

The promise of IoT in health care

THE NEW WAVE OF CONNECTED DEVICES ENABLES CONTINUOUS CARE

Even though the United States spends \$260 billion each year on preventive care,¹ many people put off going to the doctor until they're feeling ill. Fitting an appointment into busy schedules can be a hassle, and the out-of-pocket costs associated with preventive care can be a burden. Oftentimes, a single check-up with a primary care provider is the only health system interaction a person will have in a year — 365 days of health boiled down into a 10-minute conversation.

In this model, it's inevitable that information that could alter your health journey could be missed: early signs of a disease may go undetected, opportunities to sustain healthy choices may be overlooked and engagement in programs to improve health may be unexplored. However, many people these days are taking their health into their own hands with wearable devices and smartphone apps that deliver on-demand health data and insights. The continuous care that these insights enable has the potential to be life changing.

What is the IoT?

The Internet of Things (IoT) involves the capture and processing of data from network-connected devices, through specially designed applications. In the context of health care, the IoT enables Patient Generated Health Data (PGHD) from devices worn by people for fitness or medical purposes, sensors in the home and health-related smartphone applications. This form of nontraditional

health data — and the resulting insights — is beginning to empower both health care providers and patients to better manage medical conditions, prevent future disease and personalize how we deliver care.

Use cases

CHRONIC DISEASE MANAGEMENT

You probably aren't surprised to hear that chronic diseases are on the rise in the United States. Today, six in 10 U.S. adults have a chronic disease, and four in 10 U.S. adults have two or more chronic diseases.² Smart devices connected through the IoT can help to predict, manage and reduce the rates of chronic disease and related complications.



HYPERTENSION

One in three U.S. adults has hypertension³ (high blood pressure), which can lead to other life-threatening conditions, including heart disease and stroke. So it's imperative that those with hypertension receive ongoing proactive care.

Wearable fitness devices — like the Apple Watch® or Fitbit® smart watches — can provide ongoing, unobtrusive monitoring of vital statistics such as blood pressure and pulse. Some devices can even generate electrocardiogram data that, with your permission, are automatically and securely sent to your health care provider.





Such devices allow the wearer to go confidently about his or her day, knowing that any sudden irregularities in these key vital signs will be flagged and the connected application will immediately contact his or her health care provider. The care management team can then determine the next course of action, and quickly contact the wearer and/or authorized family members.



DIABETES

30.3 million U.S. adults have forms of diabetes, a condition in which the body doesn't properly process and use the sugars found in foods.⁴ Just as with hypertension, there are myriad opportunities for the continuous, IoT-fueled monitoring of individuals with diabetes. For example, cloud-based diabetes management programs — mobile health technology combined with health coaching — can help individuals better monitor and manage their blood sugar (glucose) levels.

Another application for diabetes management is the use of implanted devices that monitor blood sugar levels throughout the day, automatically administering insulin to the individual as needed. This type of IoT-powered intervention can help in the case of a sudden, potentially life-threatening spike in blood sugar.

There are also IoT applications for diabetes management that can help individuals work with their care providers to better plan their care over time. For example, smart glucose monitors capture and send data to the individual's care management team at regular intervals. The doctor or nurse reviews this data, notes any trends or irregularities and discusses the results with the patient at their next visit.

MEDICATION ADHERENCE

For the majority of Americans, taking a prescription medication is part of everyday life. And, often, these medications can be a matter of life or death. According to the Mayo Clinic,⁵ nearly 70% of Americans take one prescription medication and over 50% take two or more prescription medications.

However, many of us aren't taking those medications correctly. About 20% of new prescriptions are never filled and, of those that are filled, a full 50% aren't taken correctly. Such non-adherence can lead to a variety of negative impacts, including hospital readmissions, increased mortality rates, increased health care costs, and suboptimal health outcomes.⁶

IoT technology could help with medication adherence with the advent of smart medication boxes, which would know when the individual runs out of a certain medication and could automatically send a refill request to the pharmacy. Such smart boxes, as well as reminders on smartphones or wearables, could also send daily notifications to individuals or their families to take their medication.

Information about medication adherence — along with other health data such as blood pressure, heart rate or blood glucose level — can be sent securely to the care management team at regular intervals. They, in turn, can monitor how well the patient is adhering to his or her treatment for the chronic condition and how well the medication is helping to keep the condition in check.



CARE TRANSITIONS

Transitioning a patient from one care setting to another — such as from an inpatient hospital setting to a rehabilitation facility — presents a unique set of challenges for health care organizations. However, the success of such transitions goes a long way in determining the patient's outcomes and recovery. With the IoT, health care providers can use PGHD to continue to support and monitor patients who have transitioned to another care setting.

Key data — such as incision status or presence of infection — are automatically gathered and sent to the provider for analysis and speedy action, when needed. Members of your care team, for example, can react more quickly to indications of post-surgical complications and reduce the chance of hospital readmissions. The benefits of IoT application for care transitions include increased care plan adherence and better recovery outcomes, as well as reduced costs, complications and hospital readmissions.

AGING IN PLACE

As baby boomers age — and older adults are living longer than ever — the demand for health care is also on a sharp ascent. Also on the rise is the demand for high quality, in-home health care.⁷ That's because many older adults want to remain in their homes as they age — what's known as "aging in place" — rather than move to an assisted living or skilled nursing facility. There's no reason that seniors who are mostly able-bodied and have no major, unmanaged health conditions can't remain in their homes. At the same time, loved ones often worry about the safety and health of their older family members who are living independently.

The IoT and smart devices have the power to ease loved ones' worries. In-home monitoring can include fall detection, medication adherence, weight, blood pressure, glucose and activity level. This information can be gathered from both active (such as a smart scale or blood pressure cuff) and passive (wearable such as Fitbit® or Apple® Watch) devices, and automatically sent to family members and/or health care providers in real-time. In the case of emergency situations — such as a fall, a dangerously high blood pressure reading, or missed medication — family members receive an alert via text message, phone call or in-app notification.

Using the IoT to deliver aging in place solutions can help increase care plan adherence and recovery outcomes, as well as decrease health care costs, complications and hospital readmissions.

Improve the health care experience

By harnessing the power of connected devices and the secure exchange of real-time PGHD, the IoT is changing the future of health care. Connected devices have the power to paint a clearer picture of health by giving insight into data about behavioral, social and environmental factors that shape an individual's health.

Whether individuals are seeking to more proactively manage chronic conditions on a daily basis, keep tabs on the well-being of an aging or disabled loved one or just stay more engaged with their care providers, IoT-connected devices and the PGHD they generate can improve the health care experience for all types of patients — and enrich those short annual check-ups with a much more personalized and action-oriented treatment or wellness plan.



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