Impact of the COVID-19 Pandemic on Biomedical and Clinical Research

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The world has profoundly changed as a result of SARS-CoV-2. It is clear nothing has escaped the effect of the pandemic. Here, Dr. Yang Yang, an expert in thoracic surgery, weighs in on the pandemic's impact on clinical research.

Introduction

During the first 6 months of 2020, the world has profusely changed as a result of the SARS-CoV-2 outbreak. Although the source of the virus and the actual degree to which the disease spread continue to be a matter of debate, the pandemic has had a devastating impact on the entire world. From macroeconomic indicators to day-to-day routines, nothing has escaped the effect of the pandemic.

Healthcare systems and clinical research are no exception. Healthcare systems around the world are already feeling the pressure of the mounting number of cases reported daily in many regions of the world. It has stretched the healthcare systems to their breaking point. Although the coronavirus precautionary measures suggested by the World Health Organization (WHO) are universal, they have been implemented differently around the world depending on the resources and funds made available to the healthcare systems. Even countries with some of the most advanced and well-equipped healthcare systems, like the USA, the UK, and Italy, are finding it difficult to control the virus. Latin American countries, in particular, have been unable to control and effectively implement strategies to lessen the impact of the virus on their healthcare systems.1

One particularly tragic aspect is the high infection rate among doctors and paramedical staff on the front lines of the pandemic,2 which is in part due to the lack of research regarding the virus's spread and transmission.

Amid the pandemic, the performance of hospitals is being examined mostly in the context of COVID-19 patients. Meanwhile, much of the funding allocated for other research studies and operations has been halted or diverted to healthcare systems or research particularly focused on the coronavirus. This has created concerns among scientific society, as ongoing research and development programs that are already in the pipeline are no longer receiving the necessary funds. This Matter of Opinion has tried to evaluate some of the impacts of COVID-19 on healthcare systems and clinical research.

Impact of COVID 19 on Healthcare Systems

It is now an open secret that the healthcare systems of several nations are under stress and overwhelmed by the number of COVID-19 cases reported. In the USA alone, there are 2.1 million cases, and they are increasing with each passing day.3 It is estimated that almost 1.7 billion people (15%–18%) of the total world population will be at risk of getting the disease. The mortality rate could reach up to 3% if the WHO recommended COVID-19 preventive measures are not strictly followed.1

The American healthcare system, which is one of the world leaders in research, has been severely hit by the pandemic. With thousands of cases reported daily, the number of patients has outnumbered the hospital beds allocated for the adult population.3 These are not lone stories but have been typical all around the world. Doctors and other healthcare staff have been one of the most severely hit groups of professionals because of the nature of their work. China alone recorded 3,300 confirmed COVID-19 infection cases of healthcare workers and doctors, with the highest number of doctors dying during the first month of the pandemic.4 One of the leading causes of this was the unavailability of appropriate personal protective equipment (PPE), respirators, and N95 masks for healthcare providers. Made for one-time use only, workers were forced to reuse N95 masks, showing a lack of planning and resources.5 Similarly, in the UK, the availability of PPE for healthcare providers was one of the biggest challenges. This ultimately led to the death of over 100 healthcare workers and providers, mainly migrants and minorities.5 Similar stories have been reported all around the globe. Although, the situation has improved with more resource allocation for PPE and the development of improved standard operating procedures (SOPs) for caregivers. However, doctors and nurses are still at a greater risk of becoming infected because of their firsthand contact with patients. This fear has impacted the mental health and efficiency of healthcare providers to a great extent.6 All around the world, healthcare providers have protested over the short supply of protective equipment that is necessary to allow

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to safely carry out normal operations (Figure 1).

Unless the pandemic curve is flattened, the COVID-19 pandemic is likely to cause a shortage of hospital beds, intensive care unit beds, and ventilators. In any pandemic, hospital beds are in short supply, particularly in areas with large population densities.7 As a result of the economic crisis created by the coronavirus, the allocation of funds for healthcare systems is even more difficult.

It is now established that COVID-19 mostly spreads through human-to-human contact and hits people with a weak immune system. This puts cancer patients, who frequently visit hospitals for check-ups, chemotherapy, or radiotherapy, at higher risk. The risk is compounded because their weak immune system is unable to fight even the normal infections, either because of the malignancy of cancer or as a result of the therapy they are undergoing.8 According to one estimate, the risk of cancer patients getting infected by COVID-19 is higher than that of non-cancerous patients, and the need to protect them is paramount. Interestingly, there is little research over the guidelines for the protection of such high-risk patients during any pandemic.

Similarly, for cardiovascular patients, the COVID-19 infection is more likely to produce complications. Those with COVID-19 and pre-existing cardiovascular disease have an increased risk of severe disease and myocardial injury, and treatments under investigation for COVID-19 may have cardiovascular side effects that are yet to be investigated. According to the WHO, COVID-19 can also spread through asymptomatic transmission. Thus, doctors can be both host and vector of infection to patients, increasing the risk of contagion manyfold for patients with cardiovascular diseases.

