vodafone

Better health, connected health

How 5G and IoT Technology Can Transform Health and Social Care

A WPI Strategy report for Vodafone UK

November 2020

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About WPI Strategy

WPI Strategy is one of the UK's leading political communications consultancies, with a track record of delivering high impact public affairs campaigns. We offer senior strategic counsel and work extensively with our sister company, WPI Economics, to ensure that campaigns are underpinned by evidence-based content.

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About Vodafone

Vodafone UK connects people, businesses and devices to help our customers benefit from digital innovation. Our services span mobile, fixed line, broadband and the Internet of Things (IoT). We employ around 11,000 people across the UK, and operate more than 400 retail stores nationwide.

Having made the UK's first mobile phone call and sent the first text, Vodafone has a history as a tech pioneer. In 2018 we made the UK's first live holographic call using 5G, and were the first to start carrying live 5G traffic from a site in Salford, Greater Manchester. Today we serve more than 18 million mobile and fixed line customers in the UK, with 4G network coverage at 99%. Vodafone has launched 5G in over 50 places across the UK so far. Our customers voted us the UK's Best Network Provider at the 2020 Trusted Reviews Awards. To help deliver Gigabit UK, we are rolling out full fibre broadband across 12 towns and cities in partnership with CityFibre, reaching one million homes and businesses by 2021.

Our ReConnect programme is supporting women and men back into work after a career break, our IoT technology is working to create a low-carbon society, and our free Digital Parenting magazine is helping families across the UK to navigate the online world safely. For two years running, we have been named one of the UK's 25 Best Big Companies to Work For by the Sunday Times, and a Top 100 Employer by Stonewall.

We are part of Vodafone Group, one of the world's largest telecommunications companies, mobile operations in 22 countries, partner with mobile networks in 42 more, and provide fixed broadband in 17 markets. As of 30 June 2020, Vodafone Group had approximately 300+ million mobile customers, 27 million fixed broadband customers and 22 million TV customers, including all of the customers in Vodafone's joint ventures and associates.

For more information about Vodafone UK, please visit: **www.vodafone.co.uk**

Foreword

The COVID-19 pandemic has been a challenge for almost every organisation, large or small – and the NHS has been no exception. Through innovation and hard work, the NHS has undoubtedly risen to the challenge. On behalf of Vodafone,
I would like to thank everyone at the NHS for the work they have done over the last few months, and continue to do.

I'm really proud of the work Vodafone has done to support the NHS in dealing with the new challenges of COVID-19: doubling the calling capacity for the NHS 111 service to help it manage a huge increase in the number of people seeking advice remotely; providing free network support and technical assistance for the temporary Nightingale hospitals; enabling Wi-Fi calling connections for hospitals around the country; offering our customers who are NHS staff and care workers free unlimited mobile data for six months; and more.

The NHS changed its ways of working at speed, with technology being central to the NHS's ability to continue to function effectively and to serve the people who depend on it. The rapid changes to ways that NHS staff interacted with each other and with patients while maintaining social distancing would simply not have been possible without digital technology.

Technology has already helped to transform the NHS at short notice at a critical time. But it promises even more in the future – particularly with the roll-out of 5G and Internet of Things (IoT) technology. The possibilities unleashed by 5G and IoT touch almost every part of the healthcare system, from the visible (remote surgery, or drones carrying transplant organs and drugs between hospitals) to the unseen but vital (IoT-enabled hospital equipment management systems that use sensors to automatically monitor stock levels). Both NHS patients and staff stand to benefit from these technological innovations.

New polling carried out on behalf of Vodafone UK shows that a clear majority of the public want the NHS to use 5G and IoT applications. For example, four out of five of those polled say they would like to see 5G-connected ambulances, and three out of five back the use of 5G remote assisted surgery and drone technology, and believe that video consultations are more convenient than visiting a GP surgery or hospital in person. A similar proportion (57%) would be comfortable having medical appointments via video even once the coronavirus pandemic is over.

Our polling shows very strong public support for the Government to increase the use of the latest digital technology in the NHS so that we future-proof the UK healthcare sector. In particular, the public believes that the 40 new NHS hospitals promised by the Government by 2030 should be fully equipped with the latest digital technology, including 5G. This technology is already available and the NHS should take advantage of it now. We have a perfect opportunity to ensure that digital technology is designed in from the start, so that the hospitals of the future can use the technology of the future.

Healthcare has always been an early adopter of the latest technology. New technologies have often been used to make healthcare better, faster and more efficient. It is vital that the NHS is given the opportunity to maximise the benefits of the next big technological innovations, driven by 5G, as it has in the past. By committing to make the NHS the world's leading 5G healthcare provider, Government can ensure that healthcare professionals and workers have the very best technology they need to do their jobs effectively.

