

# THE RISE OF TELEMEDICINE

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How Sensors are Advancing Real-time and Remote Patient Monitoring Healthcare Technologies



## The Rise of Telemedicine

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With the ongoing growth of the Internet of Things (IoT) and connected technologies, startups, Fortune 500 companies, insurance companies and medical providers have been looking at new products and devices that could revolutionize medical care and streamline costs by reducing hospital readmission rates, and allowing patients in remote areas to get the care they need. Telemedicine has been a focus for the medical industry for several years. Though due to recent safety concerns and the associated restrictions related to global pandemic preparedness, telemedicine has become an even greater focus for healthcare facilities and all related stakeholders.

The collection and measurement of accurate data is essential to telemedicine technologies and processes functioning properly. Therefore, sensors play a very key role in telemedicine growth and the patient benefits which it delivers.

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## THE TRANSFORMATION OF HEALTHCARE

Most would agree, that the Internet of Things (IoT) is changing everything, including healthcare. IoT is now allowing patients and providers to work together for more effective chronic disease management, deeper engagement, and more open communication. As technology continues to dramatically evolve, the IoT is proving it's pivotal role in creating a more connected healthcare ecosystem. In healthcare, IoT is redefining how apps, devices and people interact and connect with one another to deliver healthcare solutions. This helps reduce costs, improve outcomes and manage diseases, and enhance patient experiences.

These IoT developments help push the growth of telemedicine technologies and the sensors that enable their functionality as they both span across two important areas: creation of smart, connected products and devices, and the proliferation of big data.

Telemedicine is often thought of as video appointments allowing patients to speak to their doctors and physicians virtually from the comfort of their home. With the support of telemedicine sensors, remote patient monitoring technologies are advancing to become more robust to include multiple platforms in which patients can be monitored by healthcare professionals in real-time.

The main challenge is recreating a traditional patient experience where all patient data is gathered and transition that experience into a more modern virtual experience. Additionally, there is a need for high quality technology which provides data security for these practices to succeed. This change must happen while maintaining the level of value-based care expected of the provider.

Here are some of the telehealth technologies that are being developed and the sensors that enable them to support patient monitoring capabilities.



### TECHNOLOGY 1

#### Remote Comprehensive Exam Kits

The objective for telehealth practices is to provide an alternative to in-person patient visits and to reduce contact with other individuals to prevent the spread of illness. This becomes more important when considering high risk patients. The world population is aging. People are living longer with good health, but many are also living longer with chronic disease — putting a strain on healthcare systems and resources.

As new technologies emerge, such as remote comprehensive exam kits, remote patient monitoring becomes a more substantial, complete patient check-up and further helps address these concerns. Remote comprehensive exam kits allow for medical exams to be held at any point during the day or night from anywhere. This exam could include an examination of the patient's ears, lungs, heart, throat, and body temperature by using different attachments for patient health measurements. After examination, the doctor would have the data needed for a diagnosis and to prescribe any necessary medicines. This allows for a more immediate recovery plan to be established and implemented for the patient.

Having the ability to virtually administer a comprehensive exam of the patient cannot happen without the use of reliable and accurate sensors. Whether the doctor is trying to measure the patient's pulse or determine the temperature of the patient to detect a fever, patient monitoring health data that is collected by the sensor is essential.

Pulse oximetry sensors offer cardiovascular monitoring which measure blood oxygen saturation ( $SpO_2$ ) and pulse. These sensing technologies allow for non-invasive measuring of blood oxygenation levels. These sensors can be used within the comprehensive exam kits which then could be sent over to the doctor for review.



TE Connectivity's [CM-01B](#) contact microphone is designed to minimize external acoustic noise while offering extremely high sensitivity to vibration. The CM-01B is ideal for telemedicine applications, such as within remote comprehensive exam kits, where detecting a patient's heart or lungs as part of a remote diagnostic tool is needed.



The [Finger Clip](#) photo optic sensor from TE is intended to measure a patient's oxygen saturation level, or pulse oximetry. This reusable  $SpO_2$  sensor offers continuous monitoring and fits various adult finger sizes. Additionally, TE Connectivity's disposable pulse oximeter sensor offers a single-use, lightweight, disposable option for prolonged monitoring or for environments where cross-contamination is a concern.



## TECHNOLOGY 2

### Telehealth Kiosks

Telehealth services are becoming the new normal as they make healthcare more accessible for at-risk and rural patients. Telehealth kiosks are part of this telemedicine evolution. These physical kiosks could be located at retail facilities, pharmaceutical locations, worksites, school systems or any other community location. They offer points of care where patients can go to receive on-demand health evaluations via biometric and diagnostic devices which allow healthcare providers to virtually monitor patient vitals.

A broad range of patients can benefit from these telemedicine kiosks. Patients in search of preferred specialists who may not be near them geographically are able to reach them via these kiosks and in turn, the specialist would be able to gather sensitive patient data needed from the patient in a secure and private manner. Patients who live in rural places or high-risk patients also can benefit from these health kiosks since they would be conveniently located in accessible places and these patients could also avoid in-person appointments.

