

What does remarkable healthcare look like?

Why 5G networks are poised to become critical enablers of data-driven healthcare, and what that could mean for the decade ahead.



Patient Information

Patient Options Tools



Patrick Kelly

Patient Info

Personal

Contact

Insurance

Examinations +

Evaluations -

Medications +

Physical

Mental

Cardio

Dental

OB/GYN


Forward Report

Cardiovascular History



	AUG	SEP	OCT	NOV	DEC
AC.	10mg	10mg	10mg	10mg	10mg
DAPT.	5mg	5mg	5mg	5mg	5mg

	JAN	FEB	MAR	APR	M
AC.	15mg	15mg	15mg	15mg	15mg
DAPT.	8mg	8mg	8mg	8mg	8mg

The background features a dark blue, futuristic medical interface. On the left, a white wireframe of a human figure stands on a grid. In the center, a glowing brain is visible. On the right, a hand is shown holding a futuristic medical device. The interface includes various UI elements like a grid, a window with a cross icon, and a circular progress indicator.

From robotic surgery to nanomedicine and mRNA vaccines, digital technologies have fueled dramatic medical advances over the last few years.

Today, we are on the threshold of a new wave of healthcare innovation which will see communication service providers take on a new and vital role. As we take treatment and clinical research outside the four walls of hospitals and research institutions, Telecom's 5G networks will provide the high-capacity real-time communications needed for the next stage in healthcare's digital evolution. In the decade ahead, we'll see remarkable advances:



Healthcare moving out of the hospital and into patients' home.



Telemedicine and digital therapeutics playing a far greater role in healthcare provision.



More effective management of chronic illness reducing need for hospital stays.



Real time virtual collaboration in everything from emergency medicine to education.



Artificial Intelligence and expert systems support medical decision-making to give time back to practitioners.



Use of digital twin technologies to accelerate clinical research drug development, and trials.



Personalized, behavior-based information, feedback and advice helping tens of millions of patients to better manage their physical and mental health.



More cost-effective and widely available service provision, with the capacity to maintain normal operations even during major incidents.

Three big challenges

1

Epidemic non-communicable disease

\$3.4 trillion annual cost in US alone¹.

Today, much of the world faces an epidemic of chronic illnesses. In the US, non-communicable illnesses like cancer, heart disease, diabetes and Alzheimer's are leading causes of death and disability, accounting for 90% of \$3.81 trillion annual health care costs in the US.

Many of these chronic diseases can be controlled through healthy lifestyle choices and good treatment adherence. However, making the long-term changes patients need to control their conditions with only occasional medical practitioner support is very difficult. This helps explain why chronic conditions account for 81% of all US hospital admissions².

2

Ageing populations

Between 2015 and 2050, the proportion of global population aged over 60 years will grow from 12% to 22%³. While in the US, the population aged over 65 is projected to grow by over 45% from 2018 to 2033⁴.

Meeting the greater healthcare needs of this ageing population will place major addition stress on already overstretched health and residential care resources.

3

Professional staff shortages

The American Association of Medical Colleges (AAMC) predicts a shortfall of up to 139,000 physicians by 2033. In the words of AAMC President, David J. Skorton, MD, "The challenge of having enough doctors to serve our communities will get even worse as the nation's population continues to grow and age."⁴

Furthermore, there is a global shortage of nursing staff – a situation exacerbated by pandemic burnout. According to the Bureau of Labor, US healthcare employment declined by 524,000 workers from February 2020 to October 2021⁵.

Three key advances

In healthcare today, there is a critical need to improve efficiency and deliver better patient outcomes with fewer resources. At Dell Technologies, we believe the combination of 5G connectivity, data-driven intelligence and automation can help to deliver this transformation.

1

Connectivity

5G is the ideal medium for healthcare's digital future.

- Secure, with the ability to create prioritized network-sliced connections for privacy and safety-critical data.
- Ultra-low latency and huge capacity are ideal for time-critical applications and real-time collaboration.
- Able to deliver frictionless near real time interaction to millions even at peak times of day.

2

Data-Driven Intelligence

Replacing data sprawl with clinical value.