Anne Sheehan, Business Director, Vodafone UK

The Crisis: How COVID-19 has Spurred Digital Innovation in the NHS

COVID-19 forced the NHS in England, and healthcare systems around the world, to change rapidly. While in the NHS the most visible manifestations of the crisis were the PPE-clad frontline NHS workers dealing with an influx of coronavirus cases, and the rapid expansion of capacity through new Nightingale hospitals, it also had to find ways to deal with patients seeking help with a wide range of conditions without coming into direct contact with them. This led to a huge acceleration in the NHS's transformation towards greater use of digital technology – something that was already under way before COVID-19 but has been catalysed by it.

In March, behind the scenes, the workplace collaboration platform Microsoft Teams was rolled out to all NHS organisations, and a national agreement was signed for use of the video consultation platform Attend Anywhere, enabling outpatient appointments to be carried out remotely;[i] mobile network operators including Vodafone zero-rated Attend Anywhere calls so that customers could use the service without it affecting their data usage limits.

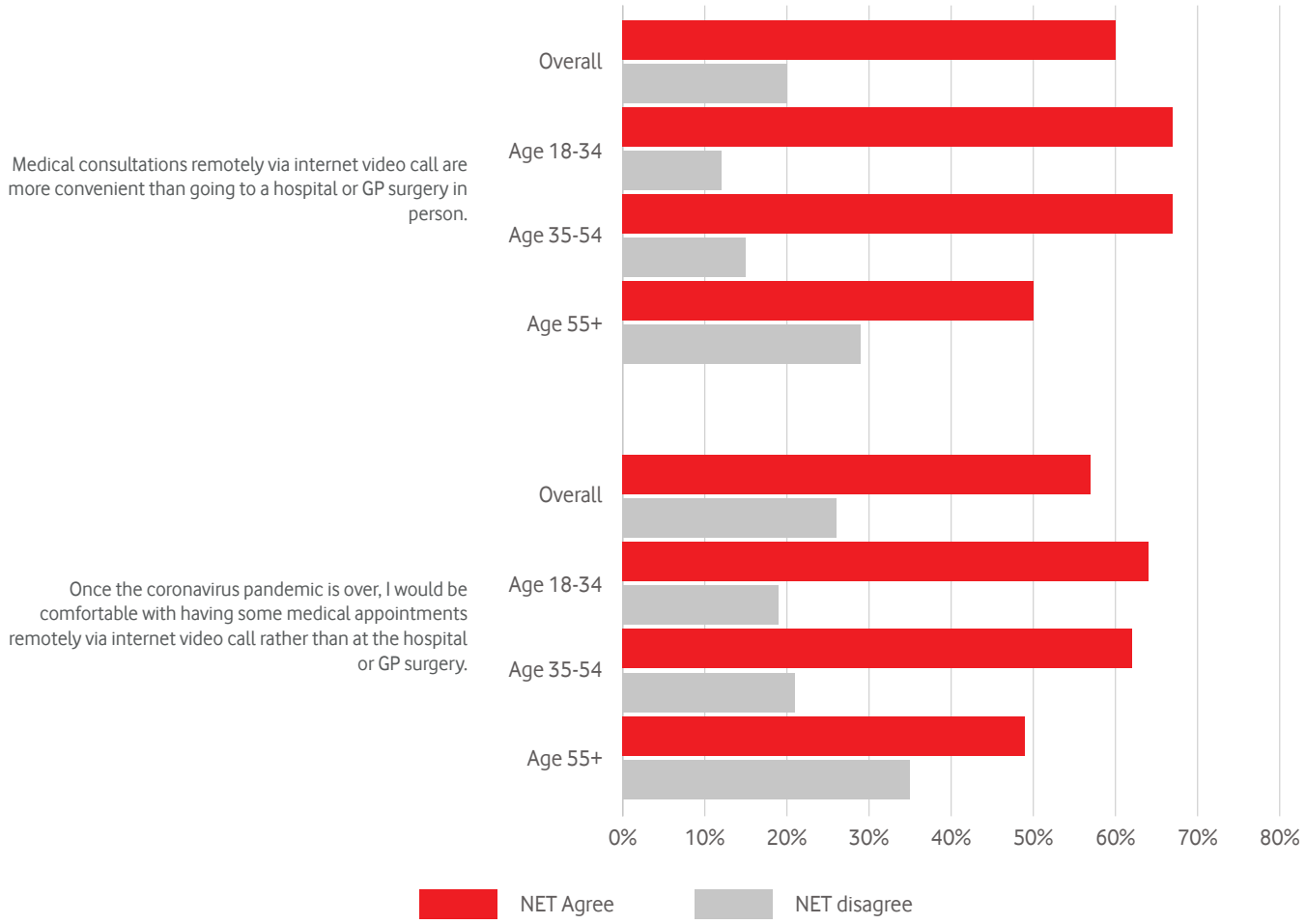
There was also huge additional demand on the NHS 111 helpline, and Vodafone doubled its calling capacity, enabling the service to handle 2,400 calls simultaneously. And to relieve pressure on the helpline further, NHS Digital set up an online system whereby people could check coronavirus symptoms; at its peak, 818,000 people accessed the service in a single day.[ii] In April, NHS England encouraged all GP practices to move to a "total triage" model using telephone and online consultation tools, directing patients to remote appointments wherever possible.[iii] Much of this digital transformation was already envisaged in the 2019 NHS Long Term Plan, but had previously been expected to be implemented over a number of years rather than just a few weeks.[iv]

