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Financing of International Collaboration and Research in a time of COVID-19

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PERSPECTIVE

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Recently, the pandemic has shown that any event that occurs locally may have a major global impact. As such, global connectivity, engagement, and collaborations are the means to move forward. This has emphasized the importance and need for international collaborations and research, which will remain valuable for exchanging knowledge and strengthening research capacity post-pandemic. The three commentaries in this issue provide insights on advancements through global efforts and the need for funding of these global collaborations and research.

As demonstrated by the successful stories of global collaborations and research supported by funding described by the three commentators in this issue of *Leadership Perspectives International*, it is necessary to finance efforts that will accelerate progress, provide better understanding of diseases and issues faced, and boost innovative approaches.

Dr. Jialin C. Zheng from Tongji University describes several cooperative efforts between Chinese researchers and their international counterparts in pursuit of combining resources and conquering the pandemic through active sharing. From Bezmialem Vakif University, Dr. Rumeyza Kazancioglu observes how the pandemic drove the international scientific collaboration that was imperative for a speedy response and recovery. Dr. Paul M. Stewart, University of Leeds, notes that the pandemic has exposed a critical flaw in how science has been approached in the past, and that financial sustainability and accountability is a key issue for excellence in medical research and innovation. The three commentaries call for nurturing and supporting global partnerships, especially as this has been proven effective in these unprecedented times.

At a time in which forming links and partnerships has been difficult with travel restrictions and economic instability, global cooperation has never been more necessary. International collaborations and research provide researchers, scientists, and academics access to additional expertise and perspectives encouraging innovation, advancements, and resource maximization to reach common goals. The pandemic has affected us all—developed and developing countries—and the recent international collaborations are leading to breakthroughs and advances that will benefit all. Developing a vaccine in less than a year could not have been accomplished if each country or institution had done it alone.

I have recently taken on a new endeavor as Senior Advisor on Research in Middle East and North Africa at the National Institute of Allergy and Infectious Diseases, National Institutes of Health. My main role is to promote international research collaboration within the MENA region.

This need for global cooperation always has been there, but the pandemic was a test that has demonstrated that it is the key to overcoming global challenges. The hard lessons learned from the pandemic should not be lulled into forgetful passivity. Financing international collaboration and research builds a solid infrastructure for the world's well-being. A post-COVID-19 world will face further challenges with overcoming the shortcomings caused by the pandemic, and we will need international collaboration and research to find our way back to "normal". This financing of research collaborations should not be the responsibility of the biomedical scientific community and healthcare systems alone, but also the corporate world, various industries, and both governmental and non-governmental organizations since all have been impacted by the pandemic. The challenge remains how to engage these entities and define a roadmap for collaboration on financing research across the globe.

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Rümeyza Kazancıoğlu, MD

Vice-Chancellor

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The SARS-CoV-2 infection has influenced the whole world and, every day, the number of cases and deaths related to the COVID-19 pandemic continue to rise. As of this writing, 17,851,975 cases of COVID-19 have been reported from 188 countries worldwide, and the death toll has risen up to 685,102 according to Johns Hopkins Coronavirus Resource Center.

COVID-19 has definitely changed how countries do science together globally. Never before have we seen so many of the world's researchers focus on a single topic as quickly as this. All other research topics have been set aside, and nearly every lab set a goal of helping to fight against the pandemic and facilitate breakthroughs that advance health and well-being.

The pandemic has marked the critical need for international scientific collaboration in both the public and private sectors to develop diagnostics, vaccines, and treatments in order to tackle this worldwide crisis. More than 200 clinical trials have been launched, bringing together hospitals and laboratories around the world. One example is Dr. Duprex's lab in Pittsburgh, which is collaborating with the Pasteur Institute in Paris and the Austrian drug company Themis Bioscience, with funding from the Coalition for Epidemic Preparedness Innovation, a Norway-based organization financed by the Bill and Melinda Gates Foundation and several countries.

Another improvement during the pandemic in terms of starting a research project was the change in the normally laborious government approval processes. It has definitely been the easiest of all times, and many clinical trials began enrolling patients very quickly.

Chinese and Australian researchers made the COVID-19 genome freely available, speeding vaccine research worldwide, especially in the developing countries where there might be lack of comprehensive research structures. Open-source knowledge, data, and information help local labs and scientists gain quick access to freely available technical know-how to allow them to produce vital medical devices to treat their own COVID-19 patients.

International collaboration is particularly important. It must not be forgotten that scientists, universities, and research institutions in developing countries have specific experience and expertise in mitigating outbreaks of rare infections. An example of just such an international research collaboration is the African Coalition for Epidemic Research, Response and Training. Clinical Characterisation Protocol (ALERRT) is a member of the Global Health Network-ISARIC, which has developed a clinical characterization protocol for COVID-19. The research has received support from the Wellcome Foundation.

