

# Development of Approaches to the Prevention and Treatment of Chronic Respiratory Diseases

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## ABSTRACT

The article investigates measures in the field of prevention and treatment of chronic respiratory diseases. The author notes that preventive measures in the field of reducing the incidence of chronic respiratory diseases, as well as preventive measures in this area will significantly reduce their spread, which will improve the level of efficiency and quality of life of people and will positively affect labor productivity, which is undoubtedly extremely important for the economy of any state. In addition, the social results of the above measures will have a positive impact on the overall public health and indirectly make a significant contribution to the country's GDP.

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## INTRODUCTION

Chronic respiratory diseases negatively affect the health of hundreds of millions of people around the world, increasing mortality and the development of various complications in patients around the world. Chronic obstructive pulmonary disease (COPD), lung cancer, pneumonia, interstitial lung disease (ISL) and asthma are among the leading diseases that require the development of effective methods of prevention, diagnosis, treatment and treatment of these diseases.

The Medical Internet of Things (MIOT) is rapidly becoming one of the most promising approaches to achieve this goal, mainly due to its cost-effectiveness, non-invasive deployment and automation capabilities. Combined with the strategic use of artificial intelligence, continuous data collection and real-time monitoring and response systems, MIOT demonstrates the potential to be an effective and efficient solution.

## MATERIALS AND METHODS

When writing the work, an array of literature was studied within the framework of the research topic, comparative and analytical research methods were used to systematize the materials.

## RESULTS

Chronic obstructive pulmonary disease (COPD) has been a global problem for many years. The prevalence of COPD increases: 3.4% in people aged 25 to 44 years and up to 11.6% in people over 75 years. The study showed that a significant number of people who have never smoked suffer from COPD, despite the fact that smoking is a key etiological factor of this disease: 36.4% of people smoked in the past, and 38.7% of them smoke now.<sup>1</sup>

It is interesting to consider the spread of chronic respiratory diseases in the context of individual countries and continents. So, in one group of Asian countries, which, for example, includes China, the number of COPD patients reached more than 90%.<sup>2</sup> The most at risk of COPD were people who often

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suffered from colds in childhood, as well as those who abused tobacco or had poor heredity.<sup>3</sup>

Studies also show that residents of European countries, especially such as Denmark, are at high risk of mortality due to COPD.<sup>4</sup>

The spread of lung cancer also has an alarming trend. In the United States, lung cancer is responsible for 14% of new cancer diagnoses in men and 13% in women in the United States. Both morbidity and mortality were negatively correlated with geographical location, socio-economic status and ethnicity.<sup>5</sup>

If we consider a country like China, then we should also point to the growth of patients diagnosed with lung cancer. This is due to the spread of smoking habits among citizens, as well as to the general pollution of the atmosphere, which occurs due to emissions from industrial enterprises, as well as due to the large amount of transport in the country.<sup>6</sup>

These days a similar trend is taking place in Europe, where this oncological disease is diagnosed to patients in three cases out of twenty.<sup>7</sup>

During this year's global COVID-19 pandemic, reporting methods and difficulties in identifying cases may vary by region. Community-acquired pneumonia (EAP) accounts for the largest proportion of hospitalizations in the United States: an estimated 650 out of 100,000 adults in the United States are hospitalized because of CAP.

A recent study predicts that more than 1.5 million adults suffering from CAP are hospitalized annually in the United States, of which 10,000 deaths are expected during their stay. In addition, it is expected that every third hospitalized adult will die within a year.<sup>8</sup>

The incidence rates of interstitial lung diseases (ILD) in Europe range from 19.36 cases per 100,000 people to 34.34 cases per 100,000 population, and the incidence rate is higher in men.<sup>9</sup> The most common variant of ILD is idiopathic pulmonary fibrosis (IPF) (19-39% of all ISL), sarcoidosis (12-35%) and hypersensitive pneumonitis (3-12%).

The median age of patients with ILD and sarcoidosis was 61 years and 42 years, respectively. It was found that from 1990 to 2003, the incidence rates doubled throughout the European region.<sup>10</sup> It is expected that the mortality rate from ILD will also increase due to the lack of appropriate treatment methods for this disease.<sup>11</sup>

As for China, a study conducted by the Chinese Society of Respiratory Diseases in ten hospitals from 1990 to 2003 showed that ILD is the cause of 25.5% of all cases of diffuse interstitial lung disease (DILD) in China.<sup>12</sup> The development of industry has a negative impact on the health of the nation, since industrial waste negatively affects the respiratory function [13].