The Royal College of GPs says that its own data suggests that in the four weeks to 12 April, 71% of routine GP consultations took place remotely compared to around 26% face-to-face – a reversal of the figures for the same period a year ago, when 70% of GP consultations were face-to-face and just 25% over the phone.[v] The demand for remote consultations is likely to be less urgent when the risk of COVID-19 recedes, and many patients would still prefer to see their doctor in person. But the convenience of remote appointments is likely to mean that they will remain more commonly used than they were before the pandemic. The Royal College of GPs says that it envisages a 50-50 balance between face-to-face and remote appointments in future,[vi] and a British Medical Association survey found that almost nine out of 10 GPs want to carry on holding consultations remotely once the pandemic has ended.[vii]

A poll of 2,000 people, carried out by Opinium on behalf of Vodafone in September 2020, has found a high level of public comfort with new technology, and strong support for many of the new possibilities digital technology opens up in the NHS and social care systems.

Our poll suggests an increased willingness to use video calling technology for health appointments. The increased use of video calls in many areas of life in recent months may have helped to build confidence in using this technology. 57% say they would be comfortable having some medical appointments remotely via online video consultation rather than going to a hospital or surgery even once the COVID-19 pandemic is over, with just 26% disagreeing. Younger people were notably more likely than older people to be enthusiastic about remote consultations, with 64% of 18-34-year-olds and 62% of 35-54-year-olds saying they would be comfortable with having them after the pandemic is over. But even in the over-55s, 49% were comfortable with the idea, compared to 35% uncomfortable.

Chart 1: To what extent do you agree or disagree with the following statements?



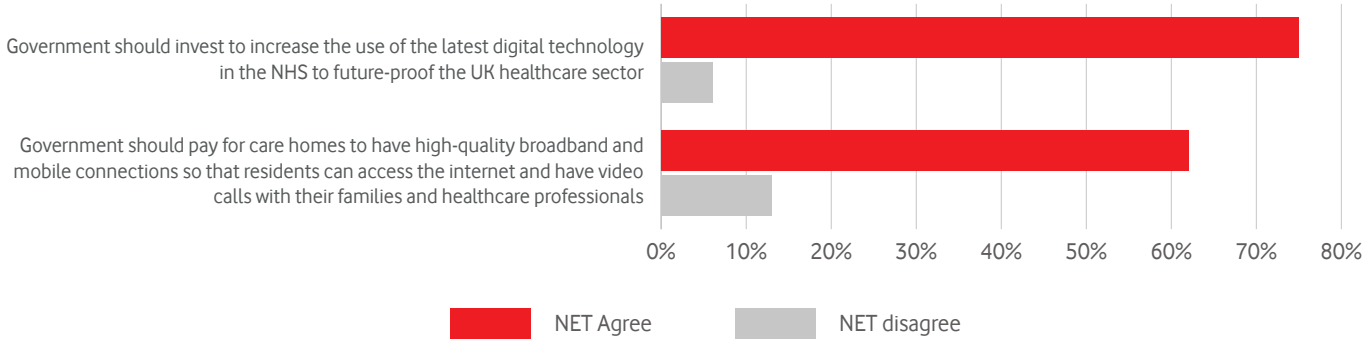
The ability to hold online video consultations will depend on the quality of the connectivity and IT equipment available to patients and NHS staff. In fact, while there has been a marked shift towards telephone consultations, there has not been a comparable switch to video or online consultations for GP appointments – despite the broader increase in the use of video conferencing for both business and social purposes during the pandemic. A BMA survey of GPs in June found that around half reported that their ability to provide remote consultations had been limited by internet speed or bandwidth, hardware and software, and IT infrastructure[viii] – but of course patient preference, and patient access to the relevant technology, also plays a part in uptake.

