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Towards the virtualization of healthcare

Charting the growth of virtual care modes, new patient behaviors and the opportunity for out of hospital care.

A few short years ago the idea of virtual healthcare was nascent. Compared to other industries, healthcare had initially resisted the off–premise and cloud shift, **facing significant regulatory and systematic barriers** around the world

And yet, the days of healthcare systems maintaining their own infrastructures inhouse is shifting fast, in line with the innovation in the care delivery model.
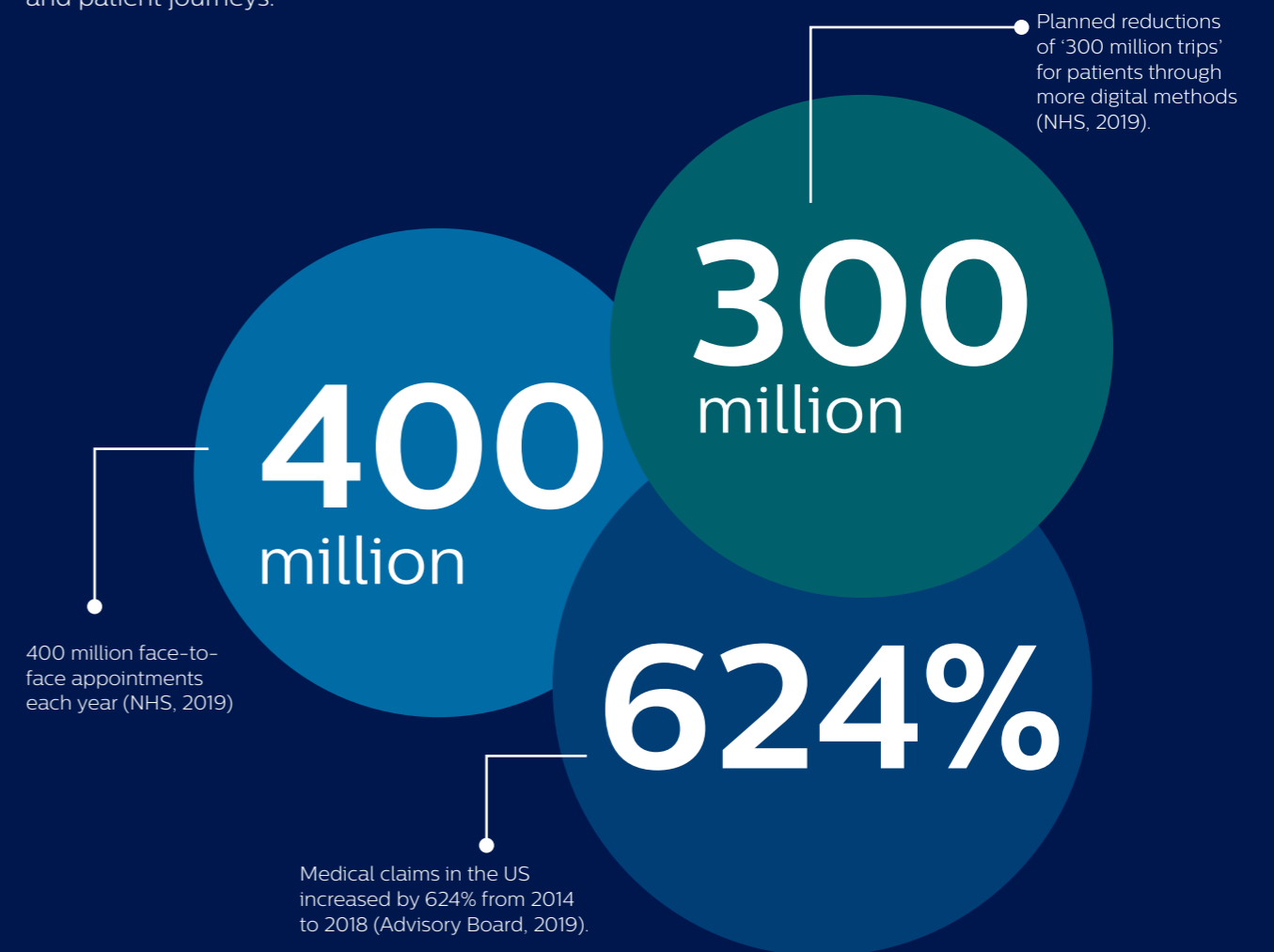
Increasing connectivity, ageing populations, rising disease profiles and a new urgency for change, in part due to the global COVID-19 pandemic, has neccessitated and accelerated transformation. More emphasis is now being placed on what virtual principles and experiences healthcare can harness to ease the burden on operations and improve patient and staff experience.