Asthma is also widespread, which affects not only adults, but also children. Asthma treatment leads to high costs for medical services, which puts a heavy burden on the country's economy. Patients with asthma are under constant medical supervision, as untimely medical care can cause death or lead to disability.

It is women who are most susceptible to asthma. Asthma is a very big problem for children, as they often switch to home schooling due to the inability to attend school.

In general, it can be concluded that respiratory diseases entail a great burden on both medical institutions and the population, as they are associated with huge financial costs. Experts who have conducted studies of household costs for medicines note that the volume of such costs is sometimes very high in comparison with other items of expenditure. This leads to a decrease in the standard of living of citizens with chronic lung diseases or living together with patients who have them.

Also, another problem in this context is the high cost of the most effective medicines, which patients often require in large quantities. It is often not possible to replace them with cheaper ones, since the effectiveness of inexpensive drugs is often very low. Accordingly, the high-cost treatment of chronic lung diseases directly affects the country's economy, since people who suffer from such diseases cannot fully perform their professional duties, and, moreover, the state spends significant funds on social insurance as part of assistance to such patients.<sup>14</sup>

If we talk about developing countries, the incidence and mortality of lung diseases are even higher here, and at the same time the level of assistance provided by the state is insufficient. This leads to an increase in mortality among both young and elderly patients, since diagnostic procedures to detect the disease at an early stage are not carried out in full, and not all patients have access to highly effective medicines.

Every year, experts increasingly point out that the incidence of COPD in different countries is growing, especially in elderly patients who have a weakened body and many concomitant diseases of a different genesis.

The number of elderly people in the world is growing at a high rate, elderly people are at greater risk of developing acute respiratory distress syndrome (ARDS), especially after episodes of pneumonia, sepsis or non-tuberculosis mycobacterial infections.<sup>15</sup>

Accordingly, based on all of the above, it is very important to search for effective methods of treatment and prevention of COPD at the present stage.

## DISCUSSION

Today, artificial intelligence and the Internet of Things are coming to the aid of medical workers. Modern information technologies are able not only to assist physicians in conducting diagnostics and monitoring patients at different stages of COPD development, but can also be adopted by medical specialists in terms of implementing procedures to help patients who live with such a disease. Such technologies give patients the opportunity to independently carry out treatment as prescribed by a doctor, using self-monitoring and self-observation systems.

To monitor such patients, doctors can use sensors that will allow monitoring the patient's condition as a whole, as well as carrying out certain procedures or taking medications to the patient.

In some pilot trials, mobile phone applications such as AppleResearchApp are used to register certain groups of the population with various potential manifestations of diseases

and to apply lifestyle interventions and efforts to prevent the disease from worsening in the future.<sup>16</sup>

Big data technology also finds application among modern methods of treatment and prevention of various diseases. In particular, the creation of a common immunization database with an increased level of protection allowed Pakistani specialists to identify the true picture of patients who received vaccination against a particular disease and exclude falsification of vaccination data. This system is very important in the modern period.

Since the development of coronavirus infection does not give humanity a chance if collective immunity is not developed. It is vaccinations performed in accordance with the requirements of medical organizations that become the key to increasing the protection of humanity from the development of such viral infections, and falsification of such data can lead to unreliability of the general global information of mass death of the earth's population.

Information technologies also make it possible today to monitor the peculiarities of the development of the incidence of chronic respiratory diseases in the population. In particular, in China, a recent national cross-sectional study found that 100 million people have been diagnosed with chronic obstructive pulmonary disease (COPD) in China, while only 12% of them have previously been diagnosed with COPD, which means that most COPD patients are misdiagnosed or neglected.

Since at an early stage of COPD, a patient may experience only limited symptoms with a short-term disorder, sometimes cough with sputum or an accidental acute event due to pneumonia, with the exception of hospitalization based on a spirometry test after a bronchodilator, they would like to have a diagnosis of COPD. Thus, in a large country such as China, there is an urgent need for the development of a modernized medical service to fill the gap in terms of the quality of education and instrumental importance in primary hospitals.<sup>17</sup>

In 2016, a completely new portable spirometer was developed in combination with a set of the Internet of Things medical system for automatic monitoring of patients with COPD. In the system, the lung test data can be uploaded to the cloud, which the doctor can immediately receive on his mobile phone or iPad. At the same time, on the system platform, local doctors can easily obtain a consulting opinion from the medical staff of a higher-level hospital, including first-hand updated recommendations and instructions on quality control, as well as annotate the test result.