- From smart watches to blood sugar monitors, the internets of medical and healthy things generate billions of data points every day.
- Virtualized Open RAN 5G networks open up potential to run analytics and digital twin models on this data at the edge, near where it is generated.
- Turning fragmented data into personalized advice and clinical insight.

3

Automation

Poor communications, administrative delay and inefficient processes waste resources and professional time.

- Expert systems support medical practitioners, quickly identifying areas where their professional judgement is most needed.
- 5G connectivity delivers even the largest imaging files almost instantly, reducing delays and unproductive downtime.
- Data-driven patient feedback ensures greater treatment adherence and reduces avoidable hospital admissions, missed appointments, and wasted professional time.



How digital twins accelerate clinical research

In some cases, infections from the pandemic are resulting in debilitating long term conditions affecting millions of patients. To better understand it, researchers are turning to digital twin models of patients to test thousands of potential explanations of its mechanisms and possible treatments.

Dell Technologies is providing the i2b2 tranSMART Foundation with computational, artificial intelligence, federated machine learning and advanced storage capabilities to build a data enclave – a secure distributed storage network – to enable deidentified data collection and processing capabilities required for a ground-breaking digital twin project that will involve over 200 hospitals and academic research centers including data collaboratives across the US, France, Germany, Italy, Singapore, Spain, Brazil, India and the United Kingdom.

With potential to grow to two million digital twins over the next four years, the platform will continually monitor each individual PASC patient's progress and responses to treatment. 5G is key enabler for the rapid analysis of edge data from mobile health technologies, such as smartphone apps and wearable devices, to gather real-world data in real time⁶. This capability will allow each of the study's huge number of digital twins to be continuously updated with real time patient data.

Researchers will then be able use these digital models to test thousands of hypotheses in simulation. Those same tests would take prohibitively long in the real world and, in some cases, may not be ethically permissible.

Right now, these applications of digital twin modeling are in their early infancy. Over the next decade, they promise to take clinical research to a whole new level.



Shifting care from hospital to home

Hospitals and residential care facilities will always play a central part in healthcare provision, but with an ageing population, increasing incidence of noncommunicable diseases and long-term staffing shortages, their roles need to evolve. Digital therapeutics will increasingly provide new options for treatment of mental and physical conditions. Over the next few years, we'll see clinicians increasingly able to provide the support and feedback to help patients manage their conditions in their own homes.

At first, this will likely take the form of reminders, coaching and positive reinforcement of drug adherence and wellness routines. However, 5G's security, capacity, and ability to support multiple connections make it possible to deliver real time advice on behavior patterns, based on data from smart devices – from fitness and medical monitors to perhaps even connected fridges.

We're also approaching a time when patients' hospital stays will be substantially reduced by the ability to provide ICU-like support from patients' homes. Imagine the benefit to hospitals' capacity and waiting lists if patients were able to receive post-operative care and convalescence support from home.

Looking further ahead, the combination of robotic surgery, real time analytics and network-sliced ultra-secure 5G links mean even some surgical procedures may eventually be performed outside the hospital environment. In remote rural areas, the ability to perform procedures from a local surgery could literally change lives.

Real-time virtual collaboration

The quality of care in the 'golden hour' after a medical emergency or traumatic injury can have a major impact on patients' prognoses. With 5G connectivity, patient data can be securely shared between an ambulance in the field and the receiving hospital to coordinate life support, operating theaters, personnel, and appropriate medication.

Enabling real time collaboration between paramedics and emergency physicians will also accelerate treatment times and streamline healthcare responses by avoiding unnecessary hospital trips for patients who can be treated in the field. This is especially important in rural areas.

As well as extending hospital care to patients outside the four walls, 5G provides the infrastructure to apply new technologies and address some of healthcare's systemic challenges. For example, telemedicine using high quality real-time video links could enable clinicians to see more patients and give patients greater access to specialists.