Because of the enormous impacts of the pandemic, economies are also shrinking. As a result of the economic crisis, the allocation of funds for healthcare systems has become even more strained. Furthermore, as hospitals have banned non-essential doctor visits, this has translated into a limitation on normal patient care and surgeries performed in hospitals. Although the US federal government has passed a $50 billion emergency bailout package to fight the pandemic, hospitals are still experiencing funding shortfalls because the main source of their income involves normal operations and clinics, which are currently being curtailed. An estimated shortage of 50%–70% is anticipated due to the cancelation of elective procedures that are the main source of hospital cash flow.

A conscious approach amid the pandemic is essential for the safety of surgeons and hospital staff, as a higher mortality rate among this group will be catastrophic for the healthcare system. Thus, the following measures must be taken to avoid exposure to hazardous conditions. Use of disinfectants and PPE for the doctors and pre- and post-surgical care of the coronavirus-infected patients under strict SOPs must be ensured. Without these measures, the healthcare staff is exposed to dangerous conditions and direct unprotected contact with the patients. Specific rooms must be set up for changing PPEs. The availability for one-time use of respirator masks must be ensured to minimize the risk of getting infections. For the safety of patients and hospital staff, unnecessary and routine checkups should be canceled. In this regard, technological advancements such as remote
consultations and follow-ups are the need of the hour. It is most likely that until a vaccine is developed, healthcare systems are going to take a massive hit. Only time will tell how and when the infection will end, and until then, only precautions are going to help.

Impact on Research

After the outbreak, funds were diverted toward fighting the pandemic on an urgent basis, including the treatment of a massive number of patients, developing kits for testing, and procuring PPE for healthcare staff. This created a gap in funding for ongoing clinical research. Furthermore, the American pharmaceutical companies’ trade group PhRMA says that more than half of its members have committed research and development funds toward COVID-19 treatments and vaccines. That means cutting funding from existing projects. This has been particularly challenging for countries with already few resources for research and development. The limited funding that they were getting has now vanished, with little hope of getting it back soon, at least not until an effective vaccine is developed.

Most American universities have canceled funding for collaboration projects because of the mobility restrictions imposed by authorities. Researchers have been sent home to minimize lab staff, a strategy to conserve resources and reduce contagion. With no hope of going back to their labs soon, they have started working remotely to share and peer review other data streams. Such restrictions on movement and stay-at-home orders are helping to mitigate the spread of COVID-19. No doubt successful strategies against this global health threat are creating threats of another kind—obstacles to clinical trials essential to finding effective treatments and cures for a myriad of diseases. For example, due to the fear of COVID-19, there has been a considerable drop in clinical trial enrollment for cancer.

This means a halt in data production that is critical for drug development. There is no way that researchers can monitor and evaluate patients like they used to because of social distancing orders. Logistics, such as timely delivery of medicines, essential test samples from the patients, and clinical evaluation of the patients are also compromised (Figure 2).

However, all is not lost. Because the biggest task at hand is managing the COVID-19 pandemic, sponsors and researchers have diverted more resources for the investigation of potential treatments, vaccine development, and eradication of the disease. To increase the testing capacity, pop-up labs, like one in Boston University, are offering free tests for students, police, and the homeless. Meanwhile, many universities have dedicated a large sum of money for the development of vaccines and medicine for critical patients.

Because of these funding allocations, several potential vaccines have successfully entered into human trials, a major step ahead. It is now hoped that with global joint efforts and collaborations, multiple effective vaccines will be available soon by the end of 2020.

It is, however, obvious that the medical research community has to come up with a new and innovative way to carry out their research. Innovative strategies involving oversight of clinical trials without compromising the health and welfare of the patient and the community must be devised. Here, technology will be an important factor that will help. Methods to monitor trial progress...
remotely and the ability of the patient to record their data may help overcome some obstacles. Clinical trials using smaller groups may also be an alternative for some diseases. But for this to happen, the clinical trials must be structured to maintain the integrity and validity of the data that is essential for the development of future medical interventions.

In summary, the present situation of healthcare systems and clinical research has been greatly impacted by the ongoing pandemic. Funding cuts and mobility restrictions have caused a sudden shock to the healthcare facilities, healthcare workers, and the research community. But this situation cannot remain for long. Innovative ideas and alternative funding sources must be explored to keep lifesaving research ongoing.

Biography of Author
Dr. Yang, an expert in thoracic surgery, has plentiful experience in the treatment of lung cancer, also specializing in video-associated thoracic surgery (VATS) and the evaluation, maintenance, and acquisition of OPO lung transplantation organs.

Based on the precision medical testing platform established by Dr. Yang, fundamental scientific research work was conducted on screening, diagnosis, and prognosis of early lung cancer according to molecular typing of lung cancer.

Dr. Yang is also dedicated to the research and development of antitumor drugs, including bispecific antibody and multispecific antibody drugs. He has made contributions to the applications of nano-biomaterials in tumor treatment with his scientific research team.

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