness for respondents, clinic managers”.

Table 5 shows that 6 eigenfactors have values greater than one. The three most significant factors were selected for analysis. When deciphering the table for the first component, the most significant criteria were as follows: “Sufficient provision of transport and equipment to the clinic” (r = 0.759), “Prompt delivery and provision of medicines” (r = 0.671), “Current human resources of the organisation ensure readiness to work under COVID-19 pandemic” (r = 0. 614), “Organisation of patient flow” (r = 0.579), “Prompt response of clinic staff to detection of contact/infectious patient” (r = 0.509), “Prompt completion of qualification improvement (QI) training by doctors” (r = 0.536), “Creation of conditions for staff training” (r = 0.537), “Knowledge of regulations by clinic staff” (r = 0.406), “Competence of doctor” (r = 0.405), “Competence of nurse” (r = 0.494). This data was considered as the opinion of clinic managers on the need for adequate provision of trained staff, medicines, and medical equipment. Therefore, this component was named “Provision of health facility with personnel and medical equipment”.

Next, using factor analysis, the factors affecting the second component were identified. The most significant criteria affecting the effectiveness of the organisation's management were: “Regularly approved and/or took part in the development of measures to inform the population about the conditions of medical care and disease prevention” (r = 0.741), “Systematically developed/organised activities to inform the population about the possibility of preferential provision of patients with dynamic monitoring” (r = 0.458), “Conditions for QI training were created” (r = 0.647), “Schemes/methods of forecasting costs for medicines and medical devices were used, considering the dynamics of morbidity in the region” (r = 0.717), “Ability to make proposals on volumes and types of necessary medicines and medical devices” (r = 0.83), “Coordinated volumes and types of medicines with doctors of the outpatient clinic when placing an order” (r = 0.76), “Interacted well with controlling organisations” (Healthcare Authority, Ministry of Healthcare of the Republic of Kazakhstan) (r = 0.667). This component is titled “The role of communication skills of an organisation

leader in organisational performance.” In the third component, the significant criteria were mainly as follows: “Supervisor work experience” ($r = 0.83$), “Supervisor age” ($r = 0.649$), and “Record of service in primary care” ($r = 0.88$). This component was labelled as “Supervisor experience”. Thus, some attitudes of the respondent clinic managers were explained in the factor analysis. For the effective work of the head of a medical facility (polyclinic), first of all, the clinic must be provided with trained competent staff, sufficient equipment and medicines, a low rate of personnel turnover, communication skills, the openness of the head to innovations, their experience and record of service in primary health care institutions.

In terms of general practitioners, a critical issue was to sample their competence, ways to improve it, and identify factors affecting it. For this, by calculating paired samples, the study managed to determine the degree of correlation in the samples and its significance. The most commonly used method of statistical analysis involves comparing the averages of distinct independent samples. If there is a difference in the mean values, two independent samples were compared using Student’s t-test. In addition, the significance of differences between the selected samples was determined. When determining impact, samples such as “Age”, “Doctor’s position”, and “Experience” had no impact on “General practitioners’ competence” ($p \geq 0.05$). Samples such as “Organisational management effectiveness”, “Nurse competence”, “Willingness to work under difficult conditions,” and “Doctor-nurse interaction effectiveness” had a statistically significant effect on “General practitioners’ competence” ($p \leq 0.05$).

According to Student’s t-test for paired samples, “Competence of doctors and nurses” correlated with each other ($r = 0.576$; $p < 0.001$), “Competence of doctors” correlated with the criterion of “Readiness to work under COVID-19 conditions” ($r = 0.497$; $p < 0.001$), with the “Efficiency of interaction between doctors and nurses” ($r = 0.448$; $p < 0.001$), “Prompt QI completion by nurses and doctors” ($r = 0.354$; $p < 0.001$). A moderate degree of correlation was noted between the criteria “Use of Standard Operating Procedures (SOPs) in general practitioners’ work” ($r = 0.101$; $p < 0.05$), and “Agreeing on a work plan for infection prevention” ($r = 0.183$; $p \geq 0.5$). There was no correlation between the competence of general practitioners and their involvement in complaints, the region of residence of the respondent, and the duration of work in the clinic ($r = 0.024$; $p < 0.05$) (Table 6).

The paired samples test in this case confirmed a significant difference between the selected pairs of samples. This study should also exclude the null hypothesis and take the alternative hypothesis as the basis for the hypothesis that is supported by differences and effects. The above data indicate that the readiness of general practitioners to work under the

conditions of a pandemic was influenced to a greater extent by the effective work of the organisation, sufficient medical equipment and medical devices, medicines, informing the population about coronavirus infection, preventive work in the context of the spread of infection, and management of patient flow. There was no correlation with the release of additional transport in pandemic conditions. General practitioners' use of SOPs and their readiness to work under COVID-19 were not statistically significant ($p \geq 0.05$). Upon constructing the prediction of the criteria under study among the respondents, regression analysis was used in which R is 0.668, i.e., with those on which the regression line passes, indicating a fairly strong correlation (Table 7).

The values will be adjusted and with them the R^2. The resulting R^2 value of 0.446 will be considered consistent in this case. Table 8 prompts strong conclusions about the model formed in the study, a high level of significance of the criterion is required ($p \leq 0.001$).

If "General practitioners' competence" (dependent variable) changes by 1 unit, the variable "Willingness to work under COVID-19 conditions" will change by 0.096, and "Organisation management effectiveness" will also change "General practitioners' competence" by 0.117. An inverse relationship would mean that if the "General practitioners' competence" increases, the "Experience of the polyclinic doctor" will increase by 0.037 units. Thus, the prediction of these criteria for general practitioners was obtained (Table 9).

The next stage of this study was to conduct a factor analysis to determine the key factors affecting the criterion "Organisational effectiveness" for general practitioners-respondents.

