



The Impact of IoT on the Healthcare Industry

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The Internet of Things (IoT) has transformed the way we live, work, and make decisions. It has already had a profound and positive impact on many industries, including healthcare. The healthcare industry has begun to undergo a significant transformation with the impact of IoT. The forecasted value of the Internet of Healthcare Things (IoHT) is projected to exceed \$163 billion by 2020 according to a recent analysis from Accenture¹. IoT solutions offer greater efficiency and accuracy in the operation of healthcare providers—and has shown to add value in critical healthcare operations, such as patient monitoring.

This industry has basic challenges stemming from security and strict regulations. Therefore, the adoption of any IoT-based solution must address these issues. In addition, an IoT solution must address the requirements of the existing devices in operation, specifically, interoperability and connectivity. The available IoT solutions from IoT vendors, led by Lantronix, have overcome these challenges and offer the healthcare industry innovative ways to leverage IoT to cut costs and make valuable information available throughout its ecosystem. This solution brief will examine promising IoT use cases in healthcare and discuss cost reduction measures IoT can provide.

¹ Accenture. (2017). *Digital Health Accenture 2017 Internet of Health Things Survey*.

HEALTHCARE IoT USE CASES

The benefits of connected healthcare are measurable. Current IoT technologies, for example, radio frequency identification (RFID), wireless sensor networks (WSN), in-room monitoring devices and wearables, are intelligently connecting medical applications, devices and people. This connectivity enables doctors and healthcare professionals to monitor how their patients respond to treatments remotely. With more accurate and on-demand insight into a patient's health status using these smart connected devices, doctors can deliver more personalized treatments and improve their patients' quality of life. To ensure a continuous and uninterrupted improvement in patients' quality of life, three main features must be available to the IT staff:

1. Performance data – to provide the intelligence on medical equipment efficiency level. This data can significantly reduce costs and errors.
2. Remote access to medical machines and their components – enables IT managers to monitor systems and diagnose problems in real time before impacting machine availability.
3. Machine analytics – to provide optimal planning of machine downtime for maintenance, reducing overhead costs and spare parts inventories.

INCREASING ACCURACY AND REDUCING ERRORS

Wireless communication and mobile computing technologies have significantly improved the efficiency of healthcare operation. They have untethered healthcare workers from medical equipment, allowing for greater flexibility when tending to patients. This flexibility has been greatly enhanced by the integration of IoT gateways with medical devices which has reduced the need for staff to record patient data manually. Both embedded and external gateways now perform data collection and analytics services on-premises, and transmit secure encrypted information, i.e., digital records, and other relevant data, over the network to health record management applications.

Digital health records and automated data collection have significantly reduced instances of human error by simplifying documentation procedures required by hospital administration. Communication can now be done seamlessly from the medical devices themselves and directly accessed from tablet computers to alert attending nurses, doctors, supervisors and floor nurses on the status of the patients and the medical devices including any technical issues that need their immediate attention.

PROLIFERATION OF WEARABLES

New wearable devices such as wearable Electrocardiography (ECG) monitors, infant monitors and wearable pain management systems are finding their way onto hospital floors. These smart connected devices track a variety of data points to lower costs and deliver better patient outcomes. On the augmented reality front, various smart glasses such as Microsoft HoloLens® and Google Glass® have also found their way in some of the leading-edge hospitals. One AR application currently in use allows surgeons to access device settings and documentation in the operating room using gestures and can connect directly to remote specialists to resolve specific issues during surgery.



ADVANCED DISEASE MANAGEMENT

Chronic disease management is an economic challenge for the healthcare system. The Agency for Healthcare Research and Quality cited that “eighty-six percent of the nation’s \$2.7 trillion annual health care expenditures are for people with chronic health conditions².” However, these costs can be reduced because many chronic illnesses are preventable or reversible if patients are informed and empowered to act. The AHRQ also notes that more facilities are using IoT to implement chronic disease management programs that focus on lifestyle choices to avoid repeat hospitalizations. Wearable devices such as the Apple Watch play a crucial role in improving disease management and provide early warnings for specific diseases. In November of 2017, Apple partnered with the insurance giant Aetna to offer more than 500,000 Apple Watches as part of a pilot program to reduce health costs.

ENHANCED DRUG THERAPIES

The development, production, and distribution of drugs are expensive but can be minimized by IoT. Many pharmaceutical companies have taken the lead using IoT in their manufacturing facilities to reduce production costs and improve yields³.