According to the NHS Long Term Plan, prior to the COVID-19 outbreak, GP practices and hospital outpatients in the UK were providing around 400 million face-to-face appointments each year[1], while planning to save '300 million trips' for patients through more digital GP consultations[1].

Telehealth in the US had surged with medical claims increasing by 624% from 2014 to 2018[1].

The growth of virtual healthcare offers pressurized health systems a chance to expand access to healthcare, cut their operational costs and address bigger systematic challenges: reducing waste; cutting foot traffic into the hospital and patient length of stays; bridging gaps between siloed clinical departments; and, supporting staff and patient journeys.

According to a report by management consultancy, Deloitte: "Virtual care also has the capability to inform, personalize, accelerate, and augment care across the care delivery spectrum, from disease prevention to treatment to ongoing monitoring."[2] "It will enable simple collaboration and the sharing of data and insights across the complete circle of care. Taking the mystery out of care and treatment plans for the family and caregivers of patients, while maintaining privacy, becomes more effective in the virtual-care domain."

Planned reductions of '300 million trips' for patients through more digital methods (NHS, 2019).

300 million

400 million

400 million face-to-face appointments each year (NHS, 2019)

624%

Medical claims in the US increased by 624% from 2014 to 2018 (Advisory Board, 2019).

Trends driving the virtual hospital of the future

Hospitals as buildings and service providers were designed to bring care under one roof; all in a single place so people would know where to go to when they were ill. Where do you go in a virtual future? Many of us are hard-wired to the concept of 'hospital = care', but as virtual care becomes integrated into processes and workflows, the very idea of the hospital – a place where care is delivered – changes quite dramatically. If healthcare becomes more virtual, then technology will begin to shape the physical design of the future hospital, how people interact with it, the activities it undertakes and what it looks like

> The hospital of the future is not a physical location with waiting rooms, beds and labs. It will instead be a network with nodes and connections. Technology, in other words, will be the starting place of our new spaces and will allow us to approach health and care in new ways.

Potentially, a virtual healthcare facility can reside anywhere – in your home, inside an old telephone box or in a public washroom. It is part of a wider healthcare delivery system.

The hospital of the future is, then, not a physical location with waiting rooms, beds and labs. It will, instead, be a network with nodes and connections. Technology, in other words, will be the starting place of our new spaces and will allow us to approach health and care in new ways.

Healthcare will be accessible anywhere. A virtual healthcare experience will allow for continuous monitoring of patients anywhere, so that care is provided wherever and whenever it's needed.

This means retail-type outlets close to residential areas; specialist hubs, in-patient facilities, out-patient clinics and ambulatory facilities, all connected into a single network. In other words, technology won't remove the hospital's central role in care delivery. Instead, it will expand its reach beyond its own walls, to create a much bigger system, in which the hospital itself plays a less centralized role[3]. And in reaching that goal some key trends are accelerating change and addressing the operational challenges of hospitals.

The global pandemic as a unique once in a century accelerant for virtualization

Cited as 'the major disruptive event of the decade'[4] and purported by some to be a 'Black Swan Event'[5] – the term popularized by former Wall Street trader, Nassim Nicholas Taleb in his book Fooled by Randomness – COVID-19 stalled the hospital's revolving door and kickstarted a shift to virtual care by immediately altering the way doctors and patients interacted, and reducing traffic inside hospitals.

Medical appointments went online, workers began remote work, equipment monitoring was adopted, elected procedures were delayed or cancelled. Remote monitoring technologies such as telemonitoring, telemedicine, mobile monitoring all grew at speed. Telehealth adoption rates lagged around 11% in January 2020 in the US—but spiked amid the coronavirus pandemic to 36% in August 2020.[6]

The revolving door of the hospital was already a big problem before COVID-19. In 2018, there were an estimated 142 million visits to emergency rooms in the US, up from 100 million in 2008.[7] The pandemic highlighted that hospitals are too overloaded: covering too many different clinical specialties, accepting a wide spread of low-to-high acuity patients.

Jeevan Gunaratnam, a former NHS Director, who is now Director of Independent Sector & Community Diagnostics at Philips explains the issue further: "The bandwidth for hospitals to plan was reduced to zero during COVID-19. Patients also stopped going to hospital, delaying procedures, clinical work and elective procedures and staff were were quickly redeployed as part of the COVID-19 response."