The table shows that 12 eigenfactors have values greater than one. The five most significant factors were selected for analysis. When deciphering the table of the rotated matrix of components for the first component, the most significant criteria were as follows: "Participation in activities to inform the population about the conditions of medical care and disease prevention" (r = 0.872), "Polyclinic has created conditions for QI or training, seminars related to preparedness to work under COVID-19 conditions" (r = 0.814), "Nurses of the polyclinic take prompt and sufficient QI training" (r = 0.806), "Regularity of QI training" (r = 0.749), "System of management and organisation of medical care in the polyclinic allows ensuring readiness to work under COVID-19 conditions" (r = 0.729), "Use of SOPs in work" (r = 0.717), "Participation in the development of Individual Development Plans (IDP)" (r = 0.709), "Patient flow management" (r = 0.696), "Infection detection rate" (r = 0.691), "Adequate provision of the facility with medical transport during COVID-19" (r = 0.677), "Adequate provision of medical equipment to the facility" (r = 0.638), "Prompt provision of

medicines" (r = 0.523), "Adequate provision of medical equipment to the facility" (r = 0.638), "Provision of medicines under COVID-19 conditions" (r = 0.622). Apart from these criteria in this component, the following criteria had moderate correlation with a negative sign: "Total record of service of the specialist" (r= –0.404), "Duration of work" (r= –0.319). This data was considered as "General practitioners' perception" that a specialist's length of service and length of time working in primary care was, in their opinion, essential to the effective performance of the organisation. Therefore, this component will be referred to as competent staffing of the health facility.

Next, using factor analysis, the factors affecting the second component were identified. The most significant criteria affecting the competence of doctors were as follows: "Availability of sufficient medical equipment and transport during the pandemic" (r = 0.67), "Management and separation of patient flow during the pandemic" (r = 0.699, r = 0.648), "Prompt provision of medicines and supplies to the treatment and diagnostic facility" (r = 0.663), "Participation in activities to inform the population about the conditions of medical care and disease prevention" (r = 0.654). Furthermore, such criteria as "Development of IDP for each specialist of the clinic," "Regular updating of knowledge about new versions of clinical protocols and changes in regulations," and "Creation of conditions in the clinic for QI training" were quite strongly correlated with each other and were significant. This component was named "Ways to improve the organisation of diagnostic and treatment work of primary care physicians."

To identify the factors affecting the work of general practitioners during the pandemic, the third component was considered, in which the significant criteria were as follows: "Prompt provision of medicines during the pandemic" (r = 0.519), "Sufficient diagnostic and therapeutic equipment" (r = 0.529), "Preventive work conducted among the population during the pandemic" (r = 0.427), "Separation of patient flow during the pandemic" (r = 0.598), "Preventive work conducted among the population during the pandemic" (r = 0.427), "Separation of patient flow during the epidemic" (r = 0.598), "Regular training, seminars, master classes" (r = 0.506), "Informing about changes in the regulations" (r = 0.525), "IDP development" (r = 0.623). This component was named "Key steps in overcoming the epidemic." Thus, the factor analysis explained some positions of doctors-respondents of polyclinics of general practice serving the population during epidemics. In other words, for the effective work of a medical institution (polyclinic), it is important to provide the polyclinic with uninterrupted prompt supply of medicines, transport, and medical equipment, regular training of both general practitioners and nurses of these polyclinics, knowledge of

regulations, and their new wordings. Also important for general practitioners was experience and length of service in PHC, and the low rate of personnel turnover among specialists. The work of general practitioners during the pandemic, according to the respondents, was prompt training in COVID-19, adequate supply of anti-COVID-19 medicines, segregation of patient flow, and preventive work among the population during the pandemic.

To establish whether there is a relationship between several variables such as age of respondents, education, and nursing competence level among nurses, conditional table, Chi-square, Pearson's test, and Spearman's correlation was used. 56.4% of respondents had secondary education, 37% had higher education, 5.8% had a bachelor's degree, and 0.8% had a master's degree. Among the respondents aged 18–39 years, almost 25% of the nurses had secondary education and the expected number was higher than the observed number, indicating that the variables were mutually dependent. With higher education – the expected number decreased significantly. Considering the standardised residuals in the individual fields of the randomness table for forecasting, it can be concluded that this significance is mainly determined by the fields in which the variable "Education" has the value "Average". This value is elevated among respondents aged 18–39 years and decreased among respondents aged 40–60 years, 60 years and older. In the age category 40–60 years, on the contrary, the number of respondents with higher education, bachelor, and masters increases. Proceeding from the above, it can be assumed that among the respondents among young nurses aged 18–39 years old, the number of professionals with "technical" education will decrease, and professionals with higher education with bachelor's and master's degrees, on the contrary, will increase.

During the COVID-19 pandemic, according to the nurse respondents, the "Nurses' competence" criterion identified fairly significant Pearson correlation values with "Organisational effectiveness as well as Nurses' competence and Doctors' and nurses' effectiveness in a pandemic" as well as their "Willingness to work under COVID-19 conditions." It can be concluded that the null hypothesis should be ruled out here and an alternative hypothesis that confirms those differences and effects should be adopted. At the same time, comparison criteria such as regularity of nurses' QI training and their prompt completion did not find such a connection ($p \geq 0.5$). Furthermore, nurses' competence was not strongly influenced by the use of SOPs in work ($r = 0.081$), regularity of QI training ($r = 0.189$), and the use of clinical guidelines in work ($r = 0.198$). Therewith, the criterion "Willingness to work under COVID-19" correlated quite strongly with the criteria "Use of clinical guidelines in nursing work" and "Regularity of QI training". As a result, it was found

that the competence of nurses was more influenced by effective doctor-nurse communication, and for effective work in a pandemic setting, knowledge and use of clinical guidelines, and their prompt training were of absolute significance.

Regression analysis was used to construct the forecast based on the criteria under study, where R is 0.313, i.e., with those along which the regression line runs, indicating a fairly strong correlation (Table 10).

The resulting R^2 value of 0.098 was found to be appropriate for this case. Table 11 allowed strict conclusions to be drawn about the generated model, a high level of significance of the criterion was required ($p \leq 0.001$).

