

5G HQ

**Pioneering The New
5G Era In Healthcare**

**How T-Mobile® For Business
Can Help Fuel An Industry
Transformation, Today And
Tomorrow.**



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Introduction

5G Has Arrived In Healthcare. The Result? Cutting-Edge Processes, Interventions, And Patient Experiences.

Next-generation connectivity is ushering in a new era of efficiencies in healthcare, but more importantly, possibilities. In an industry built on continuous progress, increasing levels of speed, coverage, and capacity are opening new frontiers. Innovation is happening faster than ever before. It's an exciting time, but capturing the right opportunities is, and will be, essential.

It all comes back to the patient. A recent study found that at least 7 in 10 Americans trust nurses and doctors to do what's best for them and their families.¹ Through disruption and uncertainty, organizations are strengthening trust by focusing on patient experiences and outcomes. Connected solutions are uniquely suited to provide continuity, unlock new standards of care, and reduce timely processes for all involved.

While connectivity looks different from organization to organization, leaders in the space know that it takes many devices, systems, and people working together—wherever and whenever—to guarantee high-quality care. The future of stability and discovery in healthcare depends on 5G-powered connections.

Building On Innovation With 5G Breakthroughs

Over the past decade, healthcare organizations have raised the bar on their operational capabilities. Look no further than telehealth to see how the industry rapidly adopted new technologies that improved countless lives. The next phase of healthcare is well underway, and it will deliver cutting-edge procedures, greater efficiency, and expanded services. Healthcare organizations are reaching previously underserved populations with life-saving treatments and routine care.

The future is bright. Technology-driven innovation across healthcare use cases could create \$350–\$400 billion in annual value by 2025.² Adopting new approaches to connectivity using 5G technology ensures the best possible patient care while increasing business resilience. It starts with the network.

Next-Generation Networks

Reaching over 330 million U.S. patients with quality care and innovative health solutions requires broad coverage, speed, and reliability.³ T-Mobile for Business knows how important in-building coverage is for healthcare facilities. Using 5G radios, we recently deployed Ultra Capacity 5G inside the Miami U.S. Department of Veterans Affairs. The benefits go beyond connected convenience—with 5G throughout the facility, teams can:

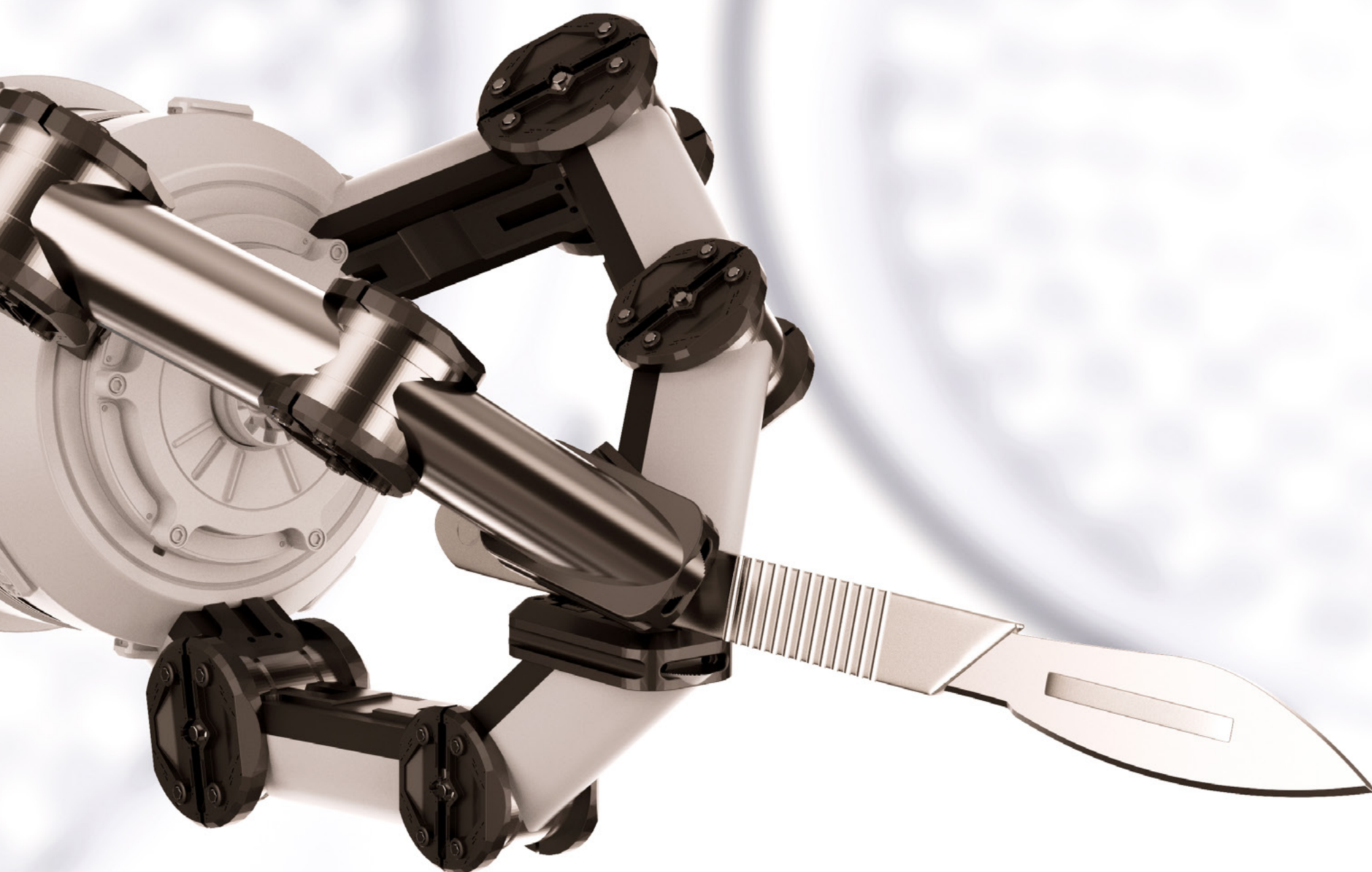
- Access high-bandwidth medical data and respond to real-time operational insights⁴
- Reduce wait times in emergency departments with predictive analytics
- Use artificial intelligence (AI) to manage remote monitoring tasks

¹ https://apnorc.org/wp-content/uploads/2021/07/Harris_AP-NORC_Nurses-and-Aides-Underpaid-2021August.pdf

² <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/the-era-of-exponential-improvement-in-healthcare>

³ <https://www.census.gov/popclock/>

⁴ <https://www.t-mobile.com/news/network/t-mobile-brings-ultra-capacity-5g-to-miami-u-s-department-of-veterans-affairs-va-hospital>



Transforming Care With 5G Devices, Systems, And Digital Processes

Organizations today are using 5G-enabled technologies to transmit and analyze more and more data. With increasing access points, devices, and automation, the healthcare ecosystem is changing. As technology advances and 5G matures, exciting new solutions will emerge and scale:

- On-site/on-demand resource production
- Research simulations using big data
- Robotic clinician assistants and deliveries
- Decentralized access kiosks in local retailers
- Fully remote telesurgery

Making the most of innovation today and preparing for the future requires a 5G network that blends speed, reach, high-capacity infrastructure, and in-building coverage installation capabilities. With all these benefits flowing across organizations, clinicians and administrators can empower operational developments that saves lives.

**Here's What 5G
Makes Possible In
Healthcare—
NOW And NEXT**

- 1 Reaching Patients**
- 2 Improved Outcomes**
- 3 Enhanced Experiences**
- 4 Increased Efficiency**

Reaching Patients

Next-Generation Wireless Technology Is The Foundation For Getting Cutting-Edge Healthcare To More Patients, In More Places.

NOW

5G Speeds And Bandwidth Are Powering Today's Virtual Care Options.

In mid-2021, telehealth utilization stabilized at 38 times higher than pre-pandemic levels.⁵ It's now an essential model of care for reaching more patients. Supporting delivery with fast, reliable connectivity is critically important for future growth.

Today, many people have limited healthcare access, sometimes receiving treatment only after a serious health event. Additionally, over 40% of Americans are living with one or more chronic health conditions, representing around 75% of all healthcare costs.⁶

Providers have made strides in treating conditions but addressing the root cause is no small task. Preventing individual illness and translating that to at-scale improvements means supporting healthcare literacy.

Whether they're hesitant to enter a facility or too far away, patients can use telehealth and mobile healthcare in simple ways to:

- Address immediate health concerns
- Build healthy habits
- Catch medical issues early
- Explore new areas of wellness

Exciting advancements in care are here today—connected infrastructure for care delivery helps reach more patients today while gathering usable data to inform new technologies and changing needs. The organizational benefits present immediate and long-term benefits, from operational growth today to data-backed investments in emerging technologies.

“Telehealth is...helping to address several challenges... including a severe provider shortage and a growing gap in access to care for rural communities and our most vulnerable populations. **By extending access to care, improving efficiencies, and reducing healthcare spending, telehealth creates a hybrid care delivery system of in-person and virtual care, bringing healthcare into the 21st century.**”

— ATA News⁷

⁵ <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/telehealth-a-quarter-trillion-dollar-post-covid-19-reality>

⁶ <https://nationalhealthcouncil.org/wp-content/uploads/2019/12/AboutChronicDisease.pdf>

⁷ <https://www.americantelemed.org/covid-19/telehealth-impact-physician-survey/>



NEXT

The 5G Build-Out Will Deliver Ultra-Low Latency And Enhanced Coverage For Quality Care Anywhere.

157.3 million units—that’s how many 5G smartphones market research company IDC estimates will ship in 2025.⁸ Device adoption is keeping pace with network expansion, even in underserved areas. To connect underserved populations, T-Mobile has promised to cover 90% of rural Americans in the next few years.⁹

With more people covered every year, telehealth is becoming a primary platform for healthcare interactions. Though video visits are popular among patients, they’re still plagued by the technical issues of the past.¹⁰ 5G will improve video quality and support the data needed to create a frictionless experience. From there, the possibilities multiply.

Very soon, patients and providers will move past simple video call telehealth visits to both procedures and facilities that fully erase the barriers of distance.

Take telesurgery. With robotics gaining traction in medical training and virtual “scrub in” procedure collaboration, fully remote telesurgery is expected to transform life-saving care, regardless of location.¹¹

⁸ <https://www.idc.com/getdoc.jsp?containerId=US48244821>

⁹ <https://www.t-mobile.com/news/un-carrier/t-mobile-sprint-one-company>

¹⁰ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8063020/>

¹¹ <https://www.telegraph.co.uk/global-health/science-and-disease/scrubbing-virtually-could-pandemic-change-surgery/>

NEXT**Decentralization Through Automation.**

One study estimates that wireless communication must deliver no more than a 3-10 millisecond delay to enable the haptic feedback required for telesurgery.¹² In the future, we'll see high-band 5G networks power surgery over great distances.

The need for care that spans distances is increasing. Nearly 80% of rural counties are short on primary care doctors¹³ and a record-breaking 20 hospitals closed in 2020.¹⁴ An emerging solution? Decentralized healthcare powered by 5G. We're already seeing care delivery through retail partnerships.

As robotics and telesurgery mature, organizations could unveil telehealth kiosks with a range of automated capabilities for routine care and sophisticated procedures. It's no longer futuristic to imagine fully automated surgery.¹⁵ For clinicians—doctors, nurses, and techs—these developments mean saving more lives in more places. And for patients, it will undoubtedly expand access opportunities regardless of location and financial constraints.

Every leap forward requires speed and capacity. 5G networks will enable high-quality virtual interactions and data transmission between stakeholders, systems, and locations in the value chain.

A Johns Hopkins research team successfully administered robotic, laparoscopic surgery on the soft tissue of a pig with no human guidance.¹⁶

Soft tissue surgery involves delicate work and steady hands, proving how capable robots will soon be.

¹² <https://www.mdpi.com/2304-6732/8/5/140/pdf>

¹³ <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2020/01/31/rural-americas-health-crisis-seizes-states-attention>

¹⁴ <https://www.beckershospitalreview.com/finance/state-by-state-breakdown-of-73-hospital-closures.html>

¹⁵ <https://www.mobihealthnews.com/news/back-future-digital-health-led-decentralization-health-care-delivery>

¹⁶ <https://www.sciencedaily.com/releases/2022/01/220126143954.htm>

Improved Outcomes

Connected Care Systems And Devices Drive Better Clinical Outcomes. With Automation, The Benefits Are Increasing.

NOW

With 5G Coverage On The Move And In-Building, Today's Technologies Reduce Timetables For Life-Saving Intervention.

IoMT (Internet of Medical Things) devices are transforming how healthcare organizations intervene in critical moments. They're gathering astonishing amounts of real-time data on vitals, patient behavior, device usage and performance, and more.

But what organizations do with the data matters most. A steady stream of information can and should prompt meaningful treatments.

With treatments at the right times, emergency departments and ICUs can reduce mortality and better manage morbidity. Additionally, burnout is on the rise and physicians report dwindling time as a key contributor.¹⁷ Reliable remote monitoring simplifies staff workflows.

¹⁷ <https://pubs.asahq.org/monitor/article-abstract/85/12/25/117940/The-Invisible-Cause-of-Physician-Burnout?redirectedFrom=PDF>

¹⁸ <https://pubmed.ncbi.nlm.nih.gov/28288655/>

Building on IoMT and virtual care innovation, eICUs are gaining traction to improve outcomes with:

- Patient condition change alerts
- Medical device maintenance information
- Early warning systems to reduce serious events by 35% (as one hospital in Wales reported¹⁸)
- Clinicians focused on high-value, skilled activities rather than passive monitoring



NOW

Saving Lives With Mobile Healthcare.

Rolling out the right systems requires fast data speeds wherever doctors and nurses need to go. A recent UCLA study found that mobile stroke units improved outcomes and reduced the chance of disability when compared to standard stroke care.¹⁹

Similarly, 5G-enabled ambulances allow clinicians to perform remote diagnostics, enabling life-saving care en route to the ER and even reducing the need for ER visits.²⁰

To put the best tools in caregiver hands, organizations need an approach that blends in-building solutions with coverage beyond facility walls. 5G offers coverage and speed beyond any previous generation of wireless connectivity.

Current in-building 5G delivers speeds 7.5x faster than LTE.²¹

¹⁹ <https://www.sciencedaily.com/releases/2021/03/210317141707.htm>

²⁰ <https://www.ericsson.com/en/cases/2020/the-5g-connected-ambulance>

²¹ <https://www.t-mobile.com/news/network/t-mobile-brings-ultra-capacity-5g-to-miami-u-s-department-of-veterans-affairs-va-hospital>

NEXT**5G Handles Massive Amounts Of Data. As The Network Expands, It Will Help Revolutionize What's Possible In Healthcare Monitoring And Treatment.**

With the pace of advancing medical technology, we could witness an exponential increase in IoMT and health-related data over the next decade. These devices collect data while also increasing the amount and impact of clinical interventions. Today, IoMT is helping remind patients to take medication and is even delivering FDA-approved electrocardiograms (EKG) embedded in wearable devices.²²

In the future, we could see patients equipped with advanced prosthetics, flexible electronics for drug delivery, and more—all designed to empower treatment and health management opportunities.

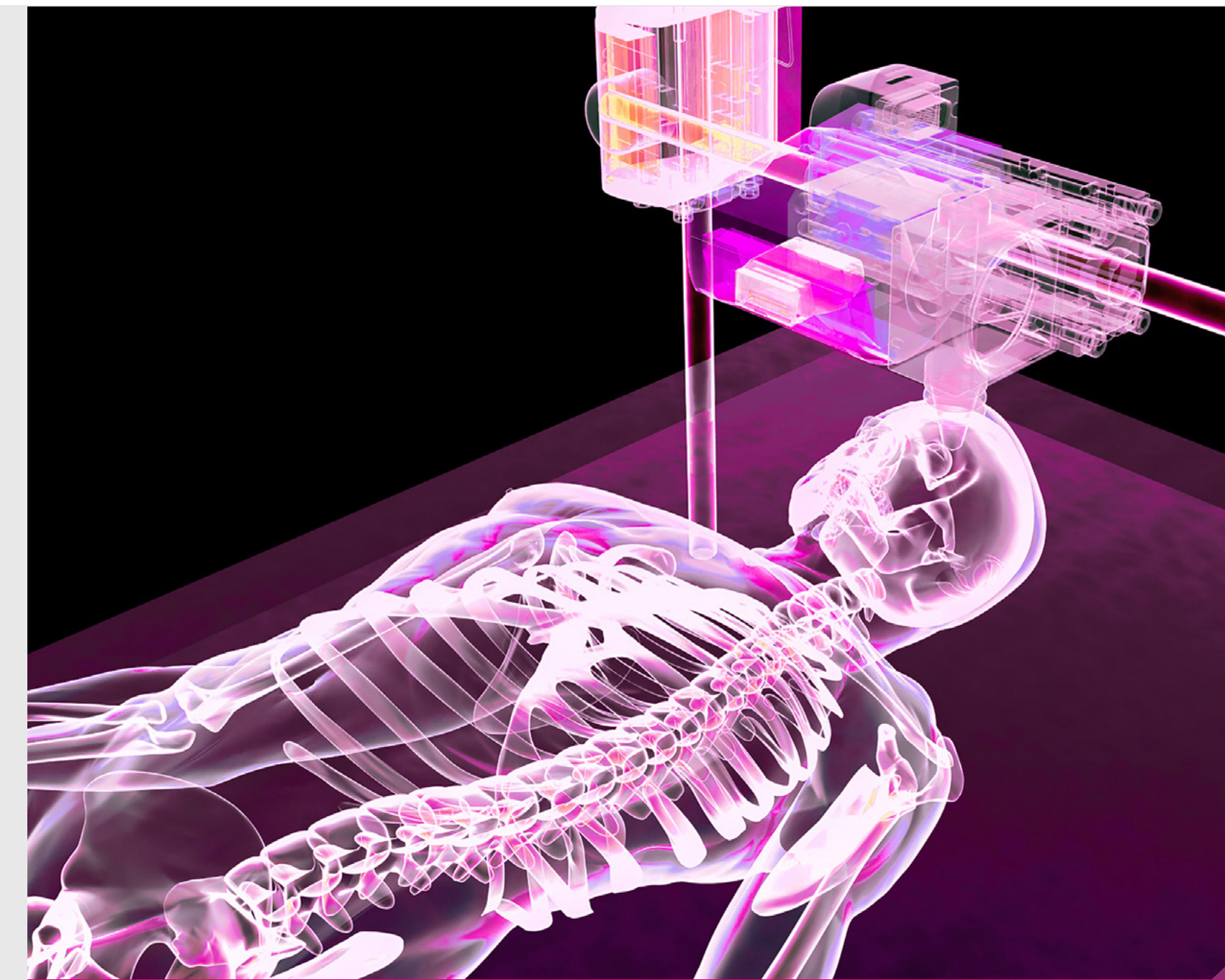
Expanding Life-Saving Tools And Protocols.

The possibilities are also exciting for clinicians, paramedics, and medical researchers. As devices proliferate in ways we can't yet imagine, healthcare organizations will need wireless connectivity to analyze data, manage connected systems, and help clinicians intervene in the right ways, at the right times.

With every innovation that relies on more data transmission with lower latency, 5G will be critical for innovative protocols that improve outcomes.

A Look At The Future.

