

POPULATION HEALTH & IoT



The cost of care in the US continues to climb at around 4% annually, costing the country more than \$3 trillion in 2014, or \$9,523 per person which, at this rate will approach 20% of GDP by 2020. Healthcare providers, insurance companies, and employers will not be able to address the continuing rise in the cost of care without an increased emphasis on healthy living and access to more timely and detailed information about patient activity. Emerging population health business models and the technical capabilities made possible through wearable medical devices and the Internet of Things (IoT) are enabling innovative players in the healthcare industry to improve patient care and drive down costs by thousands of dollars per person per year. The purpose of this paper is to demonstrate why healthcare companies need to adopt IoT technologies in combination with a population health strategy to better respond to the impacts of the Affordable Care Act and changing reimbursement models.

The Challenge

The Affordable Care Act and changing healthcare reimbursement models are causing providers, insurance companies, and employers to put an increased focus on population health. If a patient has to be readmitted shortly after a procedure or takes longer than expected to recover in the hospital, the ACA mandates that the provider not be reimbursed for the extra services. Therefore, providers are focusing more on decreasing length of stay, reducing readmissions, and creating shared-risk business models. Such attempts to optimize efficiency to manage rising costs require providers to focus not only on disease treatment but also on health management. This concept of overall health management is popularly called 'Popula-

tion Health' and is defined as the health outcomes of a group of individuals, including the distribution of such outcomes within the group. Population health is shifting the healthcare industry from the transactional model in which patients are only engaged when they come in for treatment to a proactive model in which the industry is continuously in touch with the overall health of a group of people. For individuals, the impact is that the healthcare industry and the employer are taking a more active interest in their fitness and behavior outside of traditional healthcare settings to promote a healthier lifestyle thereby reducing the care needs. The big challenge now for the healthcare industry is how to find ways for the right providers to deliver the right care to patients and encourage them to make healthier lifestyles choices.

How IoT Can Facilitate Population Health

IoT is a proposed development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data. IoT is finding wide application in the healthcare industry by equipping care teams with the ability to collect and monitor patient information outside of traditional clinical settings. With patients no longer afraid of using wearables, smartphones, tablets and home monitoring systems, the ability to collect and analyze more detailed information about patient location and health status is easier than ever before. This patient generated health data can be used to provide better and more customized care to track clinicians and equipment and to improve operational efficiency thereby reducing cost. The fundamental lesson for healthcare is that IoT brings access to more timely and relevant data and that the payoff of quickly adapting

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to this continuously changing technological landscape is lower costs of care, improved population health, and healthier individual patients.

Wearables for Customized Healthcare Incentives

Every health system wants to provide the best possible service for the patients who are entrusted in its care, but none can be confident about delivering this service when its knowledge of the patient comes only from occasional office visits, medical claims that are shared months after the encounter happens, or inquires that come from patients only after they start feeling bad. With the decreasing cost and improved portability of clinical grade wearable medical devices and the increasing popularity of personal fitness devices, care providers and insurance companies now have the opportunity to improve when, where, and what treatment is delivered to patients. For example, irregular heart rate of a patient could trigger an alert to a cardiologist, who, in turn, can contact the patient through an intervention team and make recommendations immediately.

Patient generated health data can be used to provide better, more customized care.

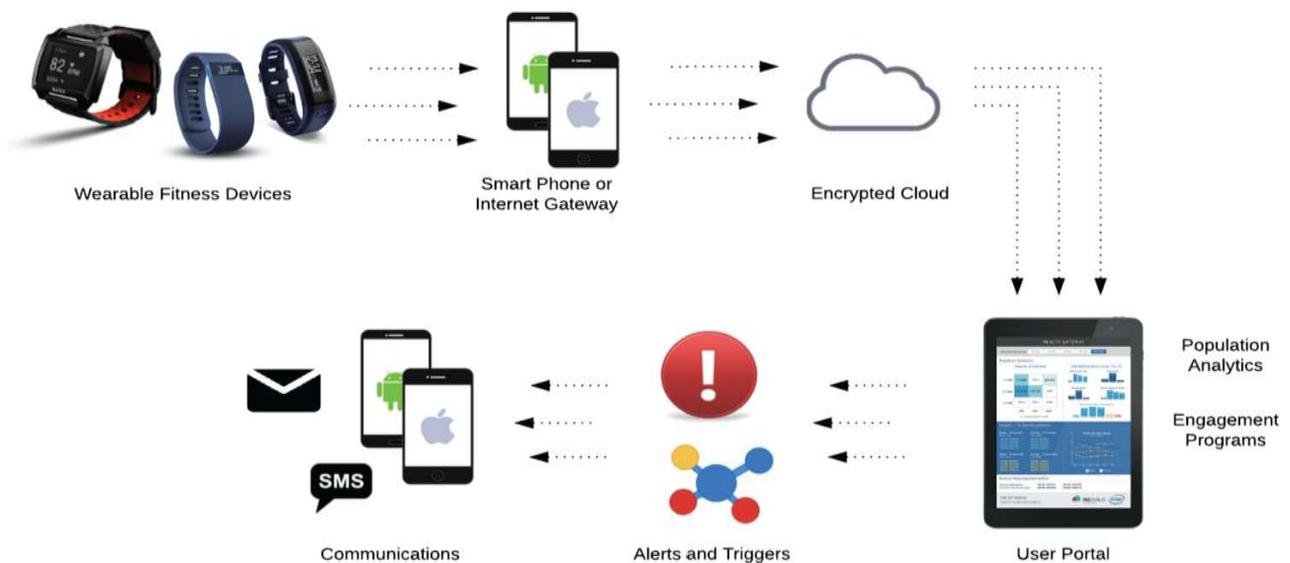
The wearable medical device market is projected to be US \$4.5 billion by 2020, and United States represents the largest market for such devices. A survey of more than 200 large employers by the National Business Group on Health found 37 percent used activity trackers in 2015 and another

37 percent planned to adopt the technology in coming years. Technological developments that allow for customization of wearable devices to suit a specific need are drivers of this demand. With the development of wearable devices like cardiovascular disease management devices, ECG monitors, and continuous glucose monitoring systems that do much more than just track steps and count calories, there will be over 80 million wearable devices within the next two years, mostly in the form of personal fitness trackers from FitBit, Apple, Garmin, and the like. With wearables making patient health data readily available, it is possible for care providers to create incentive plans that lead to better lifestyle choices and in turn to improved population health as in the following case study about a major self-insured bank.

