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HOW 5G TECHNOLOGY WILL HELP US TO MANAGE THE GLOBAL HEALTH CRISES OF THE FUTURE

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In many cases, history has shown how crises, whatever their nature, often exponentially accelerate the process of adopting new technologies. The rapid spread of danger and the widespread feeling of urgency allow to overcome many of the fears about their introduction into daily life. The intervention of the State itself in the management of the emergency, which becomes progressively more pervasive, can favor, if not even impose, their adoption. In many cases, once the threat has been eliminated, these technologies remain present in the daily life of society, which in the meantime has had the opportunity to test their contraindications, understand their potential and become familiar with them.

During the most acute phases of the COVID-19 epidemic, even before the World Health Organization called it a real pandemic, the Chinese government gave a huge boost to the extension of the 5G telematic infrastructure, promoting its application to the healthcare sector, as well as large-scale testing of the applications connected to it. This with particular focus on the areas most severely affected by the virus.

In March, the main TLC companies active in the Chinese province of Hubei, at the epicenter of the infection, provided their support for the construction of 5G stations and antennas within the complex that houses the Wuhan Vulcan Mountain Hospital. This is the well-known hospital that was built in just seven days to increase hospitalization and contagion management capabilities in the city of Wuhan, modeled on the Xiaotangshan hospital in Beijing. In addition, the companies have also set up special protection teams, capable of monitoring the security of the networks and the real-time operation of the entire digital architecture. This stimulus is the result of a decision taken by the Central Government on March 4 when, during a meeting of the Political Bureau of the Central Committee of the Communist Party, was proposed the creation of new 5G networks and data centers in the most endangered areas of the country.

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We need to think of the 5G network, in fact, as a force multiplier. Many of the devices currently in use today, which allow to perform a wide variety of functions, from

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streaming high definition images (4K) to the collection and transmission of huge amounts of data in real time, are strongly constrained by the 4G network, which for structural reasons limits their performance and potential for use. Upgrading to a 5G network make it possible to overcome those limits and enjoy a much more extensive and reliable data connection, capable of hosting an incredibly greater number of devices with unprecedented speed and transmission capacity. This opens the door to an increasingly pervasive application of technology to different fields of the daily life. These features result even more valuable during the management of a global health crisis, such as the current one.

Before reviewing the possibilities of using 5G technology during all phases of the management of a hypothetical future epidemic, starting from the recent Chinese experience, it is necessary to reflect on some basic concepts. Technology, in a context such as a global health crisis, is useful if it increases process efficiency. That is, if, on a macroscopic level, it contributes to saving time and resources, net of the quality of the service provided. In many cases, in a scenario that is looming as a struggle against time, the delays afflicting the management of the crisis also derive to a large extent from the difficulty encountered in finding, sharing and processing the information, very valuable for planning and putting into act effective contrasting strategies. Obtaining a complete situational awareness is often an unrealistic goal, given the unpredictability that characterizes the evolution of the phenomenon. However, moving towards this goal means gradually increasing the efficiency of the machine assigned to manage the emergency.

During the initial phase of an epidemic on a national scale, as was also recently experienced in Italy with the COVID-19 virus, the state implements a series of containment measures to limit the spread of the pathogen. On the one hand, displacements are drastically limited, on the other, the risk for those who are called to operate outside or in contact with other people increases considerably.

Currently, if an individual begins to manifest suspicious symptoms, he must in any case contact the medical staff, who must present himself on the spot to carry out the necessary investigations. With a nationally extended 5G network, thanks to the use of IoT (Internet of Things) devices, it would be conceivable to monitor one's vital

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parameters from the very place of residence and transmit the data in real time to the competent healthcare structures. It may also be possible to interact remotely with medical personnel through the streaming of high-resolution images (4K or higher), so as to allow the latter to carry out a first screening, quickly identifying the potential infected and distinguishing the most serious cases and compromised by less serious ones. In this way, by creating a scale of priorities, it would be possible to reduce the clogging of the reception structures which, in emergency situations, find themselves overloaded. The reception and sharing of data, through a dedicated cloud architecture, could also allow to update the infection map in real time, in order to have an increasingly precise and reliable picture of the evolution of the epidemic.

During the most acute phases of the health crisis, the 5G network would be able to facilitate a variety of tasks. First of all, it would allow hospitals to exchange data on the conditions of their patients in real time, also via the cloud. From the number of beds available (to optimize the sorting of arrivals) to the number of deaths, from vital parameters to past clinical histories, from the days of the course of the disease to responses to different types of treatment. This would allow, on the one hand, to make operational activities more efficient in a congested context, while, on the other hand, to obtain huge quantities of data, precious and essential for the study of the phenomenon. Once a critical mass of data has been collected, these can in fact be analyzed by deep learning algorithms and artificial intelligence (AI) software, with the aim of identifying trends and patterns useful for the development of treatments, as well as for creating forecast models about the evolution of the contagion. Systemically, this information is vital for the public authorities in charge of better planning and coordinating containment and public security activities. A further practical aspect of the use of 5G for the management of future health crises (already experienced, albeit limited, in China during the coronavirus pandemic) could be the creation of 'smart ambulances'. By connecting the ambulance and all the IoT devices on board with the hospital, it would be possible to inform the receiving structure about the patient's conditions during the journey, thus shortening the time needed to prepare the reception and treatment activities.

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Within scenarios in which outdoor exposure and human-human interaction must be as limited as possible, an increasingly important role will probably be played by self-driving vehicles, which are currently being tested in different countries in the world, not least Italy. Already today, in China, during the lock-down of the Hubei region due to the Coronavirus, many services were carried out using self-driving vehicles, including the delivery of food, materials and medicines within the areas most affected by the virus. Even in the United States, more precisely in Florida, the use of autonomous vehicles for the transport of the Covid-19 tests to and from hospitals has recently been tested. The 5G, in this case, could allow to put all these technologies, currently operating via the 4G + network, in a system, creating logistic architectures entirely based on autonomous vehicles, drastically reducing the exposure risks for the medical and general staff.

There is also a further extremely delicate phase to be taken into consideration, namely the one that affects the terminal tail of the contagion curve, during which activities begin to gradually reopen and the quarantine restriction to be loosened. In this period, a widespread and prudent monitoring of the population is more necessary than ever, in order to avoid the emergence of further outbreaks and to reverse the curve again, thus nullifying previous efforts. One tool that has proven extremely useful in managing this complex transition, already widely employed in China and other countries, is the use of thermal cameras and other devices for measuring biometric data from a distance. These sensors are positioned inside the main passage and assembly points, such as metro stations, shopping centers or airports, in order to immediately isolate potential new infections. Again, the ability to share, cross-check and analyze huge quantities of data in real time and without latency is guaranteed by a dedicated 5G infrastructure. These are just some examples of how this innovation could make the work of health workers more efficient during future epidemic. Already today, by extending the 5G network to hospitals and to the areas most affected by Coronavirus, China has already undertaken an important benchmark test, which has made it possible to quickly experiment and appreciate the potential of this technology in a situation of high stress. The future of health systems, especially in the West, in the face of the progressive aging of the population, will have to irremediably pass from the

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digitization of their services and from an ever greater data-sharing. This can only be possible through the creation of a powerful and reliable digital infrastructure that allows the full expression of these capabilities without structural limits, such as the 5G network. On the one hand, there is no doubt that the increasingly intrusive role of technology and data collection within the private sphere will rekindle, in the future, important ethical debates, attributable to the ancient dispute between privacy and collective security. In the face of such critical questions, each single State will be called upon to respond according to its own rules and values. On the other hand, even in the face of recent Chinese experience, it is instead difficult not to guess the disruptive benefits that the application of IoT, AI and Big Data analytics technologies can bring to the public health sector. So, in a world that will inevitably move more and more towards the construction of 4.0 health systems, the 5G network will be the fundamental prerequisite for any informatization effort, as a digital infrastructure capable of multiplying the possibilities of applying devices and technological services to a broad spectrum of medical and management activities. This could prove to be a real game-changer, not only for the future of public health at large, but in particular for the management of future global health crises.