Due to announcement by the World Health Organization of the new coronavirus COVID-19 as a pandemic, the President of the Republic of Kazakhstan declared a state of emergency in the country on March 16, 2020.

By order of the President of the Republic of Kazakhstan, the Ministry of Healthcare of the Republic of Kazakhstan together with Kazakhstan IT companies formed an IT Headquarters for the fight against coronavirus.

The IT Headquarters included representatives of the Ministry of Healthcare, local executive bodies (Akimat of Nur-Sultan, Akimat of Almaty), subordinate organizations of the Ministry of Healthcare of the Republic of Kazakhstan, other government agencies and Kazakhstan IT developers.

In the early days of the state of emergency, 70% of Ministry of Healthcare employees switched to remote work (online). At the same time, all students of 5 large medical institutions of the country switched to distance learning using digital technologies.

The Ministry of Healthcare of the Republic of Kazakhstan jointly with subordinate organizations and with Kazakhstan IT developers, based on the available resources of the Ministry of Healthcare, developed and launched a number of IT solutions against COVID-19.

In addition, Kazakhstan mobile operators provided free communication and the Internet during a state of emergency for 16,000 doctors, and more than 400 medical organizations (more than 30,000 jobs) received updates and support for the antivirus program.

The main of IT solutions are presented below:

Online learning

The most important area is the professional development and skills of medical personnel in healthcare organizations. For example, an online training was launched on the topic: "Digital technology to ensure the infectious safety of a medical specialist."

Telecentre to ensure the infectious safety of medical professionals

In Semey Medical University, in collaboration with the Healthcare Department of the East Kazakhstan Region, a telecentre has been created to ensure the infectious safety of medical specialists, whose work is aimed at reducing the risk of infection of medical personnel through the use of video communications. Using this technology, it becomes possible to remotely consult colleagues who are close to the patient with all the narrow specialists of the created headquarters. Also, through video communication, access to the patient is provided through direct visualization. All regions of Kazakhstan, more than 130 students of medical workers, joined online training.

Electronic questionnaire

The Digitalization Office also launched an electronic questionnaire to pass an express test for coronavirus infection, citizens who fill out an online questionnaire after an epidemiological sample will be able to pass an express test. A positive test result shows in a person a patient in an acute form or already defeated coronavirus. If the patient is in the acute phase, a special mobile team will be sent to him. In addition, mobile points will be installed in megacities. But they will be

invited to test in them only on the basis of questionnaires. After receiving a positive result, according to the algorithm, additional testing will be carried out. At the same time, doctors emphasize that rapid testing is only an additional tool. An accurate diagnosis and treatment is prescribed only after laboratory PCR testing. It takes 6 hours. The test allows you to immediately isolate a possible carrier of the virus.

New feature in the Smart Astana mobile app

It will allow to control the movement of persons in contact with the infected coronavirus.

The solution is embedded in the Smart Astana application. People who are at home quarantine will be required to download this application and provide access to GPS, Wi-Fi, Bluetooth and data from the sensors of the smartphone. When you leave the home quarantine perimeter, a reminder will be sent that you must comply with the home quarantine measures. In addition, it is planned to call contact numbers on phones and warn that they return to home quarantine.

In the beginning, it is planned to test the instrument in the capital, then it may be introduced in other cities and regions of the country. Those who download the application will be the first to get access to mobile stations and be able to pass the coronavirus test.

Online hackathon Anti-Corona

Anti-corona is an online open-source hackathon dedicated to creating a unified information resource to raise public awareness of the situation with coronavirus and prevent its spread. The hackathon's activity is aimed at creating a set of accessible digital resources with reliable and relevant information about the situation around Covid-19 in Kazakhstan.

The work of the hackathon was organized by the Alem School of Programming with the support of the Foundation of the First President of the Republic of Kazakhstan. With the help of Alem school, it is planned to expand the range of data by connecting mobile applications. In them, citizens will be able to fill out a diary of observations about their condition at home. This will allow to receive and analyze information without forcing citizens to visit hospitals and clinics.

Domestic IT specialists developed the information resource radiology train.

Radiology Train *- provides an educational resource on medical imaging for medical students, junior doctors and related medical workers. It will also be useful to radiologists, doctors who are now reading pictures. The resource contains about 200 cases with a description of the images, the physical condition of the patients.*

Web application COVID-19 *- Automated control system (CRM) of the lists of confirmed patients with COVID-19 and contact persons for creation of one single database.*

Platforms created on the basis of the Republican Center for Electronic Healthcare:

The main goal of the Republican Center for Electronic Health Care is to promote the development of the healthcare system by improving the information infrastructure of the healthcare system and medical statistics.

The following IT solutions for combating COVID-19 were created on the basis of the Republican Center for Electronic Healthcare:

__Mapcovid__ - a mapping application designed to visualize the location of infected and suspected individuals with COVID-19. Also in this application, services are implemented for transferring data of citizens (Individual Identification Number, phone number, geo position, etc.) and transit data of citizens (name, IIN, Category, Country of arrival, etc.) to the E-gov portal. According to the map, citizens will be able to see unwanted places to visit.

Application __"BI covid"__ - an analytical application where it is possible to use the output forms to see:

- information on dynamic monitoring of citizens in a hospital (results of tests on COVID-19, transfer from/to Anesthesiology, reanimation and intensive treatment department, transfer from/to artificial lung ventilation), as well as data on employees and equipment of beds in organizations.

- information on arrivals from abroad to the Republic of Kazakhstan by country according to the provided list from customs, which comes to the Cloud Data Manager: https://mapcovid.eisz.kz/cloudDataManager.

- Coronavirus data from the card about contacted with addresses and locations.

This application is integrated with information system of the Ministry of Healthcare:

1. in terms of obtaining information about dynamic monitoring in a hospital (results of tests on COVID-19, transfer from/to Anesthesiology, reanimation and intensive treatment department, transfer from/to artificial lung ventilation);

2. in terms of obtaining information about occupied beds;

3. in terms of obtaining data on the organization's employees and equipment of the bed.

In addition, together with Nazarbayev University, it is planned to add the "Prediction" function for mathematical calculation using the stochastic method of the epidemiological situation according to coronavirus for the near future.

__Information system "Express testing on COVID-19"__

The information system is intended for:
- processing questionnaires for rapid testing at Covid-19 by specialists of the National Center for Public Health (filling out the questionnaire on https://formcovid.eisz.kz/);
- entering the results of rapid testing on confirmed profiles by laboratory assistants;
- entering data on the questionnaire and the results of passing the rapid testing at border posts, ambulance patients and medical organizations (including military hospitals).

Also, the system implements the function of viewing data from Mgov (further data transfer to medical personnel is planned). The system is available at the following link: https://mapcovid.eisz.kz/Account/Login

__Private market__

Private developers providing services to medical organizations through the provision of medical information systems have improved the existing Damumed system.

Damumed is a mobile application designed for quick access to your medical organization to record yourself and your family members to see a doctor, call a doctor at home and view your medical documents. The functionality has been expanded in terms of Remote monitoring of disease symptoms with remote data transfer to a doctor.