As in this example, a 1-unit change would change the “Nurse’s competence” (dependent variable) and “Willingness to work during a pandemic” by 0.271. Applying the algorithm to identify an infectious patient will also change the nurse’s competence by 0.067. If the sign of correlation is negative, then there is an inverse relationship, i.e., if the “Nurses’ competence” increases, the respondent’s length of service will decrease by –0.07 units. Thus, the prognosis according to the criteria of this study for nurses was generated (Table 12).

The authors used factor analysis to determine the key factors affecting the criterion “Organisational effectiveness in nurses-respondents’ performance” (Table 13).

The table shows that 5 eigenfactors have values greater than one. Therefore, five factors were selected for analysis. The first factor explains 45.182% of the total variance, the second explains 14.61%, and the third explains 5.22%. The principal component method was used to select factors; the programme used the Varimax rotation with Kaiser normalisation to rotate factors. Of the 5 components, 3 were the most significant.

DISCUSSION

The findings of this study are of considerable interest to assess and analyse the performance of the PHC system in Kazakhstan during the COVID-19 pandemic. These results not only highlight the current state of the healthcare system but also identify a range of critical aspects that need to be considered when planning and implementing strategies to improve the situation.

The first essential aspect identified in the study is the “youthification” of the personnel of polyclinic doctors. This is due to both natural demographic processes and the optimisation of personnel policy aimed at attracting young specialists. Younger staff may be more adaptable to new technologies and practices, which is a positive change. However, it should be considered that experienced doctors of pre-retirement and retirement age also play a vital

role in ensuring continuity in the work of medical institutions [7]. Therefore, in the development of personnel policy, it is essential to strike a balance between attracting young specialists and retaining experienced staff, because this factor can affect the quality of treatment [8]. The creation of policies that support mentorship programmes that pair up younger healthcare workers with experienced specialists would be one way to keep a balanced workforce. Another way would be to devise retention strategies for older healthcare workers, such as roles that leverage their experience without requiring them to perform manual labour. A. Goyal and P. Ish noted the high performance of young medical personnel during COVID-19, and low risk of mortality due to increased risk of becoming ill during exposure [9]. S. Hassamal et al. [10] conducted a survey among medical staff on the level of stress and burnout, it was determined that personnel with long work experience had sharply expressed symptoms of depression of medium severity and psycho-emotional exhaustion, which can affect professional activity. In this study, the percentage of staff with up to 5 years of experience was about 48.5%, which correlates with the results of this study as the percentage of young nurses between 18 and 39 years was 51.3%.

Organisational management is also key to effective pandemic control [11]. Polyclinic managers note that the speed of staff response to the identification of suspected COVID-19 cases, responsiveness to ongoing tasks, and adequacy of staffing substantially affect management performance. However, they do not attach much importance to community outreach. This may be one of the reasons why some people are not sufficiently aware of coronavirus infection prevention measures [12]. It is recommended to strengthen community outreach to increase awareness and adherence to prevention recommendations. This could involve funding for community health worker programs, public health campaigns tailored to local contexts, and the integration of health education into school curricula. Apart from that, communication between different levels of healthcare providers is also very important, which underscores the need for policies that promote interdisciplinary collaboration. Teams-based care models and formal channels of regular communication between various healthcare roles (such as regular interdisciplinary case conferences or the use of integrated electronic health record systems that facilitate information sharing) would be beneficial additions to healthcare systems.

A.D. Kaye et al. [13] note the global nature of the shortage of staffing, medicines, and medical equipment in the USA during the pandemic, with costs of up to $52 billion per month, which was a massive burden on the healthcare system at that time. Proceeding from this experience, the participating managers were most likely guided by their experiences

during the pandemic, which is consistent with the results of the cited study. Another significant factor is working under understaffed conditions, which was also observed in the pre-pandemic period, which substantially affected the quality of care through physical and psycho-emotional exhaustion of human resources. In their review of 7.334 articles, M. Iddrisu et al. [14] noted that almost 90% of nurses have post-traumatic stress disorder, depression, sleep disturbance, and general asthenia, especially in young staff due to the enormous workload. Therefore, managers in Kazakhstan are particularly emphasising this point, as it is difficult to coordinate the work of exhausted staff in an atmosphere of increasing workload.

The preparedness of physicians to work in a pandemic also has an impact on the effectiveness of COVID-19 control [15]. Provision of necessary medical devices and medicines, informing the population and organising patient flows are significant for polyclinic therapists. However, SOPs and algorithms according to COVID-19 do not have a statistically significant effect on physician readiness. This may indicate that additional education and training in medical skills and protocols may be more effective ways to prepare health personnel to work in complex epidemiological settings. E.S. Leibner et al. [16] agrees with this fact, where it was noted that the staff was not prepared for such a load and in most cases lacked the necessary skills in emergency care, as a result, a special algorithm was developed to train medical staff to work with patients with this pathology, which showed extremely high efficiency in improving the quality of staff work with this group of patients.

The found relationship between good organisational management and sufficient clinic funding points to a crucial area in which policy intervention is needed. The idea that healthcare institutions should be prepared to handle spikes in demand is applicable everywhere, even though the precise resource requirements may differ from nation to nation. These results could be used by policymakers to support further funding for primary healthcare facilities, especially for telemedicine capabilities, which were vital during the pandemic. Moreover, creating nationwide inventories of necessary medical supplies and equipment under a rotating inventory system may improve readiness for unforeseen medical emergencies.