COVID-19 has also shown that many care homes have yet to install appropriate connectivity to allow their residents to access online medical services and keep in touch with friends and family. DCMS minister Caroline Dinenage MP noted in a speech in June 2020 that "15,000 care homes across England do not have adequate access to the internet"[ix] – something that has made it much harder for vulnerable residents to stay in touch with their families at a time when physical visits have been impossible.

All of this means that Health Secretary Matt Hancock's ambition, announced in a speech in July 2020, that "from now on, all consultations should be teleconsultations unless there's a compelling clinical reason not to"[x] can only be fully realised if the right technology is in place and accessible to everyone who needs it. More widely, his belief that "better tech means better healthcare" has been borne out by the experience of COVID-19, but has lessons for what comes next. The potential of technology in health and social care is clear, and its use and acceptance by both staff and patients have rapidly accelerated. But to consolidate this progress, and to realise the full potential of the latest 5G technology in particular, we need to make sure that the system is properly equipped to take advantage of it. This must include investing in digital infrastructure.

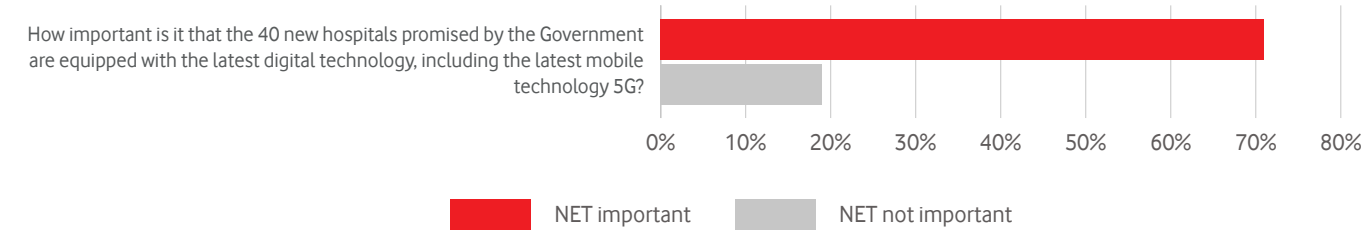
Our poll shows strong support for the idea that the Government should invest in new technology in health and social care. Three quarters of respondents agreed that Government should invest to increase the use of the latest digital technology in the NHS to future-proof the UK healthcare sector, with just 6% disagreeing. And almost two thirds agreed that the Government should pay for high quality broadband and mobile connections in care homes for the benefit of residents and their families.

Chart 2: To what extent do you agree or disagree with the following statements?



Finally, there is wide public backing for ensuring that the 40 new hospitals which the Government has announced it will build in the NHS in England are fully equipped with the latest digital technology, including 5G, with 71% saying that this is very or quite important, and just 19% saying it is not that important or not at all important.

Chart 3: How important is it that the 40 new hospitals promised by the Government are equipped with the latest digital technology, including the latest mobile technology 5G?



Vodafone UK – supporting the NHS through COVID-19

Vodafone UK is proud to have provided support to the NHS in responding to significant changes in the NHS's needs and working practices during the COVID-19 pandemic, and a sudden demand for additional connectivity.

Nightingale Hospitals

- Vodafone UK provided free network support and technical assistance for the temporary Nightingale Hospitals, set up to provide extra capacity for treating COVID-19 patients. Vodafone also increased the capacity of its network in the areas around the hospitals, to ensure that staff and patients could stay in touch with their families and loved ones.[xi]

NHS 111 service

- Vodafone UK doubled the calling capacity for the NHS 111 telephone advice service, enabling it to handle up to 2,400 calls simultaneously. With calls to NHS 111 from the public surging by as much as 400% compared to the pre-pandemic peak, Vodafone also equipped more than 1,000 retired health workers and GPs with software to work from home as remote call centre workers, to assist NHS England in staffing the free service. The additional workforce was up and running in days.
- In Northern Ireland, Vodafone added a hard-of-hearing option from social enterprise InterpreterNow, for deaf and hearing-impaired people calling the NHS 111 helpline. The service had already been rolled out in England, Scotland and Wales.

Additional NHS connectivity

- In the north east of England, Vodafone upgraded two hospitals with 900Mbps broadband, including the necessary routers capable of delivering that much bandwidth.
- Vodafone enabled 3,172 Wi-Fi Calling connections for the NHS South, Central and West Commissioning Support Unit in 24 hours. It also enabled Wi-Fi Calling for the Imperial College Healthcare NHS Trust in just two hours, as well as for the Royal National Orthopaedic Hospital in Stanmore and the United Lincolnshire Hospitals Trust.
- Vodafone provided the NHS High Weald CCG with remote working kit for their health workers who had to self-isolate, enabling them to remain operational while in isolation.
- The George Eliot Hospital in Nuneaton, Warwickshire, set up specialist pods to quarantine patients with COVID-19, with Vodafone UK's Rapid Response team equipping the pods with the necessary connections and communications services.