IoT also provides the foundation to help reduce costs and increase accuracy during the research and development phase of new drugs. The potency of medications, vaccines and drug therapies are dependent on consistent handling conditions from the factory floor to ingestion by the patient. Whether capturing more accurate weights electronically from connected weighing scales, remotely pumping reagents, or logging temperature and notifying scientists of a deviation, the IoT promises to improve the quality of drug development and reduce the time to market for new cutting-edge drugs. The faster time-to-market will positively impact patients’ quality of life and, potentially, increase the pharmaceutical revenue level.

² Gerteis J, Izrael D, Deitz D, LeRoy L, Ricciardi R, Miller T, Basu J. *Multiple Chronic Conditions Chartbook*. AHRQ Publications No, Q14-0038. Rockville, MD: Agency for Healthcare Research and Quality. April 2014.

³ Mehraban, S. *The Impact of IIoT on the Manufacturing Industry*. https://www.lantronix.com/wp-content/uploads/pdf/How-IIoT-can-Impact-Manufacturing-Industry_V14.pdf



ASSET TRACKING

One of the first IoT use cases adopted in the healthcare industry is asset tracking through the supply chain. Real-time connectivity to medical devices allows for location tracking of medical equipment in hospitals – a significant expense for healthcare providers. According to Frost & Sullivan, the cost of lost and stolen equipment is between \$4,000 to \$5,000 per bed per annum while the utilization of equipment stands below 45%. IoT and location tracking applications that use the data from connected medical equipment reduce that cost significantly. Furthermore, manufacturers are now required to track individual devices from their manufacturer through the distribution chain as required by the Food and Drug Administration (FDA), for a specific type of device. The purpose of device tracking is to ensure that manufacturers of specific devices establish tracking systems that will enable them to locate devices in commercial distribution promptly. Tracking information may be used to facilitate notifications and recalls ordered by the FDA in the case of severe risks to health presented by the devices. With asset tracking capability, reduction in lost or stolen equipment is achieved, directly improving the hospital's bottom line and, indirectly, improving patients' quality of life.

DECREASING COSTS OF HEALTHCARE

The cost of healthcare services has been growing at an alarming rate. In the United States alone, national spending on healthcare has reached 17.9% of GDP in 2017 or \$10,348 per person, an increase of 4.3% in 1 year⁴. Technological advances are helping arrest and/or reduce this growth rate. For example, real-time connectivity to the existing medical devices can assist medical professionals to access patients' health status. In turn, many medical device manufacturers are adding connectivity options to their newer products. Patient monitoring can be done on a real-time basis, thus significantly cutting down on unnecessary visits by doctors. Remote patient monitoring is guaranteed to cut down on hospital stays and re-admissions rates – main contributors to rising healthcare costs.

⁴National Health Expenditure Accounts (2017). *Center for Medicare & Medicaid Services*.

Medical device manufacturers and health care providers are also looking at reducing maintenance and support costs. Device connectivity enables the manufacturer and the care provider to have access to the real-time status of the devices deployed in the field. Predictive maintenance techniques currently in use in the manufacturing sector can help determine the condition of in-service medical devices to predict when maintenance should be performed. This approach offers cost savings over routine or time-based preventive maintenance because tasks are only performed when warranted.

IS YOUR BUSINESS IoT READY?

The benefits of IoT technologies are very real, for example, optimizing medical treatments, enabling seamless and secure communication among devices, applications, and Health IT (HIT) systems. Realizing the benefits of IoT, many countries have programs in place to accelerate the investment in IoT to help curb the rising healthcare costs. Although the benefits are obvious, it can be challenging to understand how to apply these technologies to their fullest advantage. Below are a few questions to help you prepare to take advantage of IoT:

- Are the inefficiencies in your current operations? If yes, identify them.
- What type of data would help you overcome these inefficiencies?
- What are the high-value medical equipment in your hospital and how are they maintained today?
- How much is the financial impact of misplaced or lost medical equipment in your facility?
- How much manual entry is used on the daily provisioning of healthcare?
- What communication processes need to be in place to utilize the data in a meaningful way?
- Who are other stakeholders in your supply chain that can benefit from having access to your data?
- How can you integrate wired and/or wireless connectivity into your device without the cost and time of recertification?

Answering these questions can help medical companies and healthcare providers to identify the technologies to meet their immediate business needs and start taking advantage of the long-term benefits of the Internet of Things.

For additional information, please refer to our website www.lantronix.com

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