The competence of medical staff also plays a vital role, especially in their interactions with doctors and in the application of clinical protocols. Regular training of nursing staff on COVID-19 is of high value and should be continued. Q. Liu et al. [17] investigated the staff performance in China during COVID-19. It was found that doctors and nurses were unprepared to work under pandemic conditions, reflected in low treatment efficacy, high staff morbidity, and early psycho-emotional burnout, confirming the need for additional training

for staff to improve pandemic performance [18]. Thus, in this study, during the survey, the respondents also mention the significance of doctors' and nurses' competence in working in this setting. Robust training programmes emphasising crisis management, adaptability, and clinical abilities would be beneficial to healthcare systems worldwide. The current study's findings indicate that regular, focused training sessions greatly increase healthcare staff members' preparedness for handling emergencies. Policymakers should think about requiring yearly crisis preparedness training for all medical personnel, which would include role-playing of a variety of public health events, not simply infectious disease outbreaks. However, L.J. Labrague and J.A.A. de Los Santos note the negative impact of training among nurses [19]. The study found that nurses who had undergone specialised training were more stressed by the fear of contracting a new coronavirus infection, which was reflected in lower quality of care.

Another factor of significance noted by participants in this study is the rational triage of patients. Replication of coronavirus patients plays a critical role in pandemic management as it allows rapid and effective assessment of patient severity, prioritisation of treatment for those in need of immediate medical attention, and optimisation of the use of limited healthcare resources. This approach helps reduce the risk of overburdening health facilities and provides more targeted treatment, helping to reduce the spread of the virus and COVID-19 mortality. A. Gilbert and A. Ghuysen also cite data that during the pandemic period, the triage protocol changed several times due to the emergence of new diagnostic methods other than polymerase chain reaction, as well as to the acquisition of experience in the treatment of this group of patients, which reflects the high importance of triage for foreign clinics [20]. Thus, F. Alhaidari et al. [21] noted that a rational triage system speeds up care, reduces emergency department costs, and offloads staff, especially during a pandemic.

This study primarily examines how the COVID-19 pandemic affected PHC performance in Kazakhstan, but it's also important to take into account the possibility that several pre-existing problems within the healthcare system and external socio-economic factors may have also had an impact on the observed outcomes. The healthcare system in Kazakhstan, like many other post-Soviet nations, has undergone reforms since independence. Pre-existing problems could have made the pandemic more difficult to contain, including inadequate funding, unequal distribution of healthcare resources between urban and rural areas, and ageing infrastructure [22]. These systemic issues could have affected PHC facilities' capacity to respond to the crisis.

Socioeconomic variables also have a significant impact on healthcare outcomes. The economic conditions in Kazakhstan, such as income inequality and regional disparities, may have affected population health overall and access to healthcare services. These variables may have also had an impact on the workload and effectiveness of PHC facilities during the pandemic, as well as their ability to handle the increased demand. Finally, cultural factors and public health literacy levels may have had an impact on how the population responded to preventive measures and sought medical attention during the pandemic.

However, this study was conducted only in Kazakhstan, and its results may be limited by the national specificity of the healthcare system. A comparative analysis of the situation in different countries should be carried out to get a broader picture and identify common patterns. Further research focusing on the impact of differences in emergency care in Kazakhstan on the quality of performance in the setting of a new coronavirus infection is needed to complement the findings of this paper. The results obtained can be used to develop recommendations to improve the training and activities of medical organisations in the spread of COVID-19 and other infectious diseases. Special attention should be paid to the issues of personnel policy, logistical, and medicinal supply, as well as information support of anti-epidemic measures. It is also recommended that research in this area should continue to continuously improve the healthcare system.

CONCLUSIONS

The study identified a range of key factors determining the performance of medical staff in Kazakhstan during the COVID-19 pandemic. Firstly, nurses' competence was found to be more dependent on effective interaction with doctors and prompt training, while regular QI and use of SOPs did not show statistically significant effects on their professional competence.

The trend of increasing numbers of young nurses with tertiary education deserves special attention. This indicates an improvement in educational standards and may improve the quality of health services in the future, but at the moment it poses some difficulties in implementing innovations as staff lack the experience to effectively utilise new treatment protocols and work on the ward. Prompt training, provision of medicines, separation of patient flow and preventive community outreach were also important to the effective work of general practitioners during the pandemic. These factors, along with sufficient diagnostic and treatment equipment, were key to overcoming the epidemic. Furthermore, a strong correlation was found between doctors' and nurses' competence and their willingness to work during a

pandemic, emphasising the significance of psychological resilience and training. The effective management of the organisation also depended on the management's ability to adapt to changing conditions, to communicate effectively with the public and to interact with regulatory authorities.

In conclusion, ensuring that clinics have the necessary transport, equipment, and medicines, as well as competent and trained staff, are key factors in ensuring that health facilities can operate effectively in a pandemic. All these findings emphasise the significance of an integrated approach to the management of healthcare facilities, including the quality of education and training of healthcare personnel, effective communication within the team, and providing the necessary resources to adequately respond to health emergencies. It is critical to recognise some of this study's limitations. The use of questionnaires that rely solely on self-reported data raises the possibility of biases such as social desirability bias or recollection bias, which could skew the results. Furthermore, the study's cross-sectional design gives us only a momentary view of the circumstances, making it difficult for us to monitor developments throughout the epidemic. Despite having a high sample size, the questionnaire approach might not fully capture the complexity of the experiences of healthcare workers and might overlook subtle insights that could be discovered using qualitative methods. Additionally, while the study's emphasis on the perspectives of healthcare workers is essential, it excludes the opinions of patients and managers of the health system, which could offer a more thorough assessment of PHC performance during the pandemic. Finally, the analysis may not have properly taken into consideration regional differences in COVID-19 impact and healthcare resources within Kazakhstan, which could restrict the applicability of the findings to all regions of the nation.

Further research could develop in several directions. Firstly, benchmarking with other countries can provide a unique opportunity to learn what strategies and approaches have been effective in diverse economic and cultural contexts. This will help in adapting successful practices and lessons learnt for Kazakh PHCs. A second area of focus could be to investigate the long-term effects of the pandemic on PHC. Such analyses will help to understand what changes in care for this patient group have been most sustainable, and what strategies are used after a crisis. A third major area is to assess the impact of government support on PHC during a pandemic. Understanding the effectiveness of different support programmes and their contribution to the survival and development of PHC will provide valuable guidance for future public policy interventions.