Helping NHS and care staff, and those most in need

- Vodafone offered customers who are NHS staff and care workers free unlimited mobile data for six months.[xii]
- Vodafone donated handsets and tablets to hospitals and organisations in need. For example, working with the Norwegian start-up No Isolation, Vodafone distributed specially designed video units, equipped with free connectivity, to elderly and isolated people to help them to stay connected to family and friends at a time when visits were impossible.[xiii]
- Vodafone zero-rated the NHS website, the NHS COVID-19 tracing app, and video consultation platform Attend Anywhere, so that customers can use these services without it affecting their data usage limits.

The Possibilities: How Technology Can Transform Healthcare

While the COVID-19 pandemic has seen the acceleration of the use of some digital technology in the NHS, the possible applications of new technological developments, such as IoT technology and the next generation of mobile technology – 5G – go much further. 5G is not just faster than 4G connectivity: it also offers much greater capacity, enabling millions of devices to be connected simultaneously. In addition, much lower latency means the delay between a device being instructed to perform an action and that action being carried out is reduced to less than 10 milliseconds: essentially real-time. This promises to transform many aspects of our lives, from leisure to manufacturing to transport – and some of the most exciting applications are in healthcare.

Some of these new applications of 5G and IoT technology in healthcare will be immediately visible, and some of them will be unseen but hugely beneficial. This chapter gives a taste of just some of what will be possible in the future once 5G is widely rolled out across the country, and in the NHS – and shows the level of public support for seeing some of them used in the NHS.

Remote assisted surgery and training

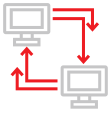
5G's high capacity and low latency (reducing the delay to less than 10 milliseconds making the transfer a near real-time interaction) means that it can enable surgeons to use augmented reality (AR) technology to provide remote expert guidance on surgery without needing to be in the same operating theatre – or even the same country. AR technology allows surgeons to interact with their colleagues remotely: via AR video feed, their hands can be superimposed on the patient's anatomy to give guidance during the operation, and they can overlay sketches and anatomical diagrams for reference. The same technology can be used to carry out training remotely, with students able to access teaching in real time from expert teachers who are not able to be physically in the same room as them. In both cases, the technology makes it easier to connect clinicians and access expertise from around the world.

Drones

Drones can be used to transport vital medical assets including organs for transplant, medical equipment and drugs both more quickly and more cheaply than by courier. In July this year, Vodafone announced a partnership with Skyports and Deloitte to use drones to transport medical supplies for NHS Scotland. Supplies including medicine, personal protective equipment (PPE) and COVID-19 testing kits will be flown to hospitals and medical practices on the remote Scottish Islands of Argyll and Bute using satellite-guided drones flying along pre-defined routes, significantly cutting transport times – from as long as 48 hours to just 30 minutes. Drones provide a significant cost saving too: a report by WPI Economics on behalf of Vodafone earlier this year found that, on average, it is 95% cheaper to use drones than couriers for transportation.

Data sharing

The massively increased speed and capacity of 5G compared to 4G means that very large files, such as MRI scans, can easily be shared securely for review between clinicians in real time, enabling more patients to be moved along the care pathway more quickly.



5G-connected ambulances

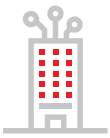
5G connectivity can link paramedics working with a patient in an ambulance with a hospital clinician using high-resolution video and tools that share the patient's medical records as well as live clinical data such as heart rate. Clinicians can examine the patient remotely, assess symptoms, perform initial diagnosis and prescribe urgent treatment that the paramedics can carry out before the patient even arrives at the hospital. Ambulance staff can use augmented technology (AR) support with AR glasses to follow specific treatment plans. The information sent to the hospital enables staff there to prepare the right treatment before arrival and save time – and lives.

Asset tracking

Every time NHS equipment, from wheelchairs to laptops to bed linen, goes missing it costs the NHS – and the taxpayer – money. Low-cost trigger tags on assets, combined with a series of beacons which constantly monitor where they are, means they can be found if they go missing or tracked if they are stolen. The technology can also be used to monitor stock levels for drugs and assets and track them across the supply chain, and to help understand how often equipment is used to manage resources and capacity, as well as helping medical staff locate equipment rapidly in an emergency.