Jeevan Gunaratnam continues:: "A lot of healthcare's needs could be addressed without ever stepping foot inside a hospital. And if you do that across the board, you have reduced traffic inside the hospital and can reconfigure that hospital to deliver higher value care – more complex care and procedures that really add value."

The use of virtual health technology for screening, monitoring, and e-visits, as well as the patient's preference to stay away from the hospital during the pandemic, offered a glimpse of healthcare's future. Could more healthcare be delivered virtually or elsewhere? Will healthcare as a result become more decentralized?

Experts see a future determined by which clinical services make sense for a hospital and the speed of innovation around new care models that allow more space and 'bandwidth' for hospitals to focus on acute care. This inevitably drives a shift to models for out of hospital care as much as on site care.

Stuart Wilders, Marketing Operations Manager for Solutions at Philips explains: "Separating patients out represents a new streamlining opportunity for healthcare. For a long time hospitals have been accessible to everyone. There is a strong case for pinpointing the activities that don't necessarily need to happen inside a hospital and shifting their provision to out of hospital care. If you do that across the board, you will reduce traffic inside the hospital and can reconfigure that hospital to deliver the more complex care and procedures that really add value. Patients also won't have to travel great distances for diagnostics. Ultimately, this model supports the health providers in being better able to spread resources, knowledge and learning across the geography"

Jeevan Gunaratnam, a former NHS Director, who is now Director of Independent Sector & Community Diagnostics at Philips, identifies five of the key trends likely to inform healthcare's virtualized future in the immediate and short term:

Trend 1: Virtual monitoring and maintenance

How hospitals maintain their vast and sweeping technology investments into the future while under continued operational pressures is a challenge. Hospitals still rely heavily on highly technical diagnostic equipment to diagnose and form treatment plans for patients.

During the COVID-19 pandemic, the servicing and maintenance of critical diagnostic equipment was central to a hospital's operational ability to manage patient volumes. Hospitals still require in-person visits from field service engineers, some who travel great distances to keep diagnostic equipment online, even though digital and virtual tools exist to troubleshoot, problem-solve and remotely diagnose and fix failing equipment.

In Latin America, countries including Brazil, Argentina, Peru and Chile quickly innovated, adopting virtual maintenance, during the COVID-19 pandemic by providing remote maintenance services to hospitals. As equipment issues emerged, hospital biomeds turned to remote support to get systems back up and running. They achieved this through digital tools such as the video conferencing platform, Zoom, and the virtual reality platform, Reacts. These technologies were used to deliver customer training programs and to diagnose MRI equipment problems virtually.

In early 2020 remote resolution made up 26% of maintenance requests in Latin America before jumping to 39% in March and then 43% in April

during the COVID-19 lockdowns, before steadying to between 35-37% for the months of May, June and July. "We started this transition to remote support in 2019 and we were looking to extend this model further in 2020. Then COVID-19 arrived. The fact this need came directly from the hospitals meant we had a good opportunity to test these services, and the success stories started to emerge,"[8] says Felipe Gonzalez Berthelon, Philips Remote Service Manager for Latin America.

Gonzalez Berthelon adds: "A lot of this was about convincing hospitals that there is a faster way of making sure they are supported with zero downtime. If we connect their systems, we have the chance to monitor those systems and predict and prevent failures. Hospitals found the support good, we didn't get any pushback – they could see the value. What COVID-19 did was push a transformation that would have taken one or two years."

Increase in remote resolution

Early 2020
26%

April 2020
39%

March 2020
43%
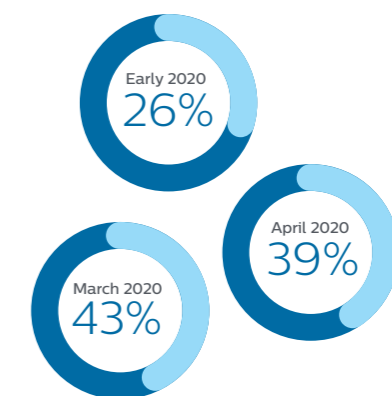
Source: Philips Services and Solutions, Latin America, 2020

Trend 2: Patients shifting to more self diagnosis

Trend 3: Developing innovative telehealth care models

Virtually, there is a lot patients can do to track their own health and stay out of hospital in the first place. Patients are more emboldened by their growing understanding of their own health and are now more immersed in their own healthcare.