Article information and declarations

Data availability statement

The data that support the findings of this study are available on request from the corresponding author (A.M.).

Ethics statement

All procedures performed in studies involving human participants were by the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. A study was approved by the National Ethics Commission of the Salidat Kairbekova National Research Centre for Health Development on September 21, 2022, No 1045-B.

Author contributions

Study design: AM, DO, AT; data collection: AT, TS, IF; data analysis: TS, DO; supervision: AM, AT; manuscript writing: AM, DO, TS; critical revision for important intellectual content: AM, AT, IF.

Funding

This study was conducted within the framework of the programme-targeted funding of the IRN OR12165486-OT-23 “National Programme for Implementation of Personalised and Preventive Medicine in the Republic of Kazakhstan 2021–2023”.

Acknowledgements

None.

Conflict of interest

The authors declare no conflict of interest.

REFERENCES

1. Omar NO, Stepkina YL. Assessment of the activities of ambulance and emergency medical care in the Almaty region in the context of coronavirus infection. Cent Asian Sci Pract J Public Health. 2021; 3: 89–92.
2. Sagatkali AS, Tussupkaliyeva K, Urazayeva ST, et al. Analysis of Mortality from COVID-19 in the Atyrau Region during the Outbreak in 2020. ЗДОРОВЬЕ

НАСЕЛЕНИЯ И СРЕДА ОБИТАНИЯ - ЗНиСО / PUBLIC HEALTH AND LIFE ENVIRONMENT. 2022: 18–23, doi: 10.35627/2219-5238/2022-30-3-18-23.

3. Mukhamedyarova AB, Rakhypbekov TK, et al. Te impact of COVID-19 on the performance of primary health care service providers in a capitation payment system in the Republic of Kazakhstan. 2021; 23(5): 6–12.
4. Yerniyazov NB, Aringazina A. IMPACT OF COVID-19 PANDEMIC ON NEUROSURGICAL SERVICES. Bull Kazakh Natl Med Univ. 2021(1): 335–339, doi: 10.53065/kaznmu.2021.78.65.070.
5. Adilbekov EB, Akhmetzhanova ZB, Adilbekova BB, et al. ORGANIZATION OF STROKE SERVICE DURING CORONAVIRUS INFECTION PANDEMIA (SARS-COV-2) IN THE REPUBLIC OF KAZAKHSTAN. Нейрохирургия и неврология Казахстана. 2021(1): 40–53, doi: 10.53498/24094498_2021_1_40.
6. Utaganov B. Features of providing emergency medical care during a pandemic (literature review). Cent Asian Sci Pract J Public Health. 2021; 3: 104–116.
7. Lee YY, Medford ARL, Halim AS. Burnout in physicians. J R Coll Physicians Edinb. 2015; 45(2): 104–107, doi: 10.4997/JRCPE.2015.203, indexed in Pubmed: 26181523.
8. Jalil A, Mahmood QK, Fischer F. Young medical doctors' perspectives on professionalism: a qualitative study conducted in public hospitals in Pakistan. BMC Health Serv Res. 2020; 20(1): 847, doi: 10.1186/s12913-020-05681-w, indexed in Pubmed: 32912271.
9. Goyal A, Ish P. Young doctors for UK-India telemedicine and COVID-19: the need of the hour. QJM. 2022; 115(7): 497, doi: 10.1093/qjmed/hcab213, indexed in Pubmed: 34347107.
10. Hassamal S, Dong F, Hassamal S, et al. The Psychological Impact of COVID-19 on Hospital Staff. West J Emerg Med. 2021; 22(2): 346–352, doi: 10.5811/westjem.2020.11.49015, indexed in Pubmed: 33856322.
11. Montagna E, Donohoe J, Zaia V, et al. Transition to clinical practice during the COVID-19 pandemic: a qualitative study of young doctors' experiences in Brazil and Ireland. BMJ Open. 2021; 11(9): e053423, doi: 10.1136/bmjopen-2021-053423, indexed in Pubmed: 34551956.
12. To KKW, Sridhar S, Chiu KHY, et al. Lessons learned 1 year after SARS-CoV-2 emergence leading to COVID-19 pandemic. Emerg Microbes Infect. 2021; 10(1): 507–535, doi: 10.1080/22221751.2021.1898291, indexed in Pubmed: 33666147.
13. Kaye AD, Okeagu CN, Pham AD, et al. Economic impact of COVID-19 pandemic on healthcare facilities and systems: International perspectives. Best Pract Res Clin Anaesthesiol. 2021; 35(3): 293–306, doi: 10.1016/j.bpa.2020.11.009, indexed in Pubmed: 34511220.
14. Iddrisu M, Poku CA, Mensah E, et al. Work-related psychosocial challenges and coping strategies among nursing workforce during the COVID-19 pandemic: a scoping review. BMC Nurs. 2023; 22(1): 210, doi: 10.1186/s12912-023-01368-9, indexed in Pubmed: 37337228.