Smart buildings

IoT devices can be used in buildings to monitor how space is used and ensure that energy is only used where it is needed. For example, technology such as smart heating and ventilation systems can ensure that only spaces that are occupied are using energy by being heated or cooled. Motion sensors can facilitate smart lighting, ensuring that again only occupied spaces are lit and to the correct levels. And smart buildings can learn about occupancy patterns and suggest how they can be optimised for both workforce comfort and energy efficiency. In hospitals, this could make a huge difference, both to how the buildings are used and to how much has to be spent on energy bills, as well as cutting the NHS's contribution to the UK's greenhouse gas emissions.



Heat detection cameras

The Vodafone Heat Detection Camera can screen the body temperature of patients, visitors and staff to help provide reassurance at a time of concern about COVID-19 infection, but also beyond. Intelligent thermal and HD camera technology is used to discreetly and accurately screen up to eight people at a time and 100 people per minute.

Social and technological prescribing

Technology such as wearable devices and monitoring systems can help people to stay healthy by living more active lifestyles, and support those with chronic conditions. And as a Vodafone report last year showed, technology can also help alleviate loneliness in older and more vulnerable people by keeping them in touch with their family and friends. Prescribing schemes that enable GPs and other health service practitioners to prescribe the use of wearables and other technology can support health and independent living.

Telemedicine

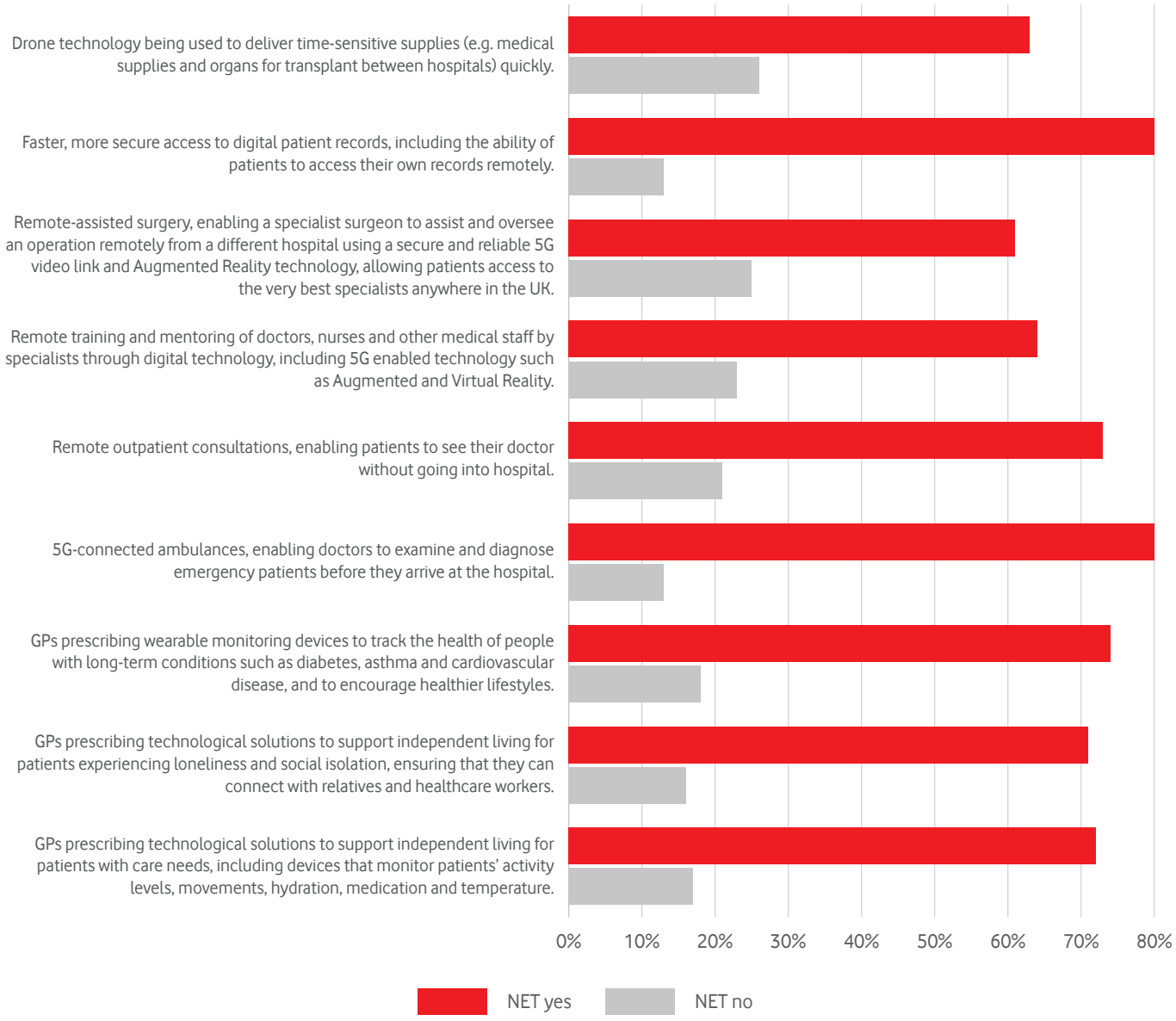
In Greece, the Vodafone Foundation Telemedicine Programme uses mobile technology combined with next generation medical devices to provide high-quality specialised healthcare, regardless of location. Using tablets and medical equipment, GPs and rural doctors are able to transfer their examinations to medical specialists for their expert opinion. The programme is implemented in 100 remote areas, covering a population of 500,000 people.

