THE DIGITAL TRANSFORMATION OF CARE

A NEW PARADIGM FOR EFFECTIVE HEALTHCARE DELIVERY IN A POST-PANDEMIC WORLD

EVELYNE PRIESTMAN
HEALTH ENTERPRISE EAST

Medtech Navigator

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Abstract

Telehealth, used to provide care and services at a distance, has been around for over 100 years. But it took the sudden shock to the system created by Covid-19 to create the optimal conditions for a sudden burst in uptake for a technology which has thus far been waiting in the wings.

How lasting this digital transformation of care will be, depends heavily on the structure of the healthcare system and the incentives for healthcare providers to seek efficiencies in the provision of care. This report identifies the areas most likely to benefit from this momentous pivot and assesses the factors which have thus far been restraining uptake. We also identify the opportunities for healthcare technologies created by this historic moment.

A sudden and momentous pivot to telehealth

Primary care physicians throughout the country have drastically changed the way they operate and have transitioned to doing most consultations remotely. In a dramatic shift since lockdown was announced in March, remote consultations now make up half of all primary care interactions (see Figure 1)[2]. Most of these are telephone consultations as uptake of video-consultations is hampered by the fact that many patients do not have the necessary digital infrastructure to access video-calls. Doctors transitioned to telehealth in a very short period, not only to reduce the risk of patients infecting healthcare professionals, and other people in the GP practice, but also to prevent Doctors themselves from becoming a vector of disease[1].
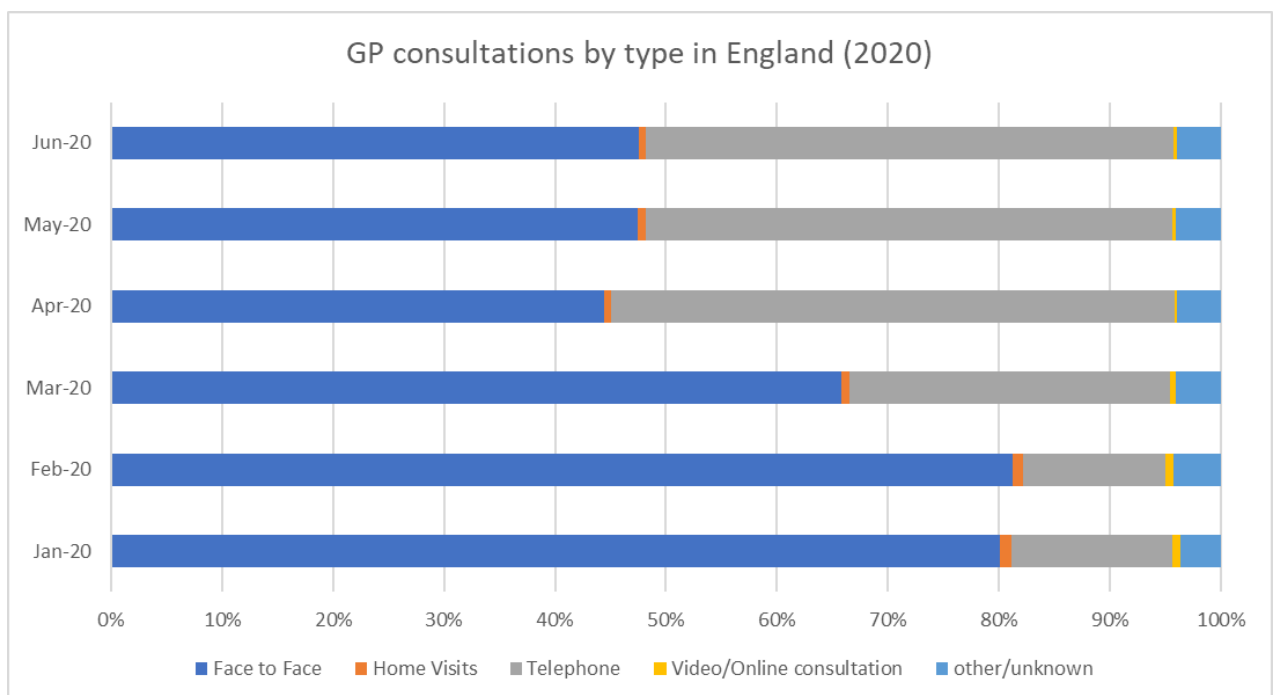

