WHO, WIPO, WTO Joint Technical Symposium on Cutting-Edge Health Technologies: Opportunities and Challenges

The eighth Joint Technical Symposium, held by the World Health Organization (WHO), the World Intellectual Property Organization (WIPO) and the World Trade Organization (WTO) in Geneva on October 31, 2019 served as a forum for experts to discuss opportunities and challenges of cutting-edge health technologies. It marked 10 years of cooperation among WHO, WIPO and the WTO.

Introductory remarks

WTO Director-General Roberto Azevêdo said that meeting future public health challenges required promotion of innovation and affordability of cutting-edge medical technologies. The intellectual property system, and the flow of international trade, are critical in bringing to the public the necessary new technologies in safe and effective forms. It was important to explore how IP settings relate to new medical technologies, including gene-editing. He cited the example of chimeric antigen receptor, or CAR-T cell therapy, a therapy still under development. This promising area of medical research involves both public and private actors. The terms they choose to license their technologies will have important implications for how new treatments are rolled out. Such therapies, though transformative, could involve costs that may strain health budgets.

The WTO Trade Facilitation Agreement simplified and accelerated border procedures. Trade, in the sense of the cross-border movement of goods and services, contributed to public health by helping ensure the availability of new technologies. No single country would ever be fully self-reliant for the medical technologies they need. Facilitating trade means facilitating access to medical technologies and inputs. That reduced the ultimate cost of treatment. The WTO TRIPS Agreement and the Doha Declaration on TRIPS and Public Health sent a clear signal that IP rules must be seen within their wider policy framework. A further milestone was the 2017 entry into force of the TRIPS amendment that explicitly legalized a new pathway for access to affordable generic medicines for all.

WHO Director-General Tedros Adhanom Ghebreyesus said that advances in science and technology are opening up new horizons in public health. Gene-editing technology, robotic surgery, 3-D printing, virtual reality, wireless brain sensors, telemedicine and mobile health, artificial intelligence (AI) and machine learning are developing faster than the legislative framework, with significant ethical and social implications. Dr Tedros stressed that today's world was marked by shocking inequality. People in high-income countries lived an average of 18 years longer than those in low-income countries. Although more people have access to health services and products, they are paying more out of their own pockets to use them. Medicines were a significant driver of this out-of-pocket spending. It affected all countries.

High prices and rapidly-changing markets put increasing pressure on the financial sustainability of health systems globally, and on their ability to provide full and affordable access to quality care. He emphasized that WHO's top priority is universal health coverage, including access to medicines and vaccines. Health was a human right for all people, not a privilege for the few. No one should get sick or die just because they are poor, or because they cannot access the products or services they need. Dr Tedros noted that Member States have requested WHO to address the impact of intellectual property (IP) protection and trade agreements on public health and access to medicines and health products and a recently approved resolution aims to improve the transparency of markets for medicines, vaccines and other health products. Among other activities, WHO is working to determine the patent status of health products, including publicly available user-friendly patent status information databases.

WIPO Assistant Director General Minelik Alemu Getahun highlighted that the potential of cutting-edge technologies on the health care sector needs to be fully appreciated while addressing the challenges these disruptive technologies present. Countries need to maintain an enabling environment for sustained research and development that allows for invention and innovation to flourish. And they need to provide policy frameworks commensurate with the rapid pace of progress, reflecting societal values without unduly erecting barriers. There is an imperative to address in a balanced manner issues of accessibility and affordability. The IP system faces a similar challenge in keeping pace with the ever-increasing rate of progress, continuing to incentivize and reward innovation, and ensuring the diffusion of knowledge to support continued innovation in a balanced and effective manner.

WIPO encourages collaborative health innovation, for example through its public-private partnership WIPO Re:Search which is now in its eighth year. Published patent applications reflected technology trends and developments. The *Global Innovation Index 2019* (GII), published by WIPO with Cornell University and INSEAD as well as WIPO's first *Technology Trends Report* on artificial intelligence provided analyses from the IP and innovation perspective, looking at trends in medical innovation fields such as genetics and stem cells research, nanotechnology, biologics, and brain research, as well as the largely untapped opportunities AI represents for agriculture, healthcare and manufacturing.

First panel on landscape and perspectives of cutting-edge health technologies

Michael Altorfer (CEO, Swiss Biotech Association) stressed the progress achieved in medical treatment, vaccination, life expectancy, life quality and survival rates while the cost for medicines had remained at a stable level of about 12% to 14% of healthcare costs. The share of gene and cell therapies in the clinical development pipeline was increasing. These therapies would, however, pose challenges because of the high costs per patient and the short treatment periods. The spread of antimicrobial resistance was self-inflicted. The lack of new antibiotics resulted from negative signals to investors: artificially low prices, low sales volume prospects, and the effectiveness of prevention. Partnerships and early stage financing, relying on talented researchers, high impact patents and effective technology transfer offices, were among the success factors of biotech companies. To date, two thirds of innovations were coming from small and medium-size biotech companies. Investors needed to be convinced that the innovation model generates sufficient profit to recover costs.