A speedy recovery from the COVID-19 outbreak will require coordination among not just medical science and public health, but also in a broad span of disciplines such as data science, sociology, psychology, mass transit systems engineering, and others. Hence, financing and support of this collaboration and research will be critical not only globally but also on a country basis. Science ministers and representatives from 122 countries recently expressed their whole support for a global pact on open research at a high-level meeting of the UN's science agency.

Financial resources have been devoted to specific research since March 2020. For example, in Turkey the Turkish Health Institute (TUSEB) issued four and the Scientific and Technological Research Council of Turkey (TUBITAK) issued two new calls specific for COVID-19 Research. Within the scope of the EUREKA Program, a joint call was launched in May 2020 to fund research and innovation projects aiming to find short- and medium-term responses to the needs specific to COVID-19. Turkey, Canada, Austria, Denmark, Netherlands, Spain, and France will be joining this call to fund the joint projects. The Turkish Ministry of Industry and Technology also declared its support for project-based incentive investment programs. 48.2 million euros of support was provided to 18 projects of 151 research teams by the European Commission in March. The Commission aimed to provide another 122 million euros of support to scientists with five separate calls in June.

EIT Climate-KIC, the Partnership for Advanced Computing in Europe (PRACE), HADDOCK-EOSC (High Ambiguity Driven protein-protein DOCKing portal), the EGI Foundation, the European Cooperation in Science and Technology

(COST) Actions, the European and Developing Countries Clinical Trials Partnership (EDCTP), and Horizon2020 are some of the other funding resources for researchers. In collaboration with the Islam Development Bank (IsDB) and the World Academy of Sciences (TWAS), a new project call was launched recently to fund joint research and technology transfer work on the COVID-19 outbreak.

This pandemic highlights an important truth for all of us. We are all connected in this era and thus we must all protect one another. It is very important to realize the benefits of science as a common good for all human kind and the environment. Research isn't just a tool for discovery, but a means to help our societies and community. Through cooperation, mutual support, and a spirit of sharing and openness, we can move forward in controlling and even beating COVID-19 together and be better prepared for such crises in the future.

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Paul M. Stewart, MD

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The UK can be rightfully proud of its performance and impact globally across the life sciences sector; with just 0.9 percent of the world population, we sustain 4 percent of the world's researchers, publishing 6.4 percent of the world's publications but crucially 16 percent of the world's highest cited research in life sciences[1] .

The impact of our research is far reaching—from technology developments such as MRI imaging, genomics, stem cells, and in-vitro-fertilisation, to discovery science leading to new therapeutics for patients with rare diseases, to practice-changing clinical trials (notably in cancer and cardiovascular disease), to health service and public health population research. The origin of this research is mainly found within strong university-NHS partnerships, supported by prismatic research institutes (e.g., Francis Crick, Sanger Centre, Alan Turing) and national platforms such as UK Biobank, Dementia Research, and Health Data Research UK.

Research funding in the life sciences sector supporting clinical and applied research (£1.2bn/year) benefits from an alignment of funder priorities from multiple stakeholders: the government-funded Medical Research Council and UKRI (discovery science £800m/yr); more than 140 individual medical research charities including Wellcome Trust, Cancer Research UK, and the British Heart Foundation (£1.4bn/year total); and the NHS R&D engine—National Institute for Health Research (NIHR). This is complemented by over £3bn/year from industry R&D. In addition to funding the "research engine" of doctoral and post-doctoral researchers, more than 10 percent of total expenditures is targeted to dedicated training programs, with individualized schemes for tomorrow's leaders in basic, clinical, and applied health research, and a strong commitment to a team science approach building critical skill sets in, for example, statistics, bioinformatics, data and AI, imaging, and epidemiology.

Although these numbers are large, in fact as a percentage of gross domestic product, or NHS expenditures, we fall behind peer groups, with the reality that the last 10 years of austerity has seen "flat cash" settlements across MRC and NIHR funding streams. The latest government leadership has renewed its commitment to increase its public spending on R&D from 1.6 percent to 2.45 percent by 2027, adding a further £22bn in funding by 2024. NHS has certainly embraced research and innovation with the realization that this is a key driver of patient quality, but the current NIHR budget remains less than one percent of total NHS expenditure, with a mismatch at least in its core infrastructure funding across the UK based on research activity and population need.

A further source of research funding has been through consolidated EU funding, such as the framework program Horizon 2020, and the European Research Council and Marie-Curie projects with their focus on studentships and fellowships. Historically, the UK has significantly benefitted from such funding taking an estimated £8bn of European funding over recent years set against its ~£5bn contribution. Clearly as we navigate our way through a prolonged BREXIT negotiation, this is of major concern to the future funding base for UK medical and biomedical science.