With mobile technologies and smart devices the ability to self diagnose, monitor and track is common now. Through mobile phones and apps you can now detect life-threatening conditions, collect and share your own biometric data, and even administer medicine to alleviate pain. A patient can send information about their heart rate, blood pressure, glucose levels, or oxygen saturation to care providers anywhere in real time.[9] Healthy.io, for example, is an innovation that uses the smartphone's camera to "detect problems such as bacteria in urine, or elevated protein levels, which could indicate kidney trouble" providing a virtual solution to an expensive healthcare problem.[10]

More patients are expected to be treated outside the hospital as populations become older and live with more chronic conditions and as internet power increases. By 2030, for the first time in US history, older people will outnumber children,[12] and about a quarter of all baby boomers − 14 million − will live with diabetes, and 33% (21 million) will be obese.[13]

New innovations in homecare monitoring will mean patients don't necessarily need to recover in hospital. The onset of higher adoption of voice-enabled technologies such as Apple Siri, Google Home and Microsoft Cortana could advance virtual care at home, building an accurate picture of a person's daily routine through sensor technology. They also offer the ability to detect deviations from routine, that may indicate illness or injury. It opens up possibilities of a much larger virtual care ecosystem, with new business models and care environments that reduce the patient load on hospitals and the health system.

"Home-based medical technology can help curtail costs and improve quality of life − by tracking relevant health data, integrating it with other data sources such as electronic medical records, and translating the combined data into actionable insights," says Henk van Houten,[14] CTO of Philips. "This can encourage patients to take an active role in managing their disease, while enabling care professionals to support them in a more targeted way."
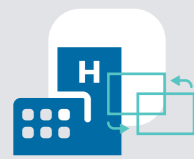
By 2030, for the first time in US history, **14 million** baby boomers will live with **diabetes**, and 33% (**21 million**) will be **obese**[11]

Virtual care will mean more outpatient care, through physical spaces where tele health services can be delivered. For example, Philips has partnered with the US Department of Veterans Affairs (VA), The American Legion and Veterans of Foreign Wars (VFW) to bring telehealth to remote parts of the US through the ATLAS Program,[15] bringing care to Veterans through non-traditional locations such as retail health, community and university environments.

Inside the hospital, innovation around telehealth delivery models can support access to care outside the hospital. The monitoring of high-acuity patients through command centers or 'eye in the sky' technologies has potential to reach beyond the hospital walls at scale. In the US, Mercy Virtual is a four-storey hospital with no beds,[16] which provides 24/7 telemedicine for patients remotely, either at their own homes or other Mercy facilities, around the clock. The staff at Mercy's Virtual Care Center conduct video calls with patients and monitor their vital signs in real time through devices such as pulse oximeters that connect to a tablet.

Patients at Emory Healthcare in Atlanta are monitored through the night by intensivists and critical care nurses 15,000 kms away in Australia.[17] Clinical staff no longer do night shifts, instead relying on a 'second set of eyes' on the other side of the globe; and receive alerts when a patient shows signs of deterioration. At Johns Hopkins Medicine's 5,200-square-foot Judy Reitz Capacity Command Center, with 24 workstations, dispatchers field calls and direct virtual traffic.[18] Large wall-mounted flat screens display live data dashboards. In the background, an array of AI applications track the occupancy of every bed in every department, and use predictive modeling to anticipate when the next ICU bed or operating room will become available. This can yield significant operational cost savings for hospitals.

* Forbes, 'Healthcare And Baby Boomers: Tech Adoption Is The Key To Better Outcomes' https://www.forbes.com/sites/forbestechcouncil/2019/06/28/healthcare-and-baby-boomers-tech-adoption-is-the-key-to-better-outcomes/?sh=21ef57b87ad4

Trend 4: Innovating out of hospital care solutions

Trend 5: Servicing the pro-consumer patient with a blend of virtual services and physical experiences

As we move to a post-pandemic new normal, patients and doctors will need to learn what works best to address their separate needs. Increasingly, patients are moving away from in-person medical appointments to virtual consultations. And yet, the expectation for both virtual and physical health services is that they should be convenient, fast and accessible.

As the need for access to quality healthcare goes up, so too will the pressure to reduce discretionary hospital visits and ease the burden further on the system. This could mean hospitals partnering to bring healthcare closer to people through satellite hubs or diagnostic centers and removing a costly part of their operations. The fact that the NHS in England spends around £2 billion per year delivering imaging services,[19] further highlights the scale of diagnostics requirements and the need to structurally embed out of hospital care.