Nathalie Virag (Distinguished Scientist, Medtronic) called for partnerships, including cross sectoral research with entities that collect data but are not part of the healthcare industry. Making innovation accessible to everyone needs to take into account economic value – moving from a fee-per-product logic to a fee-per-value approach. Medtronic's roadmap for the future included big data and analytics, predictive modeling and tissue regenerative medicine. The volume, variety and velocity of big data were challenging. For example, handling the mass of data collected by modern medical devices required intelligent information technology to present the most relevant data to a clinician in a timely manner. Ultimately, development should aim for connected devices that allow for autonomous care. Costs of clinical trials could also be reduced through computer-modeling as regulatory evidence.

María Teresa Arredondo (Professor, Universidad Politécnica de Madrid) shared her experience of empowering people through technologies such as biosensors, wearables, smartphones and environmental sensors, as well as through the Internet of Things and big data. Technological possibilities were jointly assessed with public institutions, the private sector, patients and citizens associations and users in order to promote innovation as a driver of new health ecosystems. Living labs and test beds across Europe represented the new approach to supporting successful innovation processes in the health sector. They place people and patients at the real centre of innovation in a close-to-reality environment, between the supply and demand side and between service/system providers and end-users.

Tim Hubbard (Head of Department of Medical and Molecular Genetics, Kings College London) spoke about genomics medicine which uses genomic information about an individual as part of their clinical care (e.g. for diagnostic or therapeutic decision-making). The genomes of 100,000 patients had been sequenced in the UK. Having a whole patient genome had doubled the diagnostic rates for rare diseases. There was a commitment to sequence 1 million whole genomes in the UK over the next five years. The genomes of millions of humans will need to be studied to better understand human biology and to better predict responses of individuals to healthcare. There was a general

growth in health data leading to coordinated UK health data initiatives for both care and research purposes. The infrastructure that had been established enabled stored genetic data to be reused for clinical care and for research at almost no additional cost. Data infrastructure had to ensure secure storage, maximize health care benefits, enable research activities and ensure that patients are the main beneficiaries. Public trust and regulation were important. International organizations, such as WTO and WIPO, had a role to set standards to ensure data was not blocked from being reused needed to be considered.

Manuel Juan Otero (Head of Section, Hospital Clinic of Barcelona) said that Chimeric antigen receptor T cell (CAR-T cell) immunotherapy had caused a veritable revolution in the treatment of cancer. To date, the cells are mainly an autologous product used as a “live drug”. The therapies have extended survival of some people with cancer by years, and even wiped out all signs of disease in some people with advanced cancers. The results were not just a function of the engineered cells, but also of the patient's own immune system. Therefore, he considered engineered CAR-T cells an “unusual” drug. CAR-T immunotherapy had been approved as a “live drug” for commercial production by the European Medicines Agency and the US FDA. Under the hospital exemption, the Hospital Clinic of Barcelona had developed an academic CAR-T protocol in its facilities. As compared to commercial CAR-T production, manufacturing inside the hospital had a shorter production line, a shorter transfer to the bedside of improvements and reduced treatment costs and time.

Second Panel on health, IP and trade perspectives on maximizing benefits of cutting-edge technologies

Miriam Naarendorp (pharmacist and former regulator, Suriname) said that there were certain similarities regarding the disease burden encountered by countries in the Americas region. But there were also vast differences in terms of resources, GDP, R&D capacity, production, regulatory and negotiating capacity, territorial size and population, IP regimes and legislation. Access to new technologies in Caribbean countries did not only depend on IP and trade law, but also on the capacity to absorb new trends. This situation called for a tailored approach according to characteristics and necessities, if global goals of equitable access to healthcare and universal health coverage were to be attained for all.

Martin Eling (Director, Institute of Insurance Economics and Professor, University of St. Gallen) analyzed the impact of cutting-edge health technologies on the health insurance sector. New technologies would allow healthcare to move from a “detect and repair” approach to a “predict and prevent” approach. Big data analytics would fundamentally change the business model of insurance companies. Within 10 years, the current solidarity-based insurance model could move to a pay-as-we-live model. The costs of health insurance would be calculated according to behavior and lifestyle habits. The availability of more information on the risk type would reduce the uncertainty which is part of the rationale of insurance. With more information, the value of insurance could not be big enough to justify its costs. Intelligent applications on devices would reorganize and optimize insurance and healthcare. Eling noted the absence of a discussion of these pressing challenges and whether these changes were desirable.