Case Study

A self-insured bank was looking for a way to better manage its population's health in order to lower health-care costs, reduce claims, and improve quality of life. In partnership with Amitech, it implemented the Covalence health analytics platform, integrating wearable

devices and real-time analytics to help improve the wellness of patients. The platform used data collected from Intel's Basis Peak watch to generate custom lifestyle recommendations for its employees which were sent to them in the form of alerts. Each individual was able to



compare his/her current score to an expected target score and received recommendations on how to achieve the target. Using these customized recommendations allowed for better design of incentive programs and premiums. This resulted in:

- Reduced claims in just 6 weeks of implementation
- US \$15M reduction in cost of care in less than a year
- 11% improvement in amount of activity employees were getting each day
- 17% improvement in the hours slept each night

Providers need to ensure that they have a robust data management and analytics capabilities to implement IoT as a solution.

The above example illustrates one way that care providers can benefit from IoT and achieve greater population health thereby reducing insurance costs, accessing current care programs, and improving their bottom-line.

Are IoT and Wearables the Right Choice for You

IoT is changing our expectation of healthcare. It is no longer acceptable for patient data such as vital signs or information from medical devices to be even a few hours old. Anyone who is involved in making care and treatment decisions needs access to real time information on their patients. With pressing financial concerns involved in accountable care there is a need for innovative ways to incentivize a healthier lifestyle and to promote population health. Wearable devices and developments in IoT have become a vital part of the solution that care providers need in order to implement their population health programs. The growth in the global wearable devices market is driven by the need for effective management of chronic diseases and the rapid adoption of wearable devices among patients. Population Health Management, currently a \$14B industry is expected to double in size to \$31.9B by 2020. Providers need to ensure that they have a robust data management and analytics capabilities to implement IoT as a solution. Every healthcare provider must focus on acquiring data analytics capabilities to offer customized incentives for adopting a healthier lifestyle.

IoT for the healthcare industry has shown up in two very different ways.

- In formal clinical settings, medical devices are becoming smarter. Machines that monitor vitals can share and integrate subsecond readings for a more complete picture of a patient's immediate condition. Other sensors continuously monitor motion, breathing, perspiration, blood chemistry, and individual pill ingestion. Real-time location tracking systems know where every patient, each clinician, and all of the medical equipment is located at any given time. In tr-

additional clinical monitoring, sensors and machines are regularly calibrated to ensure the measurements are scientifically consistent over time and consistent across devices and vendors. In today's unregulated world of consumer fitness trackers, the methodology for measuring activity (steps, heartrate, and sleep) and interpreting that in the form of calories and stress are built by the individual manufacturers. There is currently no "Rosetta Stone" for wearables to compare that 8,043 steps a FitBit measures is the same as the 7,734 steps that a Garmin Vivofit measures.

- Outside of the clinical setting, millions of people knowingly or unknowingly are engaging in the quantified self-movement by wearing personal fitness monitors or by simply carrying their mobile phone in their pocket. New wearable healthcare devices are generating multiple megabytes of data per day per device. The Intel Basis Peak used in the previous case study for example collects and computes nearly a dozen different metrics every second all day long. That's a minimum of 100kB of data per day per person. An estimated 52 million people are being served by Accountable Care Organizations already. If equipped with personal fitness tracking devices, they would generate more than 5.2 TB of data per day. (1 TB = 1 000 000 000 000 B = 10^{12} bytes)

Clearly, innovations in smart medical and personal health devices introduces a host of data management challenges including intake and storage of vast amounts of data, integration of data from multiple devices, and security of data. Luckily, the technology required to address many data management and integration challenges is being actively developed by contributors both inside and outside the healthcare industry. The open source movement around big data technologies (primarily related to Apache Hadoop) have quickly engaged the need for managing and processing data in motion generated by IoT devices. All of the big data specialists as well as traditional, large data management vendors are beginning to support and productize streaming data technology, open source or proprietary. Hortonworks for example acquired and then open sourced Apache NiFi for the foundation for their Hortonworks Data Flow platform. For a capable and agile technologist, this abundance of choices provides many viable paths to consume and process all of the data from IoT devices. To the chagrin of some slow to adapt manager, a complete solution will end up using more than one of these technologies in most cases.

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About Amitech

Amitech is a leading healthcare data analytics and management consulting firm. We are constantly using the most innovative approaches to healthcare data and analytics to change people's lives, lower cost of care, improve quality and outcomes and provide an enhanced consumer experience. Amitech's Big Data and IoT solutions give our clients the power to capture and analyze multitudes of structured and unstructured data and turn it into actionable insights. On the Hadoop platform and with partnerships with Hortonworks and Big Cloud Analytics, we can combine clinical, financial, device and other data in a powerful analytical engine to deliver business solutions. For more information, visit www.amitechsolutions.com and connect with us on LinkedIn, Facebook and Twitter.

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