One such example is the way that Philips is pioneering Community Diagnostic Centres (CDC), together with the NHS. This accelerated out of hospital model looks likely to transform current care models by bringing 'first time right' medical imaging and other treatment services closer to where patients reside. 'One stop shops' in the community, CDCs are modern facilities with evidence-led design and the best technologies intended to improve patient outcomes and patient and staff experiences.

Able to host training academies to support learning and development, the ultimate vision is that these centers will specialize in providing services that meet cardiovascular, fitness, wellness and health themes across Radiology, Cardiology, Oncology, Respiratory and Sleep health spaces. They could also support further NHS–commissioned specialist services such as general practice, pharmacy and tele–dentistry, supporting the elderly and patients with underlying health conditions by improving access to expert health services whilst reducing travel.

With 165 possible CDCs being planned, this Philips and NHS partnership approach enables the extension of diagnostics and addresses the unmet need of patients, while reducing the burden on hospitals. More low acuity patients can be directed to a local diagnostic center and leave hospitals to manage higher risk patients. CDCs will also be 'cold' facilities (facilities with no infectious diseases) as opposed to 'hot' zone hospitals, which can be closed off to contain the treatment of infectious diseases.

New opportunities to innovate with virtual healthcare models will bring more disruption. Patient demand for speed and convenience — removing friction from the healthcare experience — will drive new players and services towards addressing recurring pain points. A rising 'Uberization' to address gaps in primary care services, transportation, patient scheduling and homecare is one example. Could everything from healthcare insurance, payments, transportation, social care and wellness all be open to faster, more convenient and accessible virtualization? Can my lab results be sent via smartphone within minutes of leaving a medical center? Can my health records be integrated across platforms, accessible across devices and freely exchangeable?

Lyft and Uber already run non–urgent patient transportation services, while Airbnb's Open Homes for Medical Stays program, allows hosts to open their homes free–of–charge to certain patients traveling long distances to receive necessary medical treatment.[20] The digital platform, Heal,[21] allows patients to book physician house calls through an app. DispatchHealth and Philips provide 'touch of the button' emergency, primary and palliative care services through Philips Lifeline medical alert system.[22] These are connected to the DispatchHealth support center, which sends a medical team to provide needed care. In Canada, Felix is touted as an 'Uber for doctors'[23] where consumers are quickly connected to the 'next available' physician to issue a prescription.

Of course, design will have to improve to make processes and workflows that create the best patient experience, blending between virtual and in-person care experiences where necessary. "Questions remain about how to use or reconfigure real estate—does a clinician need to deliver virtual care from a medical office, should there be stand-alone centers dedicated to virtual care, or can this be done from the clinician's home? A report by PwC asks."[24] "Eventually, our virtual healthcare landscape will be different and focus on better, more efficient and effective care, while saving hospitals on foot traffic and operational expenses."

Can my lab results be sent via smartphone within minutes of leaving a medical center? Can my health records be integrated across platforms, accessible across devices and freely exchangeable?

Even with rapid digital transformation, the human experience of in-person care, face-to-face contact, and human empathy still underpins healthcare's moral objective. **You can't remove 'care' from healthcare's future: it is tightly woven into the human story.**

The opportunities and adoption of virtual care are clear and here to stay. And yet, a virtual future will still rely on the personal touch. Nothing changes one simple fact: that healthcare is a people business and caring is core to the moral imperative of quality healthcare delivery. Even with rapid digital transformation, the human experience of in-person care, face-to-face contact, and human empathy still underpins healthcare's moral objective. You can't remove 'care' from healthcare's future: it is tightly woven into the human story.

And the human touch – working alongside new innovative technologies to solve operational challenges – will steer technology to where it can make the biggest difference to people's lives. Challenges, of course, lie on the road to a more virtual future. The surgeon and writer, Atul Gawende, has observed this ongoing friction writing that: "Medicine is a complex adaptive system: it is made up of many interconnected, multilayered parts, and it is meant to evolve with time and changing conditions. Software is not. It is complex, but it does not adapt. That is the heart of the problem for its users, us humans."[24]

A virtual future for healthcare is limitless in possibility: faster data transmissions, better services, AI-enabled predictive capabilities, robotics, precision medicine, 3-D printing, augmented reality/virtual reality, genomics and more. And yet, no virtual future of healthcare nor the realisation of the Quadruple Aim can exist without the power of people. Automation, robotics and virtual environments – all need the guidance of clinical experts with deep knowledge and understanding of the application, its intended goals and the desired outcomes.

Quadruple Aim

Improved patient experience

Better patient outcomes

Improved staff experience

Lower cost of care

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