Lawrence Cullen (Deputy Director, Biotechnology and Biopharma, UK Intellectual Property Office) explained patent trends in medical technologies. He noted movements toward personalized medicine, in increasing the effectiveness of innovation, and in areas such as prosthetics and additive manufacturing or 3-D printing. Telehealth and telemedicine were emerging trends at patient level, while developments in treatment regimes and detection/diagnosis were more often seen at the general population level. Telehealth patent applications mainly came from the US, Europe, Japan, the Republic of Korea and China. Notable was the great difference between US applications and the much smaller number of US grants. In terms of patents, revenue and litigation per company, there was a much wider range of inventors in telehealth and artificial intelligence as compared to telehealth only. As regards future developments, he alluded to the potential role of AI with prosthetics and treatment regimes.

Effy Vayena (Chair of Bioethics, Health Ethics and Policy Lab, ETH Zurich) addressed ethical issues in relation to technologies with greater societal penetration, such as telemedicine, smartphone apps, sensors and wearables for diagnostics and remote monitoring, genome reading, and natural language processing. Clear principles and guidelines should frame the collection, use and sharing of information through these technologies to avoid a biased or non-ethical approach. These principles should include consent and privacy. However, patient consent was a complex matter. Privacy concerns included secondary use of data and the identification, for example, of users of health apps. The latter were not regulated, which raised questions of quality assurance. On the other hand, patient data were an enormous source of information for R&D. Vayena expressed concerns about sharing genomic data, which could impact the availability and cost of insurance in certain countries. She quoted the *2018 Tech Trends Report* by the Future Today Institute that had found that policymakers were not prepared to deal with new challenges that arise from emerging science and technology.

Ayub Shisia Manya (Senior Deputy Director of Medical Services, Ministry of Health, Kenya) said that eHealth was a key enabler for health systems globally. Kenya had pioneered various eHealth solutions, including telemedicine, a health information system, mHealth (a company which links public and private entities to support, improve, optimize and sustain the provision of quality health services) and eLearning. Most solutions concerned primary health care and HIV/AIDS. Key factors were the political

will to support solid health care reforms, the adoption of innovations for universal health coverage, the availability of highly skilled health personnel, advanced health facilities (capable of using innovations in therapeutic and diagnostic technologies) and the awareness of information and communications technology among the population in general. Furthermore, there was a high penetration of eHealth and mobile technologies among health workers and the general population. Kenya had put in place various policies to protect health data, which aimed to protect patient confidentiality and restrict access to authorized persons.

Recent work by WHO, WIPO and WTO

Sacha Wunsch-Vincent (Co-editor *Global Innovation Index* and Head of Composite Indicator Research, WIPO) shared the main findings of the Global Innovation Index (GII) 2019 that ranked innovation performance of countries and economies around the world. The 2019 special theme – Creating Healthy Lives: The Future of Medical Innovation – looked at how new technological and non-technological medical innovation could transform healthcare worldwide. Low productivity in medical R&D, slow diffusion of innovation and insufficient focus on prevention had been observed in the past. More recently, investment in R&D had picked up again and patents for medical technology were growing faster than pharmaceutical patents. Among the policy imperatives for innovative activity in the health sector were funding for public sector research, which was currently ensured by a few high-income countries, and improving the cost-benefit assessments of medical innovation.

Nicola Magrini (Secretary, WHO Expert Committee on the Selection and Use of Essential Medicines) provided an update on the WHO Model List of Essential Medicines (EML). The EML is updated every two years. It helps countries prioritize critical health products that should be widely available and affordable throughout health systems. The 2019 list focused on cancer and antibiotics, with an emphasis on smart prioritization and how access for patients could be improved. New cancer medicines providing wide benefits were added, including immunotherapies for melanoma. Out of seven recently approved antibiotics, three were added as last resort treatment. The new EML classification of antibiotics (AWARE) was further refined and extended to all available antibiotics. About 50 medicines (11%) on the EML were patent-protected, with expected (primary and secondary) patent expiry between 2020 and 2037. For the 2021 edition of the EML, new gene and cell therapies would be evaluated in view of their potentially high benefits for patients.

Thomas Verbeet (Statistician, Economic Research and Statistics Division, WTO) illustrated how data could be used to measure trade in new technologies. While there were some methodological challenges to determine what classifies as a public health good, the recent breaking up into subcategories of the WCO Harmonized System made it easier to measure trade in specific health products. There had been a huge increase in trade of such products and a generalized reduction of barriers and tariffs across the board. Data showed that the more developed a country was, the lower the applied tariffs. Parties to the WTO Pharmaceutical Agreement accounted for about 65% of global trade in pharmaceuticals in 2016. With global trade in services increasing over 10% annually over the previous decade, the challenge was to identify what constituted a health service and to take it into account when measuring trade.

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