- Smart ambulances to equip paramedics with emergency department capabilities
- 3D printing to create custom medical devices and even bones for faster recovery
- Fully simulated clinical trials for drug development, including efficacy and personalization



As of 2021, 3.2 million IoMT devices were deployed globally.

That figure is projected to increase 231% by 2026.²³

²² <https://www.businessinsider.com/iot-healthcare>

²³ https://www.juniperresearch.com/whitepapers/smart-hospitals-using-big-data-to-enhance?utm_source=juniper_pr&utm_campaign=pr2_smarthospitals_technology_markets_jan22&utm_medium=email



Enhanced Experiences

Patients Want To Be Engaged In Their Health And Doctors Want To Provide The Best Experience. 5G Connects The Dots.

NOW

5G Connectivity Helps Fuel How Patients Understand And Engage With Their Health.

Telehealth is helping providers reach more people and elevating the patient experience. We're seeing how patients who tried telehealth for the first time during the pandemic appreciated the convenience and expressed interest in other forms of virtual care, such as digital monitoring and at-home testing.²⁴

Mobile healthcare improves patient engagement, inspiring preventative actions that reduce the burden on patients and providers. Telehealth is just one part of the patient experience. Providers and organizations should also consider in-person solutions.

²⁴ <https://herodigital.com/insights/first-time-telehealth-adopters/>

NOW**The Patient Experience And Employee Engagement Connection.**

Employee engagement is one key facilitator. Studies show that patient experience scores related to interactions with nurses have the strongest association with hospital financial outcomes.²⁶

In other words, happy nurses create happy patients. It sounds simple, but nurses are the busiest employees in a hospital or clinic.

What can organizations do?

- Digital tools for recognition
- Professional development and technology courses that seamlessly integrate with on-the-job tools
- Wellness apps so employees can build healthy habits

Organizations that invest in clinicians are also investing in the patient journey. Whether it's the result of repeat visits for other services or reduced liability following negative experiences, this much is clear: in-person interactions matter.

Fast, reliable connectivity is essential, powering tools and systems so caregivers can better serve patients.

**Telehealth Fuels
Patient Engagement**

According to an American Psychiatric Association (APA) report, only 9% of psychiatrists reported that all patients kept their appointments before the pandemic.

With the switch to telepsychiatry, the number increased to 32%.²⁵

²⁵ <https://www.pbs.org/newshour/health/more-telehealth-therapy-means-fewer-skipped-sessions>

²⁶ <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/life-sciences-health-care/us-dchs-the-value-of-patient-experience.pdf>

NEXT**As Technology And Networks Mature, Advanced Healthcare Will Move Into Homes.**

5G is projected to transform the patient journey. The prospect of hospitals at home might be the most monumental step forward.

These systems could help patients facing long-term illnesses get quality care from the comfort of home.

The technologies that define a hospital at home:

- Remote-health monitoring, including audio and video connections
- Robotics to automate basic tasks including IV pump management
- Powerful analytics to diagnose problems and recommend treatments

Reliability is key—knowing systems are working seamlessly with hardware and that communication lines are always open.

Organizations need high-bandwidth networks with ultra-low latency to make every automated intervention successful—not only in life-saving moments but over the course of care, preventing problems before they arise.



“ The availability of technology is opening people’s minds on how we might deliver services differently, consider a more patient-centric experience, and discuss where this type of care is appropriate and where not. ”

— Becker’s Health IT ²⁷

²⁷ <https://www.beckershospitalreview.com/digital-transformation/what-s-the-future-of-hospital-at-home-5-innovation-execs-weigh-in.html>

Increased Efficiency

Today, 5G Helps Healthcare Organizations Maximize Efficiency. Future Innovation Could Change How The Whole Ecosystem Operates.

NOW

5G Connectivity Supports More Streamlined Tasks And Helps Uncover New Ways Of Working—And Opportunities For Healthcare Businesses.

Imagine robots producing medical inventory on-site, organizations with automated administration processes, and a hospital with sophisticated patient forecasting. These use cases are here now.

Behind the scenes, intelligent automation technologies remove redundancy and increase efficiency to reduce revenue-cycle expenses. Real-world examples speak to the potential, down to the dollar.

