BEYOND FITBITS: Meet The New Wave of Life-Saving Wearables

by Scott Jung

A 2013 Pew study showed that 1 in 5 people use some form of technology to track their health data. Consider that just 20 years ago, health tracking "technology" was little more than a thermometer under the tongue. Jump ahead to today, and you'll see that wearable devices are one of the most popular ways of tracking health data and the one of the hottest tech trends on the market. The most popular ones are equal parts fashion and function: stylish to wear and technologically advanced in their sensing capabilities. But the majority of fitness wearables are limited to step counting and are already seen by some as a passing fad that's already headed the way of the dinosaur. We're more optimistic about the small, but growing segment of medical wearables - devices that go beyond fitness tracking and monitor important information about your health. Turn the page for our list of innovative wearable medical devices that can help both patient and doctor in the management and treatment of the most pervasive chronic diseases.


Pixie Scientific

Prices for EKGs can vary widely. Uninsured patients can expect to pay around $800 (and as much as $2000) for an EKG, according to howmuchisit.org.

QardioCore

Qardio - San Francisco, CA

Electrocardiography is not a new technology, but it requires special knowledge to properly position the various cables and electrodes. Qardio simplifies the process with an upcoming, 3-lead wearable ECG/EKG device called QardioCore.

Looking somewhat like two boomerangs fused together at their elbows, QardioCore measures only 7.3 inches at its longest and is designed to be comfortably worn all day. Its rigid, yet ergonomic design ensures correct electrode placement every time and doesn't require gels or adhesives.

In addition to medical-grade ECG/EKG sensors to help detect cardiac conditions, QardioCore also includes a host of other health sensors that makes it suitable for patients with a history or predisposition to heart attacks or strokes, high blood pressure, high cholesterol, diabetes, or obesity. A temperature sensor continuously measures body temperature, and a galvanic skin response sensor helps indicate stress levels. A built-in accelerometers tracks your steps, and a heart rate sensor continuously monitors your beat-by-beat heart rate. On top of all that, it's waterproof, so you don't need to worry about wearing in the rain.

All of the measured data is transferred via Bluetooth Low Energy to the Qardio app for iOS or Android. From the Qardio app, you can view trends, view data from other Qardio devices, log activities, and set alerts for any abnormal measurements. Data from QardioCore can also be shared automatically with your doctor of those closest to you.

COST: $449
AVAILABILITY: Exact date unknown (Spring 2015)
WEBSITE: www.getqardio.com

Dexcom G4 PLATINUM Continuous Glucose Monitoring System with Share

Dexcom - San Diego, CA

Dexcom is a pioneer in continuous glucose monitoring (CGM), which is a method of measuring glucose levels in the body in the interstitial fluid underneath the skin. Up until recently, blood sugar levels had to be measured frequently throughout the day with painful fingersticks. Measurements were limited to a single number. With CGM's, measurements are taken continuously every five minutes, allowing patterns to be observed and more informed decisions to be made regarding diet and insulin injection. Dexcom's CGM takes glucose monitoring even further by making the system completely wireless and internet-connected.

The system itself consists of four parts: a small, discreet sensor is inserted just underneath the skin to measure glucose levels for up to seven days, a transmitter receives readings from the sensor and sends it wirelessly up to 20 feet, a receiver with a color display, multifunction buttons, Bluetooth Low Energy, and a speaker displays readings, trends, and alerts, and an iPhone or iPod Touch loaded with Dexcom's Share 2 app receives and shares the data. Additionally, up to 5 family members, friends, or doctors can download the Follow app on their iPhone or iPod Touch and view the user's data in real-time.

Because glucose takes 5-10 minutes to move from the blood to the interstitial fluid, measurements from CGM's lag behind what's actually in your blood and aren't always accurate. While this means that continuous glucose monitoring can't yet completely eliminate the need for fingersticks, it allows diabetics to easily monitor trends in their glucose levels and allow their loved ones to be involved in their care.

COST: Approximately $1198 (depending on insurance)
AVAILABILITY: Available now
WEBSITE: www.dexcom.com/dexcom-g4-platinum-share

iPhone HealthKit & ResearchKit

Since it was first launched in 2007, the iPhone has grown and evolved from a communication tool to a portable doctor's office. From visual acuity tests to medical imaging, the iPhone has been utilized in a variety of capacities within the field of medicine.

Last year, Apple announced HealthKit, a platform which sought to unify the various streams of health data the iPhone could receive from its apps, built-in sensors, and numerous third-party accessories. For many, it was seen as the first step in validating the iPhone as a legitimate medical device and Apple as a company invested in health care. From the iPhone's Health app, data is encrypted and can be sent to other health apps for more personalized functionality or shared with health care professionals.

The iPhone's evolution into a comprehensive medical tool continued with a special announcement during Apple's March 2015 keynote event. Apple announced ResearchKit, an open-source software framework developed specifically for medical research. ResearchKit allows medical researchers to leverage the technological power and popularity of the iPhone to create apps that gather data and help them gain further insight into various diseases.

At the time of writing, over 17 medical institutions and foundations have signed on with ResearchKit. It will be interesting to see what medical discoveries and breakthroughs will be made as a result of a communication device we carry every day.

ADAMM (Automated Device for Asthma Monitoring and Management)

Health Care Originals - Rochester, NY

According to the Centers for Disease Control, 25 million Americans suffer from asthma. While most asthmatics can manage their flare-ups through a variety of medications, many patients still end up in emergency departments, desperately short of breath. Health Care Originals has developed a wearable device called ADAMM (Automated Device for Asthma Monitoring and Management) that incorporates a number of sensors to help keep asthma under control.

Asthma sufferers often have difficulty recognizing symptoms of an imminent flare-up; by the time they experience wheezing and reduced lung function, it means an asthma attack is already happening. ADAMM's highly sensitive sound and motion sensors coupled with advanced algorithms make it capable of identifying the possibility of an attack in advance. MEMS motion sensors and accelerometers measure respiration, heart rate, and body vibrations caused by wheezing. A microphone counts the number of times a user coughs but can also listen for the subtle changes in breath sounds that accompanies the onset of an attack. ADAMM also has a thermistor that can monitor for exercise-induced asthma or other respiratory conditions that cause changes in body temperature.

ADAMM wirelessly transmits data directly to the cloud via M2M technology where it can be securely accessed or can alert someone of a possible asthma attack. It can also be paired to a smartphone using Bluetooth Low Energy to remind the user to take their medication, create a digital diary, and change the device's settings.

One critical demographic for ADAMM is children, who account for over 25 percent of asthma sufferers. Children aren't always able to perceive if their asthma is starting to flare up, and even then, they often lack the discipline to use their inhaler. ADAMM can help ensure that parents can always monitor their kids for asthma flare-ups, which hopefully will lead to less missed days of school, reduced healthcare costs, and a better quality of life.

COST: Unknown
AVAILABILITY: Unknown
WEBSITE: www.healthcareoriginals.com

Pixie Scientific Smart Diapers

Pixie Scientific - New York, NY

Sometimes, the most straight forward solutions are the most effective.

Pixie Scientific's upcoming smart diapers are a prime example. They turn the simple baby diaper into a mobile pathology lab by using the diaper essentially as a giant urinalysis test strip. Once a urine sample is collected in the diaper (which any parent will agree is simple enough), various compounds in the urine react with different chemical reagents, causing 12 corresponding squares on the bottom of the diaper to change color. The color of each square determines the concentration of a specific compound in the urine, which aids in the diagnosis of potential urinary tract infections, prolonged dehydration, developing kidney problems, and even type 1 diabetes.

There is a high-tech aspect to the smart diapers; in the center of the ring of color squares is a unique QR code. Parents snap a photo of the QR code and colored squares using a smartphone app. The photo is instantly uploaded and analyzed in the cloud, and detailed report is generated. The results can also be sent to a doctor for further analysis and discussion.

Parents will also be pleased to know that the smart diapers are free of irritating chlorine, latex, and fragrances. Pricing is still unknown, but the smart diapers are expected to be sold direct to consumers later this year.

COST: Unknown
AVAILABILITY: Unknown (sometime in 2015)
WEBSITE: www.pixiescientific.com

Double duty: Pixie Scientific's upcoming smart diapers turn a simple diaper into a mobile pathology lab.

HealthPatch MD

Vital Connect - Campbell, CA

Some have described it as a "bionic band-aid", but we like to think of Vital Connect's HealthPatch MD more akin to Kevlar body armor. That's because HealthPatch does more than just protect its wearer from injuries that have already occurred, but continuously monitors vital health signs to help predict medical issues before they happen.

HealthPatch MD is a small, adhesive biosensor no bigger than a couple of ECG/EKG electrodes that is worn on the chest area for up to 3 days. It contains ECG/EKG electrodes, 3-axis MEMS accelerometer, and a thermistor and has been approved to measure a single-lead ECG, heart rate, heart rate variability, respiratory rate, skin temperature, body posture, and steps. More than just raw measurements, HealthPath MD also contains algorithms to measure stress, caloric burn, sleep quality, and fall detection.

Thousands of data points are collected and analyzed every minute on the HealthPatch MD, which are then encrypted and transmitted wirelessly via Bluetooth Low Energy to a smartphone or other device. From there, it's accessible in real-time to healthcare professionals via the company's VitalCloud secure platform or other 3rd-party systems. Given the wide range of possible applications, Vital Connect hopes that its HealthPatch biosensors will someday find themselves everywhere, from the hospitals, assisted living communities, ambulances, and even homes.

COST: Unknown
AVAILABILITY: Available now
WEBSITE: www.vitalconnect.com/healthpatch-md

Unlike some biosensors, HealthPatch MD has been designed to be comfortably worn all day and night… even in the shower.

Have a medical device or app that we should review in these pages? Email us at logan@telemedmag.com or reach out on Twitter @telemedmag