Connected Living

Vodafone's Connected Living helps people with care needs to receive tailored and personalised support. It uses a range of intuitive and user-friendly IoT devices to make everyday activities – such as household tasks and socialising – easier. These devices are controlled by a bespoke app, called Vodafone MyLife, helping the user to control their own environment with greater independence.

When asked about various specific examples of ways in which 5G and IoT technology could be used in healthcare, the respondents to our poll were broadly very positive. All of the examples provided had strong majority support, with four-out-of-five respondents saying they would like to see 5G-connected ambulances, and three-out-of-five backing the use of remote-assisted surgery and drone technology.

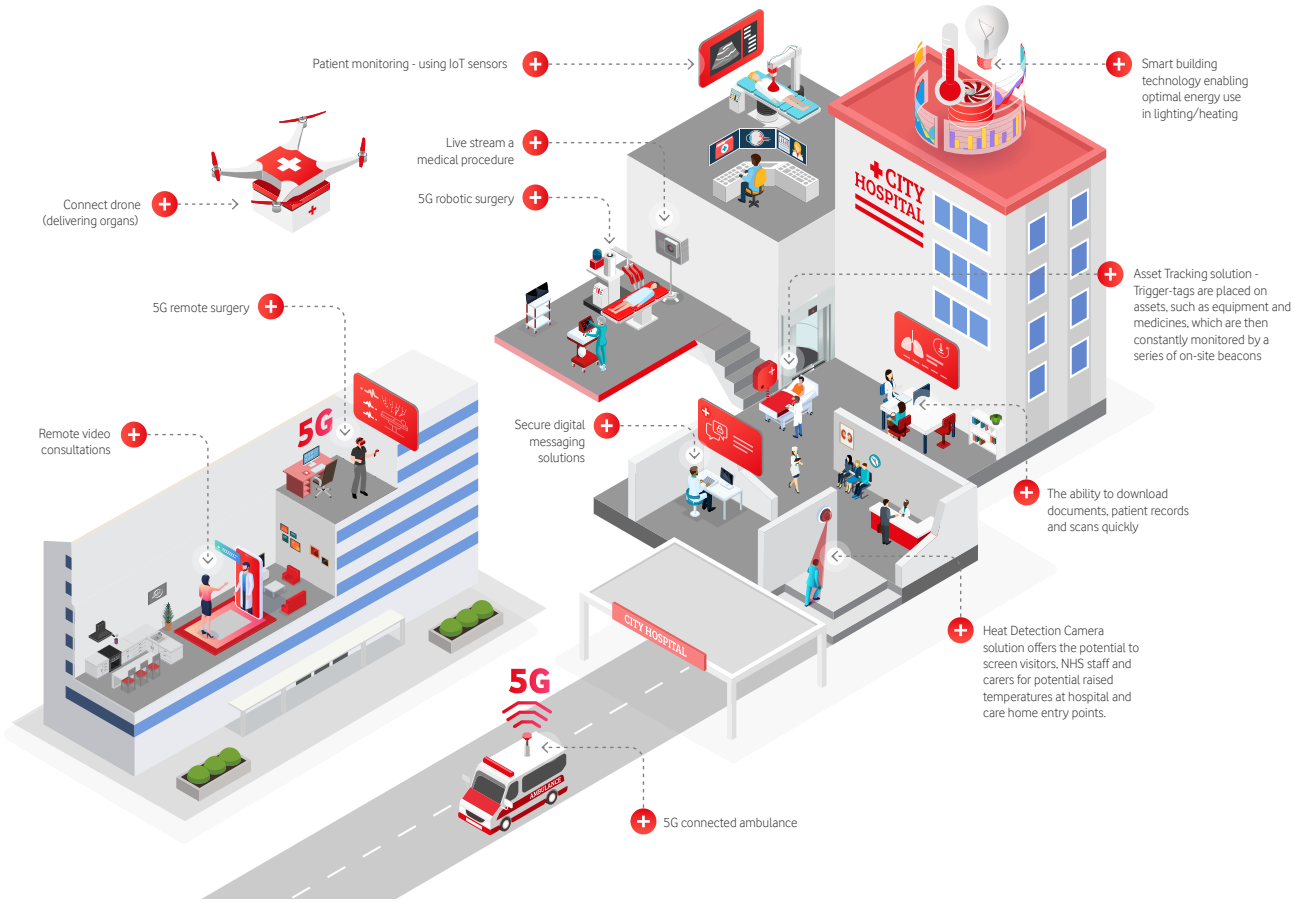
Chart 4: Here are some new applications of 5G technology that could be used in healthcare. Would you like to see each one used more widely in the NHS?



