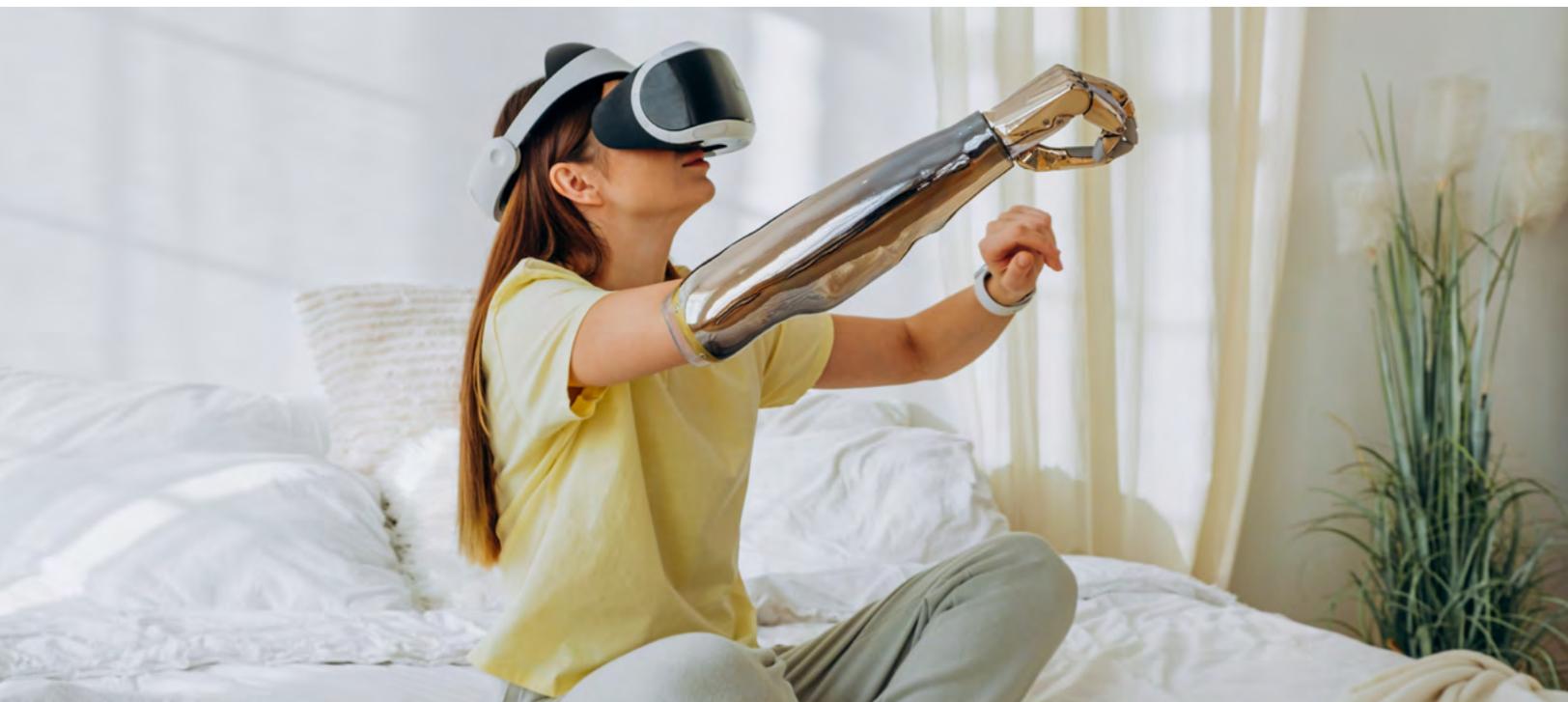




Amplify Healthcare: Connectivity, Innovation, and The Future of Care Delivery



WHITE PAPER



There is a technology revolution underway in healthcare. Remote monitoring devices, consumer wearables, and telehealth are just the tip of the iceberg. There is a wealth of innovation bubbling up just beneath the surface of the industry as R&D departments advance products and solutions designed to create smarter, more connected experiences for patients and providers. Technologies like VR and AR can improve the patient experience, while expanding remote monitoring to patient wearables is creating the level of engagement needed to ensure proactive preventive care.

Meanwhile, the ability to embed Subscriber Identity Module (SIM) cards—those same small cards in your cellphone that connects you to the network—into medical devices has allowed manufacturers to open up the floodgates when it comes to technological innovation. Products that seemed archaic yesterday—like medicine cabinets and pill dispensers—are being reinvented and added to an increasingly growing roster of innovative, connected devices. Connected to IoT platforms, these devices are reshaping the face of healthcare delivery.