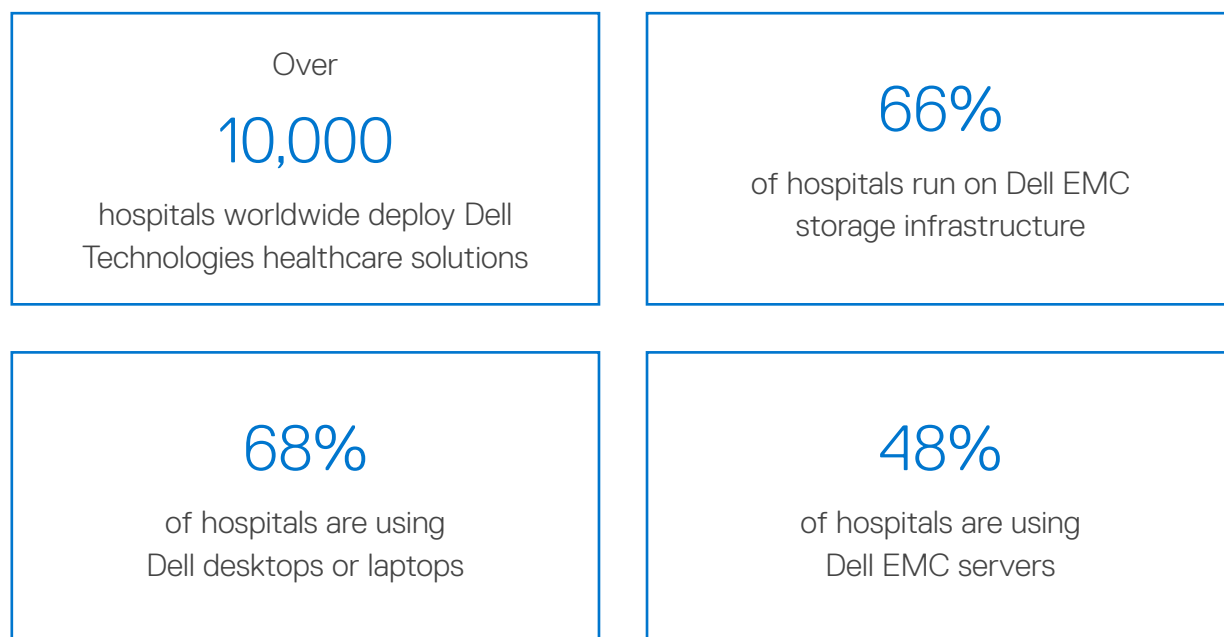
Potentially still more transformative is the opportunity to bring virtual, augmented and mixed reality technologies into everyday use. 5G provides the speed, capacity, and security to simulate complex medical scenarios in virtual reality (VR). This has clear applications both in medical education and improving patient outcomes.

For example, enabling surgeons to interact with real 3D patient data has been shown to have benefits in accuracy and safety of procedures. Interestingly, patients who can first experience their surgery in VR often experience lower levels of pre-operative anxiety.



How we're preparing for healthcare's remarkable future

At Dell Technologies, we have a deep, longstanding connection with the medical and life sciences sectors. Today:



Source: Dell Technologies slide - Definitive Health Analytics August 2020

We have also made a major commitment to accelerating the practical applications of 5G technologies through our Open Telecom Ecosystem Laboratory (OTEL).

5G is particularly suited to the demands of the healthcare sector, because of its capacity, low latency, connection density and ability to run complex workloads like data analytics at the network edge. However, achieving these benefits will require close collaboration between many different partners, from IT and telecoms infrastructure manufacturers to medical software vendors, system integrators and communication service providers.

OTEL brings all these customer and partners together in a unique collaborative environment focused on solving engineering challenges and creating tested, validated, ready-to-deploy solutions.

1. <https://www.cdc.gov/chronicdisease/about/costs/index.htm>
2. Partnership for Solutions. Chronic Conditions: Making the Case for Ongoing Care. September 2004 Update. Available at: <http://www.rwjf.org/files/research/Chronic%20Conditions%20Chartbook%209-2004.ppt>
3. WHO <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>
4. <https://www.aamc.org/news-insights/press-releases/new-aamc-report-confirms-growing-physician-shortage>
5. <https://www.bls.gov/news.release/pdf/empsit.pdf>
6. <https://www.nih.gov/news-events/news-releases/nih-builds-large-nationwide-study-population-tens-thousands-support-research-long-term-effects-covid-19>

Shaping tomorrow's healthcare today

We're excited about healthcare's digital decade and believe our deep understanding of the sector and commitment to advancing 5G will help our customers make remarkable advances.

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