Over and above these national drivers, and as highlighted in a recent Academy of Medical Sciences report[2], challenges remain in harnessing the real power and potential locally across our universities and NHS partners—issues that I know will resonate across other international academic health systems. A key issue has always been financial sustainability and accountability across organizations with very different drivers. On the one hand, NHS has significant pressures in direct clinical care faced with year-on-year increases in clinical demand and escalating healthcare costs despite fiscal austerity. This is set against significant changes in the operating models of our universities in recent years. New government legislation in 2017 (the health and education research act) created a new education regulator (the Office for Students) as well as significantly reformed the administration of UK research funding and oversight of all the funding research councils, including the Medical Research Council.

“A key issue has always been financial sustainability and accountability across organizations with very different drivers.”

Moving away from block government funding, universities in effect became businesses largely funded by self-financed student fees. This fee was set across all universities for domiciled and home students (with no quality "pay premia"), but was variably inflated for international students. Market forces and global outreach have delivered significant student growth, but with regulated caps on the intake of total numbers of students and percentage international intake into medicine, dentistry, and healthcare, additional student fee income has been skewed across universities—mainly into business and engineering schools and faculties.

Research funding has historically never supported the full economic cost of the activity in universities, particularly for high-cost areas such as biomedicine and clinical medicine. Overheads on grants vary from just 20 percent from medical charities to 80 percent for MRC with an additional external benchmarked allocation coming to universities based on the quantum and quality of research as determined by our five-year cycle of peer review through the research excellence framework. But this fails to support the endeavour. Research-intensive universities undertaking discovery science and experimental medicine do so recovering just 65-70 percent of the cost. The stark reality of the research funding model has increasingly been a cross subsidy from education—largely driven by non-medically-based students from Asian markets.

The outbreak of a new coronavirus in Wuhan, China at the end of 2019 and the ensuing pandemic with its international lock-down in global travel have brought to a head the crisis that now faces research funding across the UK. The impact is staggering, with a projected loss of a quarter of a million students and a £2.6bn deficit to the University sector[3]. Add to this the pause on research due to the lock-down, the impact of COVID-19 on medical charity research funding, and potential capacity issues from its personal toll on our researchers, it is easy to understand why all academic health systems will be agonizing over the immediate and future sustainability of high-quality research and innovation.

We remain optimistic with a very buoyant life sciences sector and a united commitment that activity across academic health centers can be the nidus for future economic recovery as well as generating patient and population health gain. Whilst governments across many of our countries have stepped in to offer unprecedented support across the public and private sectors, so far universities in the UK have received no additional support. There is however a recognition of the issue in the establishment of a ministerial review to address the immediate and longer-term sustainability of our research base across universities[4]. We await the outcome of this process with great interest and with the realization that our ongoing, world-leading contribution to excellence in medical research and innovation could be dependent upon these deliberations.

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Most countries and regions globally have been seriously affected by COVID-19. To cope with the threat to all mankind, the global research capacity needs to be combined to provide scientific support for decision-making in diagnosis, treatment, and prevention.

Although China was the first to share the gene sequence information with the World Health Organization, there is no existing global pathogen sharing mechanism at present. Under the premise of fully considering the laws and regulations of various countries, it is necessary to design a feasible mechanism to protect the ownership of biogenetic resources, and to share data and information openly and fairly, so as to ensure the maximization of global interests in public health and safety. At the beginning of the outbreak, Prof. Wei Zuo's team from the Tongji University School of Medicine (TUSM) revealed the distribution of the COVID-19 receptor gene in the lungs, suggesting that alveolar type 2 epithelial cells may be used in the transmission of COVID-19. This paper was officially published in the American Journal of Respiratory and Critical Care Medicine on July 14, 2020. However, in order to provide reference for peers as early as possible, the result was first released in BioRxiv on January 26, 2020 and has been highly cited thus far.

A special fund, established by the Ministry of Science and Technology and the National Natural Science Foundation of China (NSFC), encourages Chinese researchers to cooperate with their international counterparts in the fields of infection mechanism, clinical diagnosis and treatment, public health strategy of prevention and control, and the emergency management system. Local governments and research institutes are actively following up on these efforts. The new strategy for stem cell therapy of COVID-19 patients developed by Prof. Zhongming Liu's team at the East Hospital affiliated to TUSM is supported by these funds. Prof. Dapeng Zhou of TUSM cooperates with scientists from Tel Aviv University, Israel, focusing on the molecular immunological recognition of the COVID-19 spike protein, with the support of the Shanghai Science and Technology Commission. In addition, charitable organizations reflect the importance of social responsibility. For example, under the support of Evergrande Group, Harvard Medical School and Dr. Nanshan Zhong's team are working jointly to fight COVID-19. Mr. Yun Ma, the board chairman of Alibaba Group, has donated a substantial amount of funds to finance the development of drugs and vaccines, and encourages cooperation between the world's top institutions and researchers.

The pandemic has made authorities more aware of the importance of accelerating the innovation and development of medical education. In September 2020, the State Council of China put forward a guideline with special emphasis on multi-disciplinary integration and cultivation of innovation in medical education. Through active cooperation and sharing, the international community can combine all resources and have confidence in conquering this disease.

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