15. Babu GR, Khetrapal S, John DA, et al. Pandemic preparedness and response to COVID-19 in South Asian countries. Int J Infect Dis. 2021; 104: 169–174, doi: 10.1016/j.ijid.2020.12.048, indexed in Pubmed: 33370566.
16. Leibner ES, Baron EL, Shah RS, et al. Critical Care Simulation Education Program During the COVID-19 Pandemic. J Patient Saf. 2022; 18(4): e810–e815, doi: 10.1097/PTS.0000000000000928, indexed in Pubmed: 34569992.
17. Liu Q, Luo D, Haase JE, et al. The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. Lancet Glob Health. 2020; 8(6): e790–e798, doi: 10.1016/S2214-109X(20)30204-7, indexed in Pubmed: 32573443.
18. Mulyadi M, Dedi B, Hou WL, et al. Nurses' experiences of emergency department triage during the COVID-19 pandemic in Indonesia. J Nurs Scholarsh. 2022; 54(1): 15–23, doi: 10.1111/jnu.12709, indexed in Pubmed: 34741408.
19. Labrague LJ, de Los Santos JA. Fear of COVID-19, psychological distress, work satisfaction and turnover intention among frontline nurses. J Nurs Manag. 2021; 29(3): 395–403, doi: 10.1111/jonm.13168, indexed in Pubmed: 32985046.
20. Gilbert A, Ghuysen A. Triage in the time of COVID-19. Lancet Digit Health. 2022; 4(4): e210–e211, doi: 10.1016/S2589-7500(22)00001-2, indexed in Pubmed: 35279398.
21. Alhaidari F, Almuhaideb A, Alsunaidi S, et al. E-Triage Systems for COVID-19 Outbreak: Review and Recommendations. Sensors (Basel). 2021; 21(8), doi: 10.3390/s21082845, indexed in Pubmed: 33920744.
22. Türkkan A. Health systems in the COVID-19 pandemic: The case of Kazakhstan. Community Physician. 2022; 37(5): 323–329.

Table 1. Chi-square tests

	Value	St.St.	Asymptotic significance (2-way)	Monte Carlo significance (2-way)			Monte Carlo significance (1-way)		
				Value	99% confidence interval		Value	99% confidence interval	
					Bottom	Upper		Bottom	Upper
Pearson chi-square	64.429a -	32	0.001	0.001b _	0	0.001			
Likelihood ratios	72.249	32	0	0b –	0	0			
Fisher’s exact test	66.865			0b –	0	0			
Line-to-linear	15.783 s	1	0	0b –	0	0	0b	0	0

connection									
Number of valid observations	2595								

Source: compiled by the authors of this study

Table 2. Summary for model [b]

Model	R	R^2	Adjusted R^2	Standard error of estimate	Change statistics		St.St. 1	Art.St. 2	Meaning Change F
					Change R^2	Change F			
1	0.634 a –	0.402	0.388	0.432	0.402	27.726	42	1730	0

Note: (a) Predictors: (constant), COVID-19 information coverage, length of staff time, interaction with the Department of Healthcare Management, level of polyclinic, adequate provision of transportation means, respondent's region of residence, doctors' opinion on procurement of medicines, respondent's gender, involvement in handling patient complaints, use of Standard Operating Procedures (SOPs) in staff work, doctor's competence, respondent's education, regular qualification improvement (QI), development of benefits for patients of the polyclinic, use of forecasting in work, Individual Development Plan (IDP) developed, prompt problem solving, age of the respondent, provision of medicines for COVID-19, staff interaction, regular updating of knowledge of regulations, sufficient provision of outpatient clinic equipment, involvement in IDP development, prompt supply of medicines, speed of COVID-19 detection, prompt training of nurses and doctors for QI, readiness to work under COVID-19, organisation of patient flow, ability to make proposals on volumes and types of required medicines and medical devices, organisation of management under COVID-19, interaction between doctors and nurses, duration of work in the polyclinic, competence of nurses, created conditions for QI, the attached population is sufficiently covered by the information campaign on COVID-19 prevention, sufficient provision of transport and equipment for COVID-19, the total record of service of the respondent; b) dependent variable: the efficiency of the organisation

Source: compiled by the authors of this study

Table 3. Model ANOVA[a]

Model		Sum of squares	St.St.	Middle square	F	Significance
1	Regression	217.353	42	5.175	27.726	0b –
	Remainder	322.909	2205	0.187		
	Total	540.262	1772			

Note: (a) dependent variable: organisational management performance

Source: compiled by the authors of this study

Table 4. The coefficients or beta weights of each independent variable separately (a)

Model	Non-standard coefficient		Standard coefficient	T	Value	95% confidence interval for B	
	B	Standard error	Beta			Bottom	Upper
(Constant)	0.376	0.101		3.707	0	0.177	0.574
Region of residence of the respondent	–0.004	0.002	–0.036	–1.85	0.064	–0.008	0
Polyclinic level	0.025	0.022	0.022	1.108	0.268	–0.019	0.069
Gender of respondent	–0.066	0.031	–0.044	–2.15	0.032	–0.125	–0.006
Age of respondent	0.03	0.026	0.03	1.139	0.255	–0.021	0.08
Record of service as a manager	0.009	0.009	0.027	1.062	0.288	–0.008	0.027
Total record of service	–0.037	0.015	–0.081	–2.45	0.014	–0.066	–0.007
Education	–0.014	0.012	–0.025	–1.162	0.245	–0.037	0.01
Duration of operation	0.005	0.013	0.012	0.363	0.717	–0.021	0.03
Duration of work in the polyclinic	0.009	0.01	0.026	0.916	0.36	–0.011	0.029
Physician competence	0.169	0.024	0.19	6.989	0	0.122	0.217

Competence of the nurse	0.019	0.025	0.022	0.779	0.436	–0.029	0.068
Interaction between doctor and nurse	–0.03	0.025	–0.034	–1.199	0.231	–0.080	0.019
Interaction of outpatient clinic staff	0.14	0.027	0.143	5.168	0	0.087	0.193
Prompt resolution of problems	0.063	0.021	0.073	3.03	0.002	0.022	0.103
Liaising with the Healthcare Authority	0.057	0.016	0.097	3.644	0	0.026	0.087
Readiness to work during COVID-19	–0.021	0.02	–0.028	–1.042	0.297	–0.059	0.018
Coordinating medicines supplies with doctors	–0.064	0.019	–0.097	–3.394	0.001	–0.101	–0.027
Consideration of doctors' opinions when purchasing medicines	0.082	0.025	0.082	3.223	0.001	0.032	0.132
Opportunity to make suggestions	0.006	0.015	0.012	0.419	0.675	–0.023	0.035
Use of forecasting in work	–0.005	0.014	-0.009	–0.343	0.732	–0.032	0.023
Prompt supply of medicines	–0.003	0.017	–0.005	–0.19	0.85	–0.036	0.03
Prompt supply of medicines under COVID-19	–0.012	0.022	–0.014	–0.536	0.592	–0.054	0.031
Sufficient equipment	0.019	0.016	0.03	1.225	0.221	–0.012	0.05
Sufficient means of transport at the polyclinic	0.002	0.014	0.004	0.13	0.897	-0.025	0.028
Sufficient equipment	–	0.019	–0.016	–	0.598	–0.047	0.027