Figure 1 - GP Consultations by type of delivery (England)(2020)[2]

Though currently only accounting for a small percentage of remote consultations, video-calls are expected to experience significant growth in primary care. Since the advice from the NHSX Information Governance team changed to allow consultations via commercial platforms such as Skype, WhatsApp and Facetime[13], some GP practices have been actively encouraging the roll-out of video-consultations. GPs who perform video-consultations find that it provides them with a deeper insight into their patients' lives, their home environment, their family circumstances, all of which provide the GP with a more holistic understanding of the patient[3].

Certain health issues are easier to assess via video-call such as, for example back pain. Other health complaints are more difficult to assess via remote consultation such as earache, abdominal pain, and fatigue, which need a face-to-face visit or laboratory tests for an accurate diagnosis.

But primary care physicians are not the only ones who have shifted to telehealth; nurses, specialist physicians and social workers have all transitioned to remote consultations for outpatients in a way not seen before. Dermatology, for example, is particularly suited for telemedicine due to its visual nature[4]; improvements in camera technology on laptops and people's smartphones enable patients to take high-resolution pictures which can be used to diagnose or monitor a condition[5]. However, uptake in secondary care has been lagging behind primary care due to the nature of many of the conditions treated by secondary care physicians; chest pains and acute care, for example, need a visit to secondary care, as does a surgical intervention.

The shift to telehealth, whether that be a consultation over the phone or via a video-call has certainly been super-charged by the Covid-19 pandemic. However, how "sticky" will this change turn out to be?

A lasting change?

Telehealth for providing care and services at a distance[6], is not new. The first recorded instance of a telehealth consultation happened in the late 19th century where a letter published in the Lancet in 1879 described a physician's use of the phone to remotely diagnose a child's cough and calm the family[7]. In the early 20th century, Willem Einthoven developed the first electrocardiograph in his laboratory in Leiden where he recorded, via the use of a string galvanometer and telephone wires, the cardiac signals of patients in a hospital 1½ km away[8].

Within the context of history, it appears puzzling why telehealth has not changed our lives more significantly. While consumers are used to conducting their professional, romantic, and social lives within a digital world paradigm, delivery of medical care via the digital sphere has thus far been strangely resistant to change. It took the covid-19 pandemic and the chaos created by sudden and stringent lockdowns to fast-track uptake.

The reason behind the relative resistance to adoption until now has been due to a combination of regulatory, structural, and economic factors.

Data laws and regulation in the USA and Europe have stringent privacy and confidentiality requirements; the Health Insurance Portability and Accountability Act (HIPAA) requires fully encrypted data transmission and end-to-end secure connections (which rules out the likes of many of the freely available messaging and video-calling tools used by consumers). The UK found itself hamstrung by GDPR data protection regulations when attempting to develop its Covid-contact tracing app[9].

Healthcare systems which are built on a "fee-for-service" reimbursement model such as the USA, tend to restrain the adoption of telehealth since providers can charge higher fees for face-to-face visits. Furthermore, insurance providers, concerned over fraud and abuse, may discourage the use of teleconsultations[10]. Tele-consultations in the US were, until Covid-19, discouraged at the federal level; phone-consultations were typically either not reimbursed by Medicare or only at very low levels, leaving the patient to pick up the tab. Furthermore, physicians were not allowed to provide consultations across state lines[11]. HIPAA rules were relaxed for the pandemic, and reimbursement rules changes to enable patients and providers to ramp up quickly, enabling patients to use their phone or computer from wherever they are.

The same restrictions did not apply to the UK healthcare system which embraced digital technologies and telehealth more enthusiastically even before the pandemic. A single-payer public health system such as the NHS has more to gain from adopting telehealth and remote consultations as it enables a more cost-effective way of delivering care. The NHS Long Term Plan[12], launched pre-pandemic in January 2019 already set out the national vision of giving patients the right to access GP consultations via telephone or online and for people to be increasingly cared for and supported at home using remote monitoring and digital tools.