This system has simultaneously solved the problem of lack of resources and equipment, as well as gaps in specialized training and clinical experience between hospitals and doctors of different levels and allows you to very effectively collect fragmentary information from patients, combine and analyze raw data atomically before they are queued for consideration by the appropriate team of clinicians.

Also interesting are new information technologies that allow medical assistants to monitor the health status of asthma patients. Thus, a significant number of patients with such a diagnosis can often find themselves in an environment that will adversely affect their health conditions. However, special

programs that are installed on the patient's cell phone can allow doctors to identify negative environmental parameters in order to inform the patient about them and prevent his contact with such negative factors.

This is very important, because patients cannot always independently assess the degree of danger that threatens them, and their health condition can deteriorate dramatically. At the same time, when visiting a doctor, such patients may lose sight of the impact on their health of such negative factors, which will complicate treatment and may lead to a sharp deterioration in their well-being. Thanks to such technologies, doctors can independently track the above factors, take timely measures to maintain the health of patients suffering from asthma.<sup>18</sup>

It should also be said about the possibilities of information technology, which are associated with quality-of-life control, as well as patient visits to medical institutions. Not all patients who usually have chronic diseases can control their health status, so medical staff need to regularly monitor such patients.

In addition, the intake of various medications that are prescribed to patients should be under special control. It is necessary to exclude the use of drugs by such patients that they acquire independently without a doctor's appointment, since this can negatively affect their health. The Internet of Things, which is used today in many progressive clinics, allows monitoring the condition of patients via a wireless network, as well as using sensors with low power consumption, while such sensors are embedded either in patients' clothes or distributed in a residential environment in which such patients exist.

Information processing within the Internet of Things is of particular value also in the case that it is able to analyze the environment in which such patients are located and analyze their behavior, as well as the drug regimen. In case of emergency situations, the Internet of Things system sends an automatic message to doctors or medical teams that can provide emergency medical care to the patient in a timely manner. This situation is called biofeedback.

It's no secret that most modern medicines have many side effects that cannot always be taken into account by medical professionals when prescribing such drugs to patients. Through the Internet of Things, it is possible to constantly monitor the condition of a patient consuming certain medications, in case of undesirable effects, the system automatically informs medical staff online about their occurrence.<sup>19</sup>

Currently, there are several devices to help patients perform exercises and achieve gradual recovery of lung functions. So, experts have developed a robotic assistance system that allows online monitoring of rehabilitation of patients with COPD at home.

It should also be said about another advantage of the Internet of Things - it is the organization of interaction between the patient and the doctor in real time. So, during a regular visit to the doctor, the doctor talks about the patient's illness and his general condition, however, patients cannot always inform the doctor about the need. for him, information that is very important for the implementation of further treatment.

When using Internet of Things technologies, doctors have the opportunity not only to receive oral information from the patient, but also to analyze the data that was received by the system in the interval between the previous and present visits of the latter to the clinic. The analysis of such data allows you to see the picture of the development of the disease and enables the doctor to take timely measures to organize further therapy.

It should also be said that the Internet of Things system makes it possible to detect at an early-stage various earlier symptoms that the patient himself may not observe, and the doctor may not know about them for the reason that the patient does not report them. By studying the data obtained using the Internet of Things system, the doctor can work proactively, that is, carry out measures related to preventing the undesirable development of the disease picture and reduce the negative load on the patient's body.

And the most important factor in the application of this information system is the possibility of canceling the geographical framework, since patients with chronic lung diseases may be under the supervision of a doctor who is at a sufficiently large distance from them. In general, the advantages of the Internet of Things system are quite significant, and in the future, it can be adopted by both clinical organizations and outpatient practitioners.<sup>20</sup>

## CONCLUSION

Thus, it can be concluded that preventive measures in the field of reducing the incidence of chronic respiratory diseases, as well as preventive measures in this area will significantly reduce their spread, which will improve the level of efficiency and quality of life of people and will positively affect labor productivity, which is undoubtedly extremely important for the economy of any state. In addition, the social results of the above measures will have a positive impact on the overall public health and indirectly make a significant contribution to the country's GDP.

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