and transport under COVID-19	0.01			0.528			
Detection rate under COVID-19	0.078	0.024	0.083	3.195	0.001	0.03	0.126
Use of SOPs	–0.004	0.019	–0.004	–0.203	0.839	–0.04	0.033
Organisation of patient flow segregation	0.047	0.022	0.057	2.112	0.035	0.003	0.091
Interaction between doctors and personnel	0.027	0.025	0.028	1.094	0.274	-0.022	0.076
Involvement in the resolution of patient complaints	–0.01	0.008	–0.028	–1.256	0.209	–0.026	0.006
Organisation of management under COVID-19	0.101	0.025	0.113	4.07	0	0.052	0.15
Involvement in the IDP development	0.008	0.014	0.015	0.611	0.541	–0.018	0.035
Conditions for QI are good	0.006	0.013	0.012	0.412	0.68	–0.021	0.032
Regular completion of QI	0.008	0.018	0.012	0.436	0.663	–0.027	0.043
Regular updating of knowledge of regulations	–0.048	0.019	–0.064	–2.554	0.011	–0.086	–0.011
Prompt QI by doctors and nurses	0.033	0.024	0.038	1.393	0.164	–0.013	0.079
Participation in infection prevention awareness	0.004	0.017	0.007	0.238	0.812	–0.03	0.038
Informing the population about the benefits	0.013	0.018	0.018	0.697	0.486	–0.023	0.048

Note: (a) dependent variable: organisational management performance

Source: compiled by the authors of this study

Table 5. Matrix of rotated components (a, b)

	Raw materials						Recalculated					
	Component						Component					
	1	2	3	4	5	6	1	2	3	4	5	6
Region of residence		0.842		0.628		4.687		0.175		0.131		0.974
Polyclinic level						–0.083						–0.167
Gender			0.089						0.25			
Age			0.364	–0.062					0.649	–0.11		
Manager’s record of service		0.254	1.324	–0.397				0.159	0.829	–0.249		
Total record of service			1	–0.173					0.83	–0.144		
Education	0.302	–0.311	–0.167	–0.153			0.302	–0.312	–0.168	–0.154		
Duration of operation		–0.144	1.24	0.141	–0.174			–0.102	0.88	0.1	–0.123	
Duration of work in the polyclinic			1.274	0.546	–0.257				0.822	0.352	–0.166	
Physician competence	0.203						0.405					

Competence of nurses	0.256						0.494					
Interaction between doctors and nurses	0.221						0.458					
Personnel interaction	0.167						0.403					
Prompt resolution of problems	0.243						0.457					
Interaction with the Healthcare Authority		0.622		0.180				0.667		0.193		
Readiness to work during COVID-19	0.396						0.614					
Coordination of medicines supply with doctors		0.644						0.76				

Consideration of the opinion of doctors on the purchase of medicines and medical equipment	0.104	0.163		–0.055			0.223	0.352		–0.119		
Manager's suggestions on the volume and types of medicinal products		0.853						0.83				
Use of forecasting of consumption of medicines and medical devices	0.125	0.719					0.124	0.717				
Prompt delivery of medicines to the polyclinic	0.482						0.671					

Sufficient provision of medicines under COVID-19	0.36	0.059					0.615	0.101				
Sufficient equipment	0.523						0.659					
Sufficient means of transport at the polyclinics	0.755						0.729					
Provision of transport and equipment under COVID-19	0.611						0.759					
COVID-19 detection rate	0.221						0.509					
Use of SOPs	0.161						0.273					

Organisation of patient flow segregation	0.322						0.579					
Interaction between doctors and staff is good	0.208						0.477					
Involvement in the resolution of patient complaints		0.515		0.322	1.367			0.335		0.21	0.889	
Organisation of management under COVID-19	0.285						0.584					
IDP development	0.519			0.172	0.094		0.595			0.197	0.108	
Conditions for QI are good		0.773		0.661	0.141			0.647		0.554	0.118	
Regular completion of QI	0.293	0.085	–0.097	0.158			0.441	0.128	–0.146	0.237		

Regular updating of knowledge of regulations	0.247	0.183					0.401	0.298				
Prompt QI by doctors and nurses	0.269						0.536					
Development of measures to inform the population about the prevention of infection	0.117	0.658			0.165		0.132	0.741			0.186	
Development of measures to inform the population about the preferential provision of medicinal products	0.237	0.334			0.132		0.324	0.458			0.181	

The population is sufficiently covered with information about COVID-19	0.065						0.107					

Note: Factor extraction method: principal component method. Rotation method: Varimax with Kaiser normalisation. a) rotation converges in 5 iterations; b) only observations for which effective organisational management = 1 yes are used in the analysis phase.

Source: compiled by the authors of this study

Table 6. Paired sample correlations

		N	Correlation
Pair 1	Region of residence & doctors' competence	2010	0.036
Pair 2	Doctors' competence & record of service in the polyclinic	2012	0.02
Pair 3	Doctors' competence & nurses' competence	2012	0.576
Pair 4	Doctors' competence & Readiness to work under COVID-19	2012	0.497
Pair 5	Competence and interaction between doctors and nurses	2012	0.448
Pair 6	Doctors' competence & Knowledge of regulations	2012	0.314
Pair 7	Prompt QI completion by nurses & doctors' competence	2012	0.354
Pair 8	Doctors' competence & the use of SOPs	2012	0.101
Pair 9	Participation in handling patients' complaints & doctors' competence	2012	0.024

Source: compiled by the authors of this study

Table 7. Summary for model (b)				
Model	**R**	**R^2**	**Adjusted R^2**	**Standard estimate error**
1	0.668a –	0.446	0.443	0.438

Note: (a) predictors: (constant), use of medicine consumption prediction, total years of experience, use of SOPs, nurses' competence, COVID-19 detection rate, infection prevention measures in the population, organisational management performance, willingness to work under COVID-19, specialist length of service; (b) dependent variable: doctors' competence.