While emergency measures have allowed the use of commercial video-call platforms, primary care is expected to transition to dedicated online platforms provided via the Digital Care Service Framework[13] such as AccuRx, iPLATO, EMIS Health and others. The NHS also supports the use of "digital-first" providers of online-only consultations such as Babylon Health, which now has over 750 000 registered patients[14] in the UK alone.

Signs are starting to emerge in the UK that this may be a lasting change; Matthew Hancock, the UK's Secretary for Health and Social Care, announced in his speech to the Royal College of Physicians in July that all consultations should be teleconsultations unless there's a compelling clinical reason not to[15]. The shift to telehealth in the UK was a strategic decision on economic grounds before Covid-19 and has now become a clinical necessity to contain infection rates as a national roll-out of hardware such as laptops and other tools is being implemented to enable a "digital first" strategy across the healthcare system[16].

However, things are less clear in the USA where the outcome of the upcoming presidential election will likely determine to what extent the changes made for Covid-19 at the federal level will be retained. The Department of Health and Human Services will have to take a political-economic decision as to what extent the changes to regulation and reimbursement of telehealth will be kept. From a private insurance point-of-view the situation is dichotomous; though telehealth makes for a more cost-effective way of delivering care at the macro-level, lowering barriers to accessing individual consultations with a healthcare provider may lead to a rise in the volume of consultations which then leads to an increase in billing which will deplete the coffers of insurance providers and force an increase in premiums. On the other hand, insurance providers may find it difficult to take away cover for telehealth which their members become used to having. Many private insurers may prefer to take a "wait-and-see" approach and track volume of billing patterns before making a decision.

The new Covid-19 healthcare paradigm will stay until either a vaccine becomes available, or we have reached herd immunity. When this is likely to happen is difficult to predict but it may be another 12 to 18 months yet. During this time, telehealth will become ever more deeply embedded into the

care delivery system and more likely to stay in a post-pandemic world[17]. As health systems will start to ramp up in-person care post-pandemic, the installed base of telehealth users and providers will have grown considerably, and many patients and doctors will be reluctant to fully go back to the old days. We expect the changes to "stick" more in single-payer public healthcare systems such as the NHS in the UK where economic advantages combine with epidemiological necessity to create the optimal opportunity for a radical shift to telehealth.

The shift to telehealth experienced in 2020 is likely to be permanent in healthcare systems, which seek to achieve efficiencies in the delivery and access to healthcare. The change may not be as "sticky" in "fee-for-service" systems where moral hazard may prevent doctors from shifting away from traditional face-to-face interactions.

As in any momentous paradigm shift, there are winners and losers. So, what are the opportunities created by this significant change?

Opportunities created

Telehealth is a broad umbrella-term and the relative cost-effectiveness of telehealth systems exhibits a high level of heterogeneity[18], differing not only with the type of telehealth intervention/service but also with the characteristics of the patients, the condition, the setting and patients' geographical location[19]. Digital symptom checker tools and algorithm-based triaging tools using chatbots generally show good cost-effectiveness outcomes with savings dependent on how many face-to-face consultations can be avoided[20].

The most immediate opportunities lie in primary care where GPs need to manage large volumes of patients with a wide variety of ailments; this triage point benefits most from telehealth solutions as the throughput of patient consultations per day can be vastly increased with the use of online triage management tools such as the one offered by Priority Digital Health, as well as chatbots[21] and AI-enabled triaging solutions such as the ones offered by Babylon Health[22]. It is estimated that 27% of GP appointments are inappropriate and could be diverted or handled differently[23]. However, care needs to be taken such as not to disadvantage patients who may not own the necessary digital hardware (such as an app-enabled digital mobile phone or tablet) or who may not have access to the internet.

The telehealth revolution in secondary care is expected to be more fragmented, with some areas better suited than others. Secondary care specialities particularly suited to telehealth include dermatology and psychology, which have shown high rates of agreement between diagnoses made in person and via telehealth[24]. Ophthalmology areas which rely heavily on imaging such as retinal exams, glaucoma and macular conditions are particularly suited to AI-enabled virtual clinics[25, 26].

