THE ROLE OF SENSING TECHNOLOGIES IN DELIVERING PERSONALIZED PATIENT CARE

Sensing technologies facilitate the gathering of detailed and accurate health data that are unique to each individual. The availability of real-time, precise data presents more opportunities for tailored approaches to treatment and care management, aligning medical interventions with specific patient needs. As sensing technologies advance, they enable a more nuanced understanding of individual health patterns, driving innovation in personalized care that aligns with the genetic, environmental, and lifestyle factors of each patient. Here are some key areas where sensing technologies are supporting individualized care.

Sensors in Wearables

As discussed in part one of our healthcare technology series, wearable technologies present opportunities across patient monitoring, diagnostics and therapeutics. Most wearable technologies feature sensors that detect information and transmit back to smartphone applications where data can be viewed, analyzed and managed. For example, wearable audio sensors are worn externally and are designed to detect and record sound (i.e., acoustic signals) in the body (e.g., hearing aids, fitness trackers, wearable stethoscopes).

Sensors in Hearables

As a subcategory in wearable health technologies, hearables encompass a wide variety of devices used for listening and/or monitoring (e.g., health, activity). For example, hearable devices leverage the ears for monitoring the brain and vital signs via biofeedback sensors. Today, applications like ear-based electroencephalography (EEG) and electrocardiography (ECG) are starting to emerge, expanding the quality and availability of information gained through user-friendly health monitoring devices.

Sensors in Implantables

There's a diverse range of implantable sensors that can be used to monitor biophysical and biochemical parameters in the body, including temperature, mechanical and optical sensors. Unique clinical and engineering challenges, like performance, biocompatibility and power requirements impact their adoption, but there's interest in further study to understand their potential benefits across medical specialties.

We're already seeing examples emerge:

Cardiology

Similar to wearable audio sensors, there are implantable sensors that can detect sound or acoustic signals. These signals take the form of external inputs that can help medical professionals perceive abnormalities inside the body and acoustic manifestations of mechanical processes in the body (e.g., heart rhythms, respiratory sounds). Today, implanted microelectromechanical systems (MEMs) can detect more information about acoustic signals in the body (e.g., amplitude, frequency) than traditional equipment like stethoscopes.

Neurology

Sub-scalp implantable telemetric EEG (SITE) devices are an excellent example of emerging implantable sensors in neurology. SITE devices are currently in development for the treatment of epilepsy. With SITE, long-term, continuous EEG monitoring and brain activity surveillance is possible without external EEG systems, which can be inconvenient and uncomfortable for patients. Data collected by these systems is useful for diagnosis, condition management, monitoring and understanding disease progression.

Diabetes

Sensors and implantable devices are also found in diabetes care. For those with type 1 diabetes or type 2 diabetes who are on intensive insulin therapy, continuous glucose monitors (CGMs) are a vital tool in effectively managing their condition and preventing complications. CGMs automatically estimate blood glucose levels (e.g., blood sugar) throughout the day, usually every few minutes. These devices make it possible to check blood glucose and identify trends over time. Here, data can help people make more informed choices around food, physical activity and medication needs. CGMs are a useful tool for maintaining blood glucose levels within a target range to help prevent health impacts caused by or related to diabetes.

Most CGMs are made with three core components: a sensor, a transmitter and a receiver. Whether inserted under the skin, attached externally, or implanted within the body, sensors are responsible for estimating glucose levels in the fluid between cells—a useful proxy for the levels in the blood. The transmitter sends the information wirelessly to a receiver, which is most commonly a software program or insulin pump.

Otolaryngology

Otherwise known as ear, nose and throat (ENT) medicine, otolaryngology focuses on diseases and disorders that impact factors like hearing, balance, voice, swallowing and speech. Cochlear implants (CIs) are an example of an emerging implantable application in this space. CIs restore sensorineural hearing loss by leveraging electricity to stimulate the spiral ganglion cells of the auditory nerve and bypassing damaged components of the ear. These implants include a microphone and speech processor externally and a transmitter, receiver/stimulator, and electrode array internally.

Knowles Precision Devices is experienced in high-reliability components for medical electronics and audio sensors and can support applications across specialties. To discuss the specifics of your application, talk to one of our engineers.

Learn More

If you need help selecting from our portfolio please contact us and we can guide you through the selection process.

2777 Hwy 20
Cazenovia, NY 13035

(315) 655-8710

Contact Knowles