Source: compiled by the authors of this study

Table 8. ANOVA (a)					
Model	**Sum of squares**	**St.St.**	**Average area**	**F**	**Value**
Regression	308.787	10	30.879	161.123	0b –
Residue	383.484	2586	0.192		
Total	692.27	2596			

Note: (a) dependent variable: doctors' competence; (b) predictors: (constant), use of medicines consumption prediction, total years of experience, use of SOPs in work, nurses' competence, infection detection rate, infection prevention measures, organisational management performance, willingness to work under COVID-19 conditions, doctor' record of service.

Source: compiled by the authors of this study

Table 9. Coefficients (a)					
Model	**Non-standard coefficient**		**Standard coefficient**	**T**	**Value**
	B	**Standard error**	**Beta**		
(Constant)	0.306	0.036		8.441	0
Professional experience	–0.037	0.017	–0.107	–2.185	0.029
Total record of service	0.041	0.017	0.119	2.442	0.015
Effectiveness of the organisation's management	0.117	0.015	0.162	7.72	0
Nurses' competence	0.302	0.017	0.357	17.887	0
Willingness to work under COVID-19	0.096	0.014	0.151	6.713	0

Preventive work under COVID-19	0.045	0.015	0.062	2.933	0.003
Infection detection rate	0.083	0.018	0.087	4.498	0
Use of SOPs in the workplace	–0.02	0.009	–0.039	–2.209	0.027
Infection prevention measures	0.044	0.014	0.063	3.258	0.001
Medicines consumption forecasting	0.023	0.011	0.038	1.996	0.046

Note: (a) Dependent variable: doctors' competence

Source: compiled by the authors of this study

Table 10. Summary for model (b)

Model	R	R^2	Adjusted R^2	Standard error of estimate	Statistics of change				
					Changes in R-square	Changes in F	St.St 1	St. 2	Meaningful changes in F
1	0.313 a	0.098	0.097	0.425	0.098	162.604	4	5558	0

Note: (a) predictors: (constant), use of infection detection algorithm 5, use of SOP in work 5, willingness to work under COVID-19 5, knowledge of regulations 5; (b) dependent variable: nurses' competence 5

Source: compiled by the authors of this study

Table 11. ANOVA (a)

Model	Sum of squares	St.St.	Average area	F	Value
Regression	117.563	4	29.391	162.604	0b
Residue	1082.689	5558	0.181		
Total	1200.251	5562			

Note: (a) dependent variable: nurses' competence 5; (b) predictors: (constant), use of infection detection algorithm 5, use of SOPs in work 5, willingness to work under COVID-19 5, knowledge of regulations 5

Source: compiled by the authors of this study

Table 12. Coefficients (a)

Model	Non-standard	Standard	T	Valu	Correlations

	coefficient		coefficient		e			
	B	Standard error	Beta			Zero order	Partially	Component
(Constant)	0.664	0.025		26.089	0			
Readiness to work under COVID-19 5	0.336	0.017	0.271	19.746	0	0.303	0.247	0.242
Knowledge of regulations 5	0.034	0.015	0.032	2.314	0.021	0.165	0.03	0.028
Use of SOPs 5	0	0.011	0	–0.022	0.982	0.08	0	0
Use of the COVID-19 detection algorithm 5	0.11	0.022	0.067	4.995	0	0.155	0.064	0.061

Note: (a) dependent variable: nurses' competence 5

Source: compiled by the authors of this study

Table 13. Explained total variance (a)

Component	Initial eigenvalues			Extraction of the sum of squares of loads			Rotation of the sum of squares of loads		
	Total	% of variance	Total %	Total	% of variance	Total %	Total	% of variance	Total %
1	9.126	45.182	45.182	9.126	45.182	45.182	1.423	7.046	7.046
2	2.951	14.61	59.792	2.951	14.61	59.792	8.229	40.742	47.788

3	1.054	5.22	65.011	1.054	5.22	65.011	2.494	12.346	60.134
4	1.035	5.122	70.133	1.035	5.122	70.133	0.675	3.342	63.476
5	0.54	2.671	72.804	0.54	2.671	72.804	1.884	9.329	72.804
6	0.443	2.191	74.995						
7	0.433	2.143	77.139						
8	0.375	1.859	78.998						
9	0.334	1.652	80.649						
10	0.291	1.439	82.088						
11	0.282	1.396	83.484						
12	0.268	1.326	84.81						
13	0.243	1.202	86.012						
14	0.227	1.122	87.134						
15	0.202	1.002	88.136						
16	0.191	0.948	89.084						
17	0.185	0.915	89.998						
18	0.174	0.86	90.858						
19	0.164	0.812	91.67						
20	0.159	0.787	92.457						
21	0.142	0.701	93.158						
22	0.12	0.641	93.79						

	9		9						
23	0.126	0.623	94.422						
24	0.116	0.576	94.998						
25	0.098	0.488	95.486						
26	0.092	0.456	95.942						
27	0.083	0.409	96.351						
28	0.077	0.38	96.73						
29	0.072	0.356	97.086						
30	0.067	0.331	97.417						
31	0.064	0.315	97.732						
32	0.058	0.286	98.019						
33	0.054	0.266	98.285						
34	0.052	0.259	98.543						
35	0.048	0.236	98.78						
36	0.046	0.227	99.006						
37	0.045	0.221	99.227						
38	0.043	0.212	99.439						
39	0.04	0.196	99.635						
40	0.038	0.19	99.825						
41	0.035	0.175	100						

Source: compiled by the authors of this study