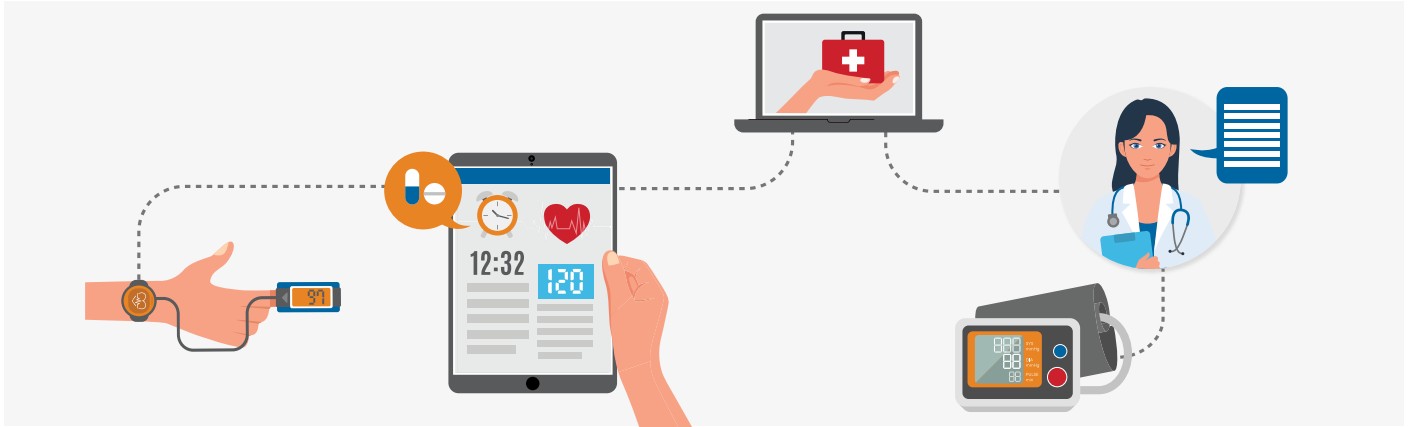
For these telehealth kiosks to succeed, the biometric and diagnostic devices used to monitor and measure the patient's health must rely on precise and durable sensors. The use of sensors in smart stethoscopes, thermometers, blood pressure cuffs, otoscopes, pulse oximeters, and more help enable these kiosks. For example, non-contact temperature sensors offer precise temperature measurement. These could be used in a non-contact thermometers within the telemedicine kiosks to measure the patient's body temperature.



TE Connectivity's (TE) [Analog Infrared Thermopiles](#) offer non-contact technologies with high precision for critical temperature measurement. Non-contact temperature measurement technology has advanced technology and devices, creating better tools for temperature measurement for medical applications. This data can be essential to applications from patient vital signs monitoring, to condition monitoring of critical industrial machinery.



The [SM4000](#) pressure sensor is a highly precise, compact device offering both digital and analog output signals. This pressure sensor is designed to function accurately within a small footprint for long-term stability within patient monitoring applications such as a blood pressure cuff.



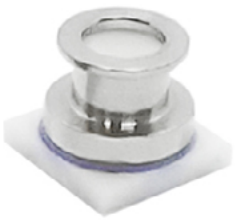
### TECHNOLOGY 3

#### Purposeful Wearable Medical Devices

The clinical application of wearable medical technology is evolving fast as technology companies are partnering with healthcare organizations to help patients and clinicians make better decisions. From continuous temperature monitoring devices which can be used for babies and young children, post-operative patients, cancer patients, and seniors to wearable fitness trackers with more advanced technology for measuring long-term health data, wearable medical devices are continuing to advance to meet the needs of telemedicine practices. As many new devices are being developed, there is still a challenge to ensure that the devices can aggregate and share data and communicate reliably and securely.

As telehealth needs evolve, there has been a focus on wearables that offer more of a long-term purpose for patients. This goes one step further than just patients wearing fitness trackers to monitor their daily activity level. The next step involves a network of smart medical devices which track a patient's health 365 days a year instead of the doctor just getting access to a patient once a year. This could even include providing patient health data to insurance companies which could affect rates and coverage.

The fitness trackers, smart scales, blood pressure cuffs, and other devices which enable this network of ongoing patient monitoring can only exist with the use of sensors to collect, monitor, and measure the patient's data.



TE Connectivity's [MS5839](#) is an ultra-compact pressure and temperature sensor that is optimized for applications where chlorine, saline and other harsh media are present. Consumer devices for telemedicine, such as smart watches, require small sensing technologies while still having the capability to precisely measure data while being potentially exposed to corrosive media.



The robust yet compact [FX29](#) load cell by TE was designed to be universally suited for a variety of force sensing applications. One possible use within telemedicine applications where the FX29 force sensor could be utilized is within smart scales.

### CONCLUSION

By integrating IoT features into telemedicine technology, it promises to greatly improve the quality, flexibility and effectiveness of healthcare and bring especially high value care for all patients. There is a growing interest in telemedicine healthcare services and wearable medical devices that feature sensors, actuators and other mobile communication methods that allow patient data to be continuously monitored and transmitted via cloud-based platforms. They give healthcare providers a complete picture of a patient's vitals between visits and can alert doctors and nurses of important changes that require intervention.

### BE PART OF HEALTH TECHNOLOGY INNOVATIONS

Key healthcare trends will continue to strengthen remote patient monitoring and open new opportunities for growth. And that translates into new challenges to design and create solutions based on advanced sensor technology. TE Connectivity can help.

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