Beyond the already crowded marketplace of remote consultation platforms lie the opportunities in remote monitoring and diagnosis of patients. There are limits to what a doctor can achieve with a webcam, and information gathered via consultation needs to be supplemented with other data, such as test results, information on a patient's mobility, mood, and other biomarkers. This data could be provided by wearable sensors from the consumer market such as Fitbit or a smart watch. Specialist add-ons for smart phones such as AliveCor's KardiaMobile clinical-grade ECG monitor can help in the early detection of Atrial Fibrillation and prevent exacerbations[27]. Non-contact sensors added to or integrated into a patient's furniture or house infrastructure such as Ally Labs' acoustic monitor would be even more reliable than worn sensors at providing continuous data from multiple digital biomarkers to inform healthcare professionals of the physiological and mental state of their

patients. A plethora of remote patient monitoring (RPM) projects have been implemented such as lifelight by XIM Ltd., CliniTouch Vie[28] and inhealthcare[29] as part of the NHS At Home Initiative, the roll-out of which has been accelerated to help ensure patients stay safe during the coronavirus crisis while at the same time ensuring that those whose condition worsens can get the right help fast. The benefits of RPM systems and services are most apparent for single-payer systems and systems based on diagnosis-related groups (DRG), keen to increase efficiencies in care provision.

Digital communication platforms to facilitate interprofessional consultations between doctors are expected to benefit from the pivot to telehealth. By enabling remote communications, such platforms can bring specialist healthcare to remote and rural areas where it would otherwise take patients significant travel time to get to a specialist. Such technologies are expected to lead to significant cost-savings in a single-payer system such as the NHS or even in large private suppliers such as managed care organisation. However, such solutions may not see the same amount of uptake in a more fragmented healthcare system.

An important component of caring for patients remotely is the long-term care needed by patients in care homes, which have been particularly affected by covid-19. Minimising the risks of transmission in an institution designed to care for vulnerable patients requires a radical shift to providing remote care in a way that is acceptable to patients who may have cognitive challenges using digital technologies. This extends beyond the provision of telehealth to digital ecosystems which enable vulnerable care-home residents to interact with friends and family safely. Many of today's remote communication and monitoring technologies are unfathomable to care home residents; a different approach to user-centred design for care home residents is needed to remove the barriers to adoption in this setting and promote digital inclusion. Using voice-interface rather than touch-screens, designing simple add-ons to existing technologies such as a box on top of a television set, or a bespoke set of hardware such as the Amazon Portal all present ways of making digital health more accessible to care home residents. The present pandemic has highlighted shortcomings in our digital health approach when it comes to long-term care recipients and care home residents; such unmet needs are set to spark novel approaches as growth opportunities in care-home settings are significant. The UK's Long Term Plan[12] encourages novel models of care delivery as a number of "Enhanced health in care home (EHCH) vanguards" have been piloting novel ways of connecting care home residents and carers to healthcare professionals in primary and secondary care, some of which have reduced hospital admissions by up to 35%[30] .

In the short-term, the most urgent needs in the healthcare system will be finding ways to manage the backlog of healthcare interventions delayed because of covid-19. Triage tool and chatbots which can classify patients along algorithms based on their self-reported symptoms are in high demand. In the medium-term, we see opportunities in the peer-to-peer remote interactions (so-called e-consults), which will enable doctors in remote locations to access the skills and expertise of specialists in secondary or tertiary care to diagnose and treat their patients. This will extend to telesurgeries, enabled by remote-controlled robotic tools[31] such as the DaVinci, and tele-ICUs, which

manage a large number of geographically dispersed ICU location from one central command centre[32].

However, this digital revolution has the potential to exacerbate already existing inequalities in the provision of healthcare; patients from the lower socio-economic layers of society may lack the infrastructure and hardware necessary for accessing care remotely. The extent to which providers of healthcare systems are prepared to counteract a potential widening inequality gap will depend on their respective social value judgements. In the UK, the shift to digital health may compromise the NHS' pledge to provide convenient and easy to access services free of charge to all citizens based on clinical need[33]. More resources may need to be invested into facilitating access to telehealth in disadvantaged areas of society to ensure the shift to digital health will not lead to poorer health outcomes for those patients who may not have the means necessary to access the new digital health paradigm.

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