The pace of innovation within healthcare R&D is progressing rapidly, but there is a dire need to expand network capabilities to ensure these solutions are interconnected when manufactured and deployed at scale. 4G technology will suffice for connected products that are not mission-critical, but in use cases where speed, low latency, and reliability are crucial, manufacturers are turning to 5G. One big reason, according to Deloitte's Rob Kasegrande, is that "Compared with previous

technologies, 5G and edge enable the connection of so many more devices—whether that's sensors, cameras, or machines—while maintaining the same level of network performance. These advancements will provide manufacturers the ability to consume, analyze, and act on massive amounts of data in real time."¹ This will increasingly be the case for manufacturers looking to future-proof innovation: according to the [Global Interconnection Index \(GXI\)](#), global private interconnection bandwidth capacity within the healthcare and life sciences industry is expected to grow annually by 48% between 2019 and 2023.²

Connectivity can also help drive down costs, which in turn increases profits. IoT deployments in healthcare R&D, for instance, can lower overall maintenance costs using predictive maintenance principles. It can increase worker safety during training and repairs. IoT helps bridge the gap between floor workers and executives. It can also identify and even resolve bottlenecks in production, as well as offering insight into future changes and opportunities before money is spent toward action.

To truly bring the interconnected products of tomorrow to market today, the healthcare technology revolution needs a low latency, high-capacity catalyst.

¹ "Take 5: 5G in manufacturing" – Deloitte, 2022

² "The Global Interconnection Index (GXI), Vol. 5" – Equinix, 2021

EMERGING TECHNOLOGIES

Healthcare is on the precipice of a high-speed, interconnected, intelligent future. The industry is transitioning from a reactive, break-fix model of care to one that is proactive and preventive. This shift is being driven by digitally enabled technologies that keep patients, providers, pharmacists, and plans connected, informed, and engaged in real-time.

The rapid adoption of innovations like telemedicine, surgical robotics, the Internet of Medical Things, and wearable medical devices for real-time remote patient monitoring is driving unprecedented growth in medtech R&D. Advancements made in wireless technology and computing power are converging, leading to the development of a growing number of connected products that are able to generate and transmit their own data. Over the past few years, we've witnessed the emergence and increasing utilization of these disruptive technologies in medical settings. Now, we're beginning to see how their power and utility can be amplified when they work in tandem.

This level of interconnectivity is where the future of healthcare lies, and it's powered by 5G. That's because 5G is able to transmit large data files quickly, providing the networking power needed to meet the needs of patients and healthcare providers quickly, efficiently, and at scale.

More importantly, 5G is enabling the level of interconnectivity needed to create medical settings where everything is smarter, faster, and synced.

Remote Patient Monitoring

5G empowers remote monitoring devices, enabling faster, more reliable transmission of patient-critical data in real-time. With 5G, electrocardiograms can be monitored remotely and vitals from a wearable device can be seen by both patient and provider in real-time, even in remote or rural locations.



Connected Ambulance

The connected ambulance has been the 5G pipedream of the decade for healthcare innovators – largely because it marries so many emerging technologies. Brick-and-mortar bound clinicians using VR headsets can guide first responders wearing haptic gloves through a series of procedures in real time. This blend of technologies is not possible without ultra-low latency networking.

Asset Tracking

With 5G, healthcare providers and pharmaceutical companies can utilize “smart cabinets” that manage inventory in real-time. For health systems and clinics, this means real-time equipment tracking. For labs, these devices create unprecedented cost-savings in supply and reagent spend.



Connected Medical Devices

IoMT—an amalgamation of medical devices, wearables, sensors, and applications—is driving digital transformation in healthcare, especially in preventive care. These technologies are data-intensive and require real-time data delivery to be effective.

When products and solutions like these are interconnected in a medical setting, their true potential is unlocked. Healthcare providers, pharmacists, health plans, and especially patients are increasingly relying on connected products to create a healthcare system that is able to produce better outcomes, reduce costs, and improve the experience of receiving care. Seamlessly connecting these technologies requires a fast, persistent, wireless network with enough bandwidth to support maximum efficiency and reliability.



Accelerating Product Development with AR/VR

While AR/VR has been an emerging technology for over a decade, it needed the power of 5G to truly take off. Medtech manufacturers are increasingly using virtual reality for supplemental labor on production lines. With the country in the throes of a workforce crisis, medical device manufacturers are struggling to keep production cycles moving. Leveraging virtual tools to design new devices from anywhere and utilizing AR/VR to assist in the buildout of equipment on the production line could assuage ongoing labor troubles. Some medtech manufacturers report a 40% increase in productivity using mixed reality to conduct real-time visualization and CAD for product design.³ These technologies are data-intensive and require networking capabilities only 5G can provide.



The Power of 5G + AI

5G on a private network with edge computing doesn't break up data. This enables an extremely fast cycle between data collection, data analysis, decision-making, and decision implementation. In this way, 5G creates the perfect environment for AI. The speed and bandwidth of high capacity 5G networking allows for instantaneous data processing; AI turns that data into real-time actionable information that can create unprecedented efficiencies throughout manufacturing and supply-chain operations.



