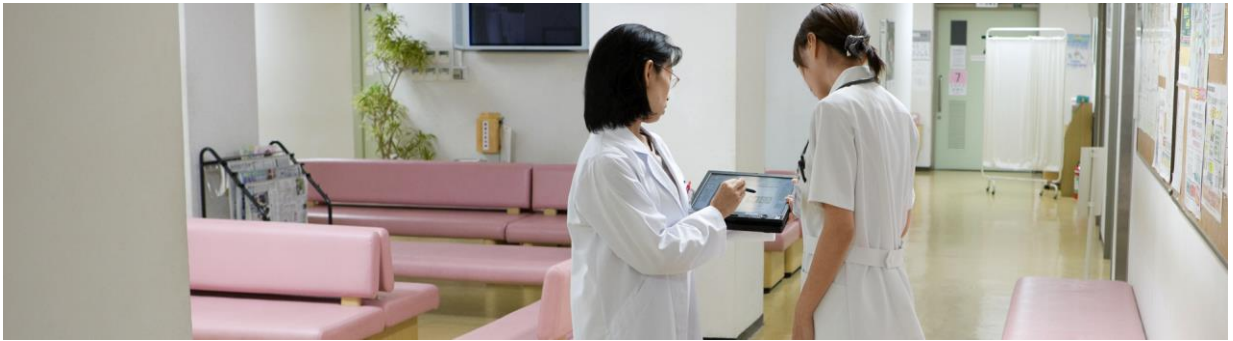# The Internet of Everything (IoE) and the Delivery of Healthcare

How Increased Connectivity Is Transforming Clinical Practice and Patient Care

A diabetic patient, under the care of a staff physician in your hospital, travels coast to coast to spend time with his family. Anxious to enjoy his grandkids, he indulges them and strays off his diet. Soon he feels faint and nearly passes out while driving back from the restaurant. Frightened, his daughter rushes him to a local emergency room. His glucose levels are erratic enough to warrant admittance. He remains overnight, expending vital hospital resources that were already stretched thin.

Now contrast this. The same patient visits his family. After a few tempting days with his grandkids, a remote glucometer alerts his physician that his sugar levels are trending high and proactive measures need to be taken immediately. The doctor then speaks to his patient and sends a text to his daughter. Using the GPS medical locator on his smart phone, he directs his patient to a nearby urgent care center, identified as the best available option. At the same time, a record of the event is automatically entered into the patient's EMR file. He is tested, treated, and sent home safely without taxing scarce hospital resources.

> Imagine having the right information, at the right place and at the right time. Data powerful enough to make critical care decisions. The Internet of Everything is making this possible.

Connectivity is transforming healthcare delivery from a process of managing disease to an optimized, pro-active system of keeping people well.

The Power of IoE and Healthcare

The challenge facing practitioners today is finding ways to save money without jeopardizing patient care. An estimated $2.8 trillion is spent annually in the U.S., nearly 20% of total GNP[1]. Administration, caregivers and workflow process is thought to account for most of this total[2].

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[1] **Health Care Costs 101: Slow Growth Persists,** Katherine B. Wilson, California Health Care Almanac, 2014.

[2] **The Price of Excess: Identifying Waste in Healthcare Spending,** Price Waterhouse Coopers Health Research Institute, April 2008.

Experts in the field conclude that inefficiencies in administration result in over 20% of unnecessary expense[3]. Waste of this magnitude is creating pressure to reduce the cost of healthcare delivery while linking financial incentives to improved patient outcomes.

Cisco maintains a prominent position within the U.S. IT healthcare market. The company's expertise is evidenced in the infrastructure business solutions it provides such as routing, switching, security and server compute space. An enormous opportunity now exists for providers to build upon this expertise. Using IoE, administrators and providers can streamline operations, redirect workflows and reduce capital outlays.

A case in point: A mid-size hospital believed it needed more operating room (OR) capacity to meet demand and generate additional revenue. By enabling location services and tagging equipment, workflow was optimized, reducing stress on the OR environment. The more efficient workflow created an opportunity to handle one more surgical patient per-week, which resulted in reaching their revenue goal without the cost of expanding their facility.

What expands with IoE is the boundaries of data reach. Consider for instance, the ability to accurately monitor a sensitive, neo-natal patient, once the infant leaves the hospital. Patient data is securely captured, transmitted and analyzed, triggering an appropriate response as needed. The rapid growth in remote sensors, devices and applications is expanding the realm of medical information and redefining the limits of care. Big Data in health care is stretching boundaries and emerging as **data without borders**.

Increased workflow efficiency - savings in time, energy and money in patient processing - empowers caregivers to shift priorities away from crisis intervention and move toward wellness and prevention. It's the ability to automate, analyze and deploy data from diverse locations that makes it possible to become more informed, more effective caregivers. IoE provides what is necessary to make that shift. The ultimate power of IoE is that it enables clinicians to exploit and optimize the use of Big Data to provide complex, pro-active, healthcare solutions.

