5G

HELPING DELIVER HEALTH AND EMERGENCY SERVICES

Healthcare Background

1. The healthcare industry remains one of the least digitised industries worldwide with many current practices still running paper-based operations. The industry has been slow to adopt new technology due to a lack of funding, concerns over reliability and security, and a complex regulatory environment with embedded legacy systems. However, it has been said that healthcare is the field that might experience the most changes and will benefit from countless aspects of 5G technology.

2. The call for more digitised healthcare systems should be further encouraged by the World Health Organisation's estimates that the World will lack 12.9m healthcare workers by 2035. The strains on healthcare systems caused by the shortfall in healthcare professionals can be alleviated by utilising new 5G technologies.

3. In the UK, the Office for National Statistics states that the population is projected to increase by 3 million by 2028; the NHS will have to adapt to cater for this increasing population. Another important change in this demographic is the amount of aging people in the population. It is estimated that 39% of us will be over 65 by 2036, meaning more people are living with age related conditions such as heart disease. This is likely to put further strain on existing health services.

4. Furthermore, the Office for National Statistics estimates that by 2043, life expectancy is projected to increase to 82.6 years for males and 85.5 years for females. These numerous statistics reliably indicate there will be an increasing number of older people and the proportion of the population aged 85 years and over is projected to almost double over the next 25 years. The elderly are more inclined to use health services and 5G technology has the ability to alleviate some of the burden these population projections will have on the healthcare system.

5. There's certainly going to be a global increase in the cost of providing healthcare to an ageing and growing population, especially in developed nations such as the UK. There is a need for technological advancements in healthcare to ensure cost effective methods are available to ensure a high standard of healthcare is maintained. It would be cost efficient to incorporate new 5G technologies in healthcare practices. Estimates reveal that 5G innovations could bring global savings of c. $90 billion to the healthcare industry in 2030. Reallocating this saved money could lead to almost a billion extra patients being treated globally each year by 2030.

6. In 2014, government statistics indicated that a single 11.7 minute trip to the GP costs the NHS £45 and a home visit lasting 23.4 minutes would total a cost of £114. Accumulation of these costs creates a major financial burden for the NHS. These costs can be reduced through utilising 5G technologies such as tele-consulting and home monitoring systems. These innovative technologies mean more medical care can be provided online which means more patients can be seen by healthcare professionals because less time is spent traveling to visit patients. This will make the healthcare system more efficient.

7. Currently many people find access to healthcare facilities very difficult. For example, some senior citizens lack mobility and are unable to travel to a doctor's office or hospital. Additionally, a significant amount of the population live in rural areas and their nearest healthcare facility is a long distance away. Travelling these long distances can be time consuming, costly and difficult (especially when ill). 5G can provide opportunities to help these members of society have better access to healthcare provisions.

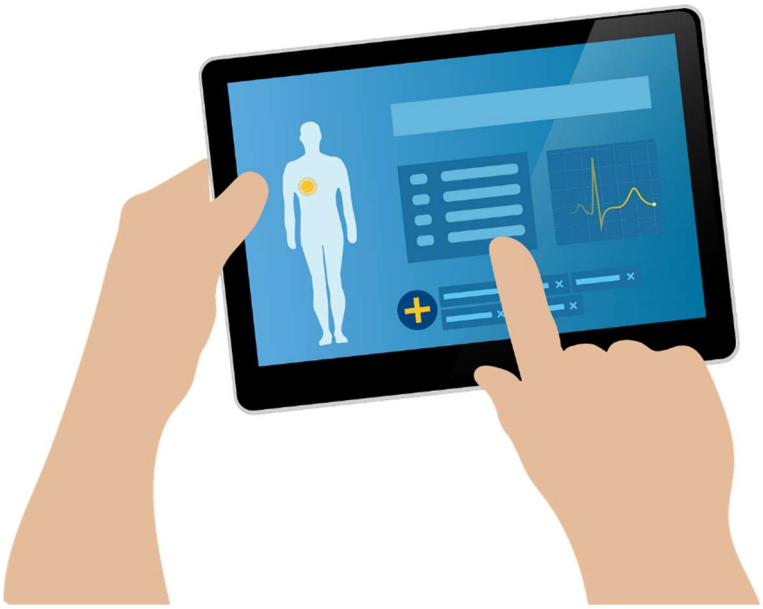
8. Finally, the recent COVID-19 pandemic has forced a re-think in regards to how we function in society. The recent pandemic has brought to the forefront the need for constant connectivity. People need reliable connections to ensure they are not cut off from society during times of self-isolation. The emergency services also need to be reliably connected to ensure they can communicate and deliver the care the public rely on. 5G is a vital piece of infrastructure which will ensure this connectivity is maintained. In addition, the recent pandemic has also exhibited the need for adequate technology which enables people to work from home. People can continue to function as normally as possible without leaving the house. This negates the potential health risks associated with leaving the house and having to work in the office. This way of functioning can be made even more possible by 5G technology.

How Can 5G Help Improve Healthcare and Emergency Services?

Improved levels of security, latency and reliability

9. 5G technology can ensure data security. One of the many issues which has prevented the digitisation of the healthcare industry are concerns over security. This should not be a concern for the adoption of 5G technology. 5G ensures sensitive data is secure through advanced encryption techniques, support for private networks and new security paradigms such as 'Software-Defined Perimeter'. Understandably it is important to protect sensitive, personal healthcare data and any new technological system

needs to be secure. Personal health information is a very private matter and patients need to be secure in the knowledge that their data will not be leaked or shared.



10. Another concern which has prevented the digitalisation of the healthcare industry is reliability. Ensuring the reliability of 5G connectivity is vital if the potential technological benefits are to be utilised. 5G promises ultra-reliable and secure connectivity with the possibility of 99.999% network reliability through new capabilities such as network slicing, encryption of data in motion and reliable handover between radio/network nodes. If new healthcare technologies are to be utilised, such as tele-consulting, the connection to a healthcare professional needs to be fast, uninterrupted and reliable. This ensures the patients will receive the care they need. Reliability is also vital if some of the urgent technological advancements are to be utilised; if a doctor in A&E is giving important information to paramedics in an ambulance, the connection needs to be reliable to ensure the safety of the entire operation. This reliability can be delivered by 5G technology.

11. Improved technological infrastructure will result in patients getting treated sooner. 5G technology can help with improving the efficiency of healthcare delivery by cutting the time it takes for digital processes to complete. For instance, magnetic resonance imaging and other image machines produce very large files that often must be sent to a specialist for review. When the network is low on bandwidth, the transmission can take a long time or not send successfully. This means that the patient waits even longer for treatment and providers can see fewer patients in the same amount of time. 5G networks can help transport huge data files of medical imagery which can improve both access to care and the quality of care which means patients get treated sooner.

12. In addition to low bandwidth, 5G technology also boasts ultra-low latency which enables instant transfer of data. Latency refers to the time between a request that a computer command be executed and the actual execution of that task. 5G will have latency levels as low as a few milliseconds. This provides new opportunities for the healthcare industry, information can be shared between specialists quicker and more efficiently. For instance, second opinions will become easier to obtain; a doctor can send an image or other data to another doctor on the other side of the world almost

instantly. The benefits of this would include overcoming disparities in geography, income or class status. This is especially the case for people in rural areas or underserved urban populations because patients in these areas do not often have access to the latest medical expertise.

13. With 5G technology, these patients will be able to have access to professional care from their remote location without having to travel.

New 5G powered innovative technologies improving healthcare efficiency

14. Mobile apps can help improve the efficiency of healthcare provision. 5G powered applications could streamline the entire healthcare process; an NHS app could be the entry point for all patients and will mean the journey from GP, to specialist, to treatment can all happen over a mobile phone. 5G technology can make this efficiency enhancing innovation a reality. These healthcare apps would save the NHS money which can be reallocated to areas of healthcare which require more funding. Ultimately, this improved efficiency could mean more lives are saved.

15. 5G opens up the possibility for new innovations such as tele-consulting. As previously mentioned, many patients who require treatment live too far from necessary facilities. Travelling to these facilities can often be difficult, time consuming and costly which results in some people going without care. 5G technology will mean people in rural areas won’t have to travel to see a doctor. Instead, virtual consultations via HD video calls could be used for initial screening assessments, routine check-ups, therapy and visual diagnoses. Doctors could make recommendations after a short video call which provides those that live a significant distance away from healthcare infrastructure access to the care they need.

16. 5G technology can open the door for remote mobile robotic surgery. Reassurances regarding the reliability of 5G technology means surgeons could now operate on patients who are located large distances away; this would mean patients won't have to travel huge distances to get specialist treatment required. The first real telesurgery has now been conducted in China, in which a brain stimulation device was implanted in a patient using robotic equipment operated by controllers at a remote location. Tele-surgery has also been used to combat the Coronavirus: In February 2020, using a 5G-powered robot, doctors at a hospital in east China's Zhejiang Province conducted an ultrasound scan for a patient 700km away in Wuhan, the centre of the coronavirus outbreak. In line with the patient's ultrasonic images transmitted back in real-time, two doctors of Zhejiang Provincial People's Hospital, operated a robotic arm via a 5G network that performed the ultrasound scan for the patient in a makeshift hospital in Wuhan. This example shows the possibilities 5G technology can have for the healthcare industry; specialist doctors could carry out procedures from a remote location. This means a patient, who's local hospital does not have the specialist professionals available, can still get the required expert care through tele-surgery.

17. 5G technology will enable more people to be connected which means more people can benefit from new innovations. Increased bandwidth and capacity enables more e-health devices (e.g. patient wearables/machine monitoring sensors) to be deployed within the same area network. This means more people will have reliable access to e-health devices which makes home monitoring and remote patient monitoring a viable technological advancement in the healthcare industry.

Home monitoring and remote patient monitoring

18. Another potential benefit brought by 5G technology could be home monitoring and remote patient monitoring. 5G could enable Remote Patient Monitoring; this includes the use of sensors, wearables and e-health devices. These devices can collect patient data which can then be analysed without the need for a patient to travel to healthcare facilities or have face-to-face appointments with medical professionals. This technological advancement could provide many benefits including:

- Fewer patients needing to stay overnight in hospitals which increases the amount of available beds. Patients can be monitored whilst at home rather than using beds in hospitals. These beds can then be used for people who need hospital-based care.

- Fewer visits by medical professionals to patients in the community. This could include a midwife visiting a new mother or a doctor visiting an elderly patient. This makes the healthcare professional's job more efficient because it eradicates travel time and they can help a greater number of patients.

- Fewer outpatient visits by patients to the hospital. Real time information provided by the remote patient monitoring devices coupled with better insights that patients have of their own illnesses will reduce the need for some visits by out-patients to hospitals.

- Overall this means that healthcare professionals can spend more time face-to-face treating those that require more attention whilst also providing care to those that are being remotely monitored. Overall, the entire healthcare system becomes slicker and more efficient.

19. Remote diagnosis devices could detect health problems without the need for doctors to examine a patient in a hospital or clinic. Remote monitoring devices can track vital signs such as glucose levels and transmit information to health care providers. This could bring tremendous benefits for people who suffer from serious health issues such as cardiovascular disease, diabetes or cancer. The remote monitoring devices detect early warning signs before an emergency happens which enables physicians to provide medical care to patients before a medical emergency occurs. An example of this is the Michael J. Fox Foundation which uses devices to track tremors associated with Parkinson's disease. The wearable motion sensors provide an unprecedented amount of reliable data in real time for doctors to analyse and identify patterns in the patient's symptoms. This allows doctors to make a better judgment calls regarding particular medications or treatments. For this to be viable, physicians need access to detailed patient data which can be provided by 5G technology.

Improving emergency vehicles

20. 5G technology could provide upgraded communication systems to improve emergency vehicle tracking and their ability to send real time data in transit. Improvements in the emergency health service are constantly sought after, new targets in the UK set out in 2018 state that all ambulance trusts should, on average, respond to category 1 (life threatening) calls within 7 minutes. This represents a decrease in average response time of a minute (or 12.5%) compared to the previous targets. 5G technology could help with improving the efficiency of the emergency healthcare services. For example, 5G technology could provide the healthcare industry with 'connected ambulances': these could provide real-time streaming of patient data from sensors and high definition cameras between paramedics and

hospital staff. This innovation would provide A&E staff with a better understanding of the patient before they arrive. In some situations, specialists can guide paramedics through procedures without the need to travel to the hospital meaning life-saving procedures could be carried out in the field by paramedics. The results of 5G connected ambulances would ensure a more efficient and potentially safer emergency service.

Aiding in pandemic response

21. 5G technology can help with pandemic control such as combating COVID-19. Due to the recent Coronavirus pandemic, mobile connectivity has shown to be a vital part of our infrastructure. In these troubling times where people are self-isolating, it is important that individuals stay connected. Good connectivity has enabled members of society to function as normally as possible by allowing them to keep in touch with loved ones, work from home, order vital provisions and many other necessary tasks. Overall this has ensured physical and mental health has been healthily maintained. 5G technology will improve this connectivity and enable much greater proportion of the population to be connected.

22. COVID-19 is also being combated by patrol robots which are using 5G technology to carry out disease prevention inspections in China. Authorities are also using disinfection robots to try and combat the virus. Additionally, 5G cloud intelligent robots have been involved with other medical services such as remote care, temperature tests, cleaning and drug delivery. In the UK, there are calls to create an app which can help control the spread of COVID-19; proposed in a paper by infectious disease experts from Oxford University's Big Data Institute (BDI), the idea is that people's movements can be tracked with the help of 5G technology. When the app detects a person has crossed paths with someone who has contracted coronavirus, they can be instantly contacted and sent for testing. Phone location data has already played a role in tracking coronavirus infection vectors with successes being recorded in China and South Korea and it could certainly be adopted in the UK with the help of 5G technology.

Disaster and fire response 5G technology

23. 5G technology could also aid in other disaster response scenarios. A team made up of BT, Verizon, Ericsson, King's and Unmanned Life demonstrated a number of cases at University College London in regards to disaster response scenarios including:

- Delivery of emergency kit or rescue equipment to a disaster area using drones.

- Search missions with HD imaging in disaster recovery zones.

- Co-ordinated missions where multi drone fleets from multiple countries could be used to inspect an emergency area or perform specific tasks.

- Rapid deployment of temporary cellular network drones which can enable communications for disaster recovery.

These applications demonstrate how 5G combined with other technological advancements can aid in providing disaster recovery services on a global basis.

24. Innovative 5G enabled fire detection systems can aid in fire response. In the case of a fire detected by the building management system, the security service provider can initially verify that it is not a false positive alert from video footage available from the site. Alternatively, an emergency call to the fire brigade is initiated, including a building floor plan for the first responders. This will give the front-line fire-fighters a better understanding of the situation they are dealing with before arrival. Additionally, 5G technology such as Qwake's C-Thru could aid firefighters by providing augmented reality helmets which use thermal imaging in which the wearer can see through smoke and darkness and rapidly locate victims. Future technology could enable artificial intelligence to filter through the noise of screams, sirens and flames to provide information to firefighters. This technology would make firefighters jobs easier and could save lives.

Improving the safety of driving

25. 5G could also bring technology which makes other aspects of everyday life safer, such as dangerous activities like driving. 5G powered smart cars could have significant benefits for health and safety. Self-driving cars can use 5G technology to talk with one another. C-V2X, a piece of communications technology will allow vehicles to communicate wirelessly with each other, with traffic signals and with other roadside gear, improving both functionality and safety. The technology will help conventionally driven cars become safer by providing warnings about collision risks or icy roads. 5G could also improve road safety by enabling drones to act as road surveillance or by replacing traditional speed cameras by tracking the speeding drivers and sending instant information to the police.

<u>How should/does planning policy help?</u>

26. National policy of all governments, reflected in the National Planning Policy Framework (NPPF), is to support the provision of advanced mobile connectivity. Specifically, under chapter 3(20), the NPPF states that strategic policies should set out an overall strategy for the pattern, scale and quality of development, and make sufficient provision for infrastructure for telecommunications. The NPPF emphasises the importance of maintaining healthy lifestyles throughout the document. This paper has

explained how 5G can aid in ensuring the population have these healthy lifestyles and therefore supports government planning policy. Section 110 of the Localism Act 2011 places a 'duty to co-operate' on public health leads to 'engage constructively, actively and on an on-going basis' to develop strategic policies. Therefore, public health and wellbeing matters must be addressed in statutory planning.

27. The NPPF is only applicable to regions of England. Other parts of the UK have similar planning guidelines which share the same message regarding the need for mobile connectivity. Scotland, for example, has the NPF3 which highlights the need for virtual connectivity under section 5.8 where it states that 'High quality mobile and fixed broadband connections have become essential to support communities and business development in both rural and urban areas.' Planning policy frameworks across the UK support the implementation of 5G technology and highlight the positive implications of this improved connectivity.

Neighbourhood Planning document support

28. Neighbourhood plans often stress the importance of health and safety in communities, many recognise that advanced digital infrastructure can help with this. Although they are only applicable in England, they set out the importance of certain types of development which should set a precedent for the whole UK. Warwickshire County Council's Neighbourhood Development Planning for Health states how mobile connectivity is vital to ensuring healthy communities. Section 4.5 Broadband explains:

> *"Broadband and superfast broadband is considered to be essential to the economy and should be treated as a necessary infrastructure for new and existing communities. It may increase access to remote educational and employment opportunities. Education and employment are both important determinants of health. It can also be important for health; delivering remote patient monitoring and health related information and education for patients and professionals. It can help to reduce social*

isolation and loneliness in communities, supporting improved mental health and wellbeing."

Under section 4.2 Health facilities, the Development Plan also explains how a national review identified problems associated with patient access to health service, especially in rural areas. Many of the reasons cited can be helped by 5G technology such as*:*

- Cost of transport
- Inaccessible location of health services
- Safety and security
- Travel horizons – people on low incomes travel shorter distances from home

NHS document support

29. NHS University Hospitals Birmingham document: Our Strategy to Build Healthier Lives. This document states under section 5.3 Digital and technological transformation that the NHS needs to be pro-active in developing technological advancements and encourage a "digital first" approach:

"As well as extending our existing systems and capabilities to all our sites and services, we now need to be bold and far-sighted in order to predict, develop and commit to the leading health technologies for the next ten years and beyond. The demographic and epidemiological trends… will overwhelm the health service unless we can find ways to transform models of healthcare to be radically more effective and efficient. New technologies are the key."

"We will be at the forefront of developing and adopting new and emerging technologies, including the technology to enable video consultations which can potentially take large numbers of outpatients from the physical clinic to the virtual clinic. We will also make a major commitment to emerging AI diagnostics and analytics."

Cellnex