More than a Building: The Hospital of the Future

The Government has committed to building 40 new NHS hospitals by 2030, with six NHS Trusts already earmarked to receive funding to completely rebuild existing acute hospitals by 2025. This is an unmissable opportunity to remodel the whole NHS estate, designing in new 5G and IoT technology from the ground up to optimise everything from patient experience, to clinical collaboration, to equipment, linen and pharmaceutical supply, to smart hospital buildings with energy-efficient heating and lighting, and more.

This graphic shows what the hospital of the future could contain if new technology is designed in from the start.



Policy Recommendations

It is clear that the foundations are in place for a technological step-change in the NHS. There is recognition and support in Government to increase the use of new digital technology in the NHS. There is willingness and capacity to innovate at an operational level on the part of NHS staff, all the way from senior management to patient-facing clinicians, demonstrated by their response to COVID-19. And there is strong support from the public for new applications of 5G and IoT technology to be more widely used, and for the Government to invest in ensuring that this is possible, demonstrated by our polling. What is needed now is for this to be put into effect: in short, for the Government to commit to making the NHS the world's leading 5G healthcare provider.

NHS estate upgrade and innovation

- The Government has already committed to building 40 new hospitals in the NHS in England by 2030. These should, as a matter of course, be designed and built in such a way that they are ready to incorporate the very latest digital technology; and the rest of the NHS estate should be upgraded to enable 5G connectivity as well. Our poll shows that the public strongly supports government investment in digital technology across the NHS in general, and in the promised 40 new hospitals in particular.
- **The Government should invest £1bn to bring 5G to every hospital in England by 2025**, either via 5G private networks or in-building solutions, according to the desired use cases. And it should commit NHS hospitals to procure currently available mobile technology, including 5G devices, applications and IoT. Procurement of currently available technology will unlock investment in the development of further 5G healthcare applications.
- In addition, **the Government should invest a further £500m to encourage the creation of 5G healthcare applications through regional innovation centres**, to get even more out of the potential of 5G connectivity and ensure that the UK is a global leader in healthcare technology.

Connected ambulances

- Our poll showed particularly high levels of support for 5G connected ambulances. **Government should invest £10m in digitising 10 ambulances per ambulance trust in England** as a starting point to rolling the technology out more widely, with the aim of all of these ambulances being equipped by the end of 2021.

Drones

- Drones could be used much more widely to enable emergency services and hospitals to respond to incidents and move time-sensitive items such as organs and medical equipment across large distances quickly. But they have a wide range of other potential benefits across various sectors, not just healthcare, and the Government should ensure that all of these are maximised.
- **The Government should increase the number of drone trials in the UK with a fund of £30m, with particular emphasis on using cellular connectivity to support registration, tracking and beyond-visual-line-of-sight applications**. To see the benefits of this delivered as quickly as possible, the fund should be set up within 12 months.

Prescribing technological solutions

- The NHS is already working on ways of digitising and personalising the experience of those with long-term health conditions. Making it easier for GPs and NHS practitioners to prescribe technology such as wearable devices and monitoring systems can help to support independent living and encourage healthier lifestyles. Technology can also help people who are at risk of social isolation, making it easier for them to connect with relatives, friends and healthcare workers.
- The Government should prioritise and accelerate this work, with **a social and technological prescribing challenge fund of £100m set up within 12 months, aiming for full introduction of social and technological prescribing by 2022**.

Tackling loneliness through better connectivity

- Social care is behind the NHS on digital connectivity, with thousands of care homes having little or no internet access – despite the fact that for many families, video calls are the only way for them to see their loved ones.
- **The Government should cover the £4m cost of providing these care homes with one year of broadband connectivity**, allowing video calling between residents and their families and healthcare professionals – as well as the other benefits of internet access.

Smartphone upgrade

- The Government should introduce a voucher scheme to enable those on lower incomes, both of working and pensionable age, to update their handsets to models compatible with new NHS digital services, such as the NHS COVID-19 contact tracing app.

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