Allegheny General Hospital in Pittsburgh, Pennsylvania recently used an IV Robot to produce 46,909 products, saving \$1.2 million.²⁸

On-site resource production is an appealing prospect for organizations facing quality control and supply chain issues.

²⁸ <https://www.healthcareitnews.com/news/allegheny-general-hospital-saves-12-million-iv-robotics>

NOW

Connecting Departments And Processes.

Beyond resources, there are incredible process efficiencies available with digital investment. Scheduling between departments is a common obstacle in large facilities.

Emory University Hospital in Atlanta, Georgia, used predictive analytics to forecast demand on certain lab tests by day of the week and even time of day.²⁹

Processing and actioning valuable data across the range of healthcare activities and devices is no small feat. Today's 5G bandwidth and speeds unlock the innovation organizations need to build resilience.

The average U.S. nurse spends 25% of work time on regulatory and administrative activities.³⁰

²⁹ <https://hbr.org/2017/10/why-hospitals-need-better-data-science>

³⁰ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6616181/#CIT0023>



**NEXT****Future 5G Networks Will Support Massive IoT, Allowing Capabilities In Their Infancy Today To Scale And Make A Real Impact.**

Healthcare is set to undergo a total operational evolution—a transformation full of opportunity for businesses and patients. Sophisticated robots, advanced forecasting software, and smart medical transportation vehicles will alter how organizations allocate resources and deliver patient care.

When 5G can support massive IoT—billions upon billions of devices consuming and transmitting data—we'll be able to power smart hospitals built on the digital foundation of big data and AI. The potential in AI:

- Diagnostics—one medical center was able to increase cancer identification in pathology slides by 3.5% using a single AI program³¹
- Operational efficiency—nearly two-thirds of healthcare organizations say they will use AI to resolve operational inefficiencies³²
- Clinician support—33% of clinician tasks have the potential to be automated with AI³³

With stronger connections and capabilities, healthcare organizations will finally be able to think beyond traditional services, expanding into new areas. A recent Accenture model estimates that between 2021 and 2025, 5G will fuel around \$192 billion in gross economic output across the healthcare sector.³⁴

Much of the innovation and opportunity will focus on connecting more devices, systems, and people. Operational investments in 5G today will reverberate for future clinicians, pharmacists, administrative staff, executives, and most importantly, patients.

³¹ <https://news.harvard.edu/gazette/story/2020/11/risks-and-benefits-of-an-ai-revolution-in-medicine/>

³² <https://www.evicore.com/insights/infographic-how-ai-can-make-hospital-administration-more-efficient>

³³ <https://www.evicore.com/insights/infographic-how-ai-can-make-hospital-administration-more-efficient>

³⁴ https://www.accenture.com/_acnmedia/PDF-146/Accenture-5G-WP-US.pdf

T-Mobile For Business: Innovation Through Partnership

Forging Ahead With America's Largest And Fastest 5G Network.

The business of healthcare is serious. Clinicians, administrators, and leaders have a lot on their plates, and patients' lives are on the line.

Exploring new technology is an investment in time, funds, and ultimately, people. In healthcare, capturing technology opportunities is easier with a partner.

The right 5G partner can help your teams:

- Identify near- and long-term investments
- Be agile, helping every person in the healthcare system navigate the demands of a rapidly changing world
- Reach more patients in more places

T-Mobile For Business Understands How To Deploy Products And Services That Make A Real Difference.

5G is and will be critical to transmitting and analyzing data from a growing list of devices, systems, and facilities.

From hospitals at home to care kiosks in the local drug store, healthcare organizations have an opportunity to change lives with the power of 5G. We're here to offer healthcare organizations the latest devices and services to transform care for patients and providers.

We start every project by listening to your specific connectivity challenges, team dynamics, and business goals.

Then we build solutions tailored to your organization, helping you lead the way on industry-wide progress.



**T[®] T-MOBILE
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Ready To Find Out How T-Mobile For Business
Can Support Your Goals?

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