³ "COVID-19 Marks a Need for Virtual Development Tech" - Medical Product Outsourcing, Aug. 2020

WHY 5G?

Digital transformation has ignited the imaginations of healthcare innovators across the world. With 5G connectivity, many of the solutions that once seemed wildly far-fetched can now be put in motion. Combining AI, telemedicine, and connected devices using low-latency 5G networks will inevitably lead to an explosion of innovation and ultimately, better healthcare.



5G unlocks new possibilities for product developers everywhere. Using 5G, medtech manufacturers can track the performance of their equipment in real-time. This enables rapid design iteration and allows manufacturers to provide maintenance before your equipment fails.



Using 5G opens up new opportunities for innovation of processes and operating models, enabling the implementation of everything from ubiquitous sensors to mobile robotics to factory automation. With 5G, product manufacturers can increase production efficiency through visual inspection, connected worker equipment, and intelligent product flow optimization. 5G is the only networking solution that can reliably improve capacity and latency to meet these needs.



Embedding SIMs with IoT platforms opens up even more possibilities: next-generation device provision, maintenance, data management and aggregation, and the ability to interface with APIs to integrate with data analytics software are just the beginning. Such benefits are only possible when connectivity is integrated into the design and development process at a foundational level. In the healthcare environment of tomorrow, connectivity cannot be an afterthought.



CASE STUDY: CARDINAL HEALTH FUSE

The face of healthcare is changing as care delivery is moving to meet patients where they are: in their homes and communities. And since the extended range of 5G removes some of the limits of care in rural locations, more people will have access to these kinds of premium services. For medical device manufacturers, this shift in care toward patients' homes and community clinics is further accelerating the need for interconnectivity.

Most major healthcare companies have their own in-house innovation labs where they are looking for ways to leverage connectivity to enhance transformative R&D projects. Some examples include the Kaiser Permanente Design Consultancy, which used technology to create an ecosystem of solutions to better prepare and instill confidence in family caregivers, connecting them with the right information and skills at the right time to provide a safety net for unexpected events. And Johns Hopkins Medicine's Technology Innovation Center has developed dozens of new software programs, including one group chat application intended to keep providers in the loop while on the move and caring for the patient.

Another example is Fuse, Cardinal Health's in-house innovation lab. Fuse is leading the way in this shift by bringing together teams of experts in technology, design and healthcare to identify complex healthcare problems and create innovative products that transform them.

As the trend toward in-home care shows no sign of slowing down, innovators at Fuse were quick to tackle one of the major barriers to receiving care in the home: connectivity.

At-home patients require the same level of connectivity they would receive in a facility – access to a complex and coordinated network of providers and technologies that together create a seamless spectrum of care.

Fuse understands that in a world where care is expected to be delivered anywhere, connectivity is key. Their diverse team of healthcare experts, designers, and technologists are developing products like **small refrigeration systems** with cloud communication capabilities, **smart medicine cabinets**, and a bevy of forward-looking technologies that are helping make in-home care just as safe, effective, and connected as care delivered in a facility.

Success in innovation depends on connectivity to improve outcomes. Fuse's technology solutions in medication reconciliation and Medication Therapy Management, for example, will deliver **8 million targeted interventions** by connecting payers to pharmacists to patients. This leads to higher pharmacist satisfaction, improved patient outcomes and reduced costs in the system. Outcomes like these motivate us to discover more ways to innovate.

Connectivity is reshaping the way medical device manufacturers are innovating for the future. Medical products that once seemed mundane—medicine cabinets, pill dispensers, and other relics of the healthcare system of yore—can now be reimaged and revolutionized by embracing the enhanced connectivity of 5G.



CONCLUSION: STEP BOLDLY INTO AN INTERCONNECTED FUTURE

When it comes to reinventing healthcare, 5G is an essential enabling technology. There are steps medical device manufacturers and healthcare organizations can take today to begin fostering connectivity and amplifying innovation.



1. Imagine

What was once deemed the stuff of science-fiction is now possible. Encourage your engineers, developers, technologists, and designers to think outside the box.



2. Strategize

Embrace connectivity as a foundational principle of innovation. The healthcare experience of tomorrow is seamlessly connected. Medical device manufacturers that integrate connectivity directly into their R&D processes will have an edge on those who approach connectivity as an afterthought.



3. Build

Find a networking partner with an intimate understanding of healthcare's unique challenges, a deep appreciation for possibilities, and strong working relationships with industry partners.

The healthcare industry is undergoing a massive transformation driven by the rise of telemedicine, connected devices, and emerging technologies—all of which require reliable connectivity, security, and innovative networking solutions. The future of care is here, now, and powered by 5G.



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