What Makes IoE So Powerful
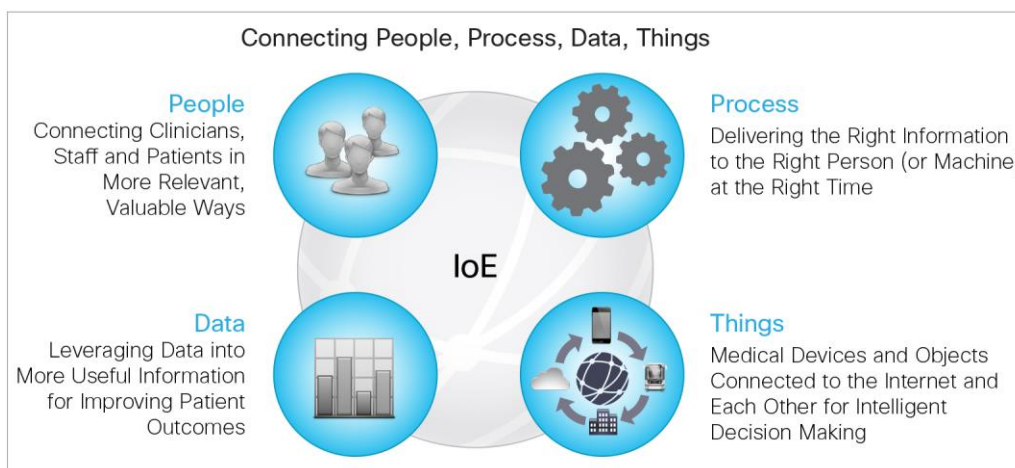
There are four basic components to IoE: People, Process, Data and Things. Increased connectivity can enhance each part of the IoE constellation, from workflow efficiencies to patient satisfaction and outcomes.

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[3] **Eliminating Waste in US Health Care,** David Berwick, MD, MPP, Andrew D. Hackbarth, MPhil, JAMA 2012.

People: The connectivity provided by IoE improves the quality of medicine for everyone involved. Patients are spared from providing repetitive data at multiple points of entry. Their hospital experience is enhanced through videos that explain more about their disease or condition, expanding their base of knowledge. Test results are more immediate. Their health history is accessible to each decision maker in their line of care, facilitating communication and collaboration. Important information is conveyed to the patient through various points of connection from wearables, tablets or smart phones. Even small things, like the ability to order food directly from the dietician, improve the patient's experience and satisfaction scores.

Process: New technology is being specifically designed to address the problem of waste in medical workflow. Testing provides a good example. Most often test results remain unread until the nurse or doctor has time to check their fax or inbox. Now information can be analyzed at the Internet edge, prioritized according to alarm level and sent directly to a care giver to take action as needed. A large number of tasks are waiting to be automated - tasks that will save time, reduce costs and improve patient outcomes.

An example of this is emergency room (ER) screening. In 2014, an estimated 136.3 million people in the U.S. called in or arrived unannounced to an ER, yet only 11.9 million were admitted[4].[*] New automated screening processes can dramatically cut the number of ER calls and visits. As patients are re-routed to more appropriate care settings, stress on the triage staff is greatly reduced. Preventing unnecessary admissions prevents waste, while it optimizes staff time for those most in need.

Data: This segment of IoE holds the greatest promise for instituting improved methods of health care delivery. By 2008, over 78% of health providers reported they were collecting electronic data, although the information tends to sit in storage unexploited[5]. A typical health care operator has multiple applications that collect and save information yet little is done to convert that data into meaningful insights for a doctor, nurse or other provider. There is also an institutional tendency to resist standardization and data sharing due to its proprietary nature and possible repercussions from HIPAA.

Working to overcome these obstacles, Cisco is making it possible to securely integrate and analyze data without compromising patient confidentiality. Information meaningful to providers can be a click away from aiding in a care decision. Consider the power of instantly comparing a patient's history with those in similar circumstances. In a moment learn what worked, what didn't. Think of it from a patient's perspective, especially if they've changed from one physician to another. Rather than wait for a patient to retrieve hard copies of X-rays or other films, imagine that they are available instantly through the Internet. Cisco's secure connections are reducing down time as they strengthen medical decision making capabilities.

Things: In the Internet of Everything (IoE) **things,** are points of connection. In the realm of medicine these range from smart phones and computers to wearables and other sophisticated medical devices. The architecture that gives intelligence to these **things** is the Cisco® Medical-Grade Network (MGN). The MGN gathers, synthesizes and produces meaningful, secure information from multiple connections. Network intelligence is created by indexing patient information, identifying problems, and alerting caregivers that corrective action is required.

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[4] **Emergency Room Visits,** Centers for Disease Control and Prevention, FastStats, 2014.

[5] **More Physicians and Hospitals Are Using EHR's,** US Dept. of Health & Human Services, Press Release, August 2014.

The Promise of IoE and Its Unique Application to the Healthcare Environment

In a typical healthcare environment the competition for bandwidth is fierce. Patients watch TV, play games on a tablet or talk and text on their cell phone. A nurse files a report on the same network while data is coming in from outside the firewall. The danger is that critical priority users and data won't get the bandwidth they need.

The MGN was created from a set of best practices and guiding principles within the healthcare space. It is built upon a set of Cisco recommended guidelines for building an optimal healthcare network. The result is an intelligent network architecture that uses application awareness, incorporates application specific security, and employs network segmentation and quality of service (QoS). Data is integrated using Cisco's middleware platform, called the Cisco Integration Platform. When data enters the network, the software platform breaks data down into stages from diagnosis to prescription, advancing intelligent medical decision-making.

Why IoE Is Important to You

Today's healthcare providers face a difficult task: trim down or face consequences. Business success is increasingly tied to patient outcomes and patient satisfaction. The message is loud and clear. There are incentives to working smart and a price to pay for resistance.

The IoE raises your medical I.Q. by providing you with the right information, at the right time and in the right place. First, it enables you to streamline your workflow. Simple things such as eliminating time spent collecting redundant patient information can significantly lower your cost of service, free staff to perform other duties and provide more quality patient/doctor time. Enhanced patient outcomes and high patient satisfaction scores like HCAHPS can increase revenue by raising your level of third party payments.

Another big promise of IoE, is it improves both business and patient outcomes. According to the IMS Institute for Healthcare Informatics, medical errors cost over $200 Billion in 2012. Increased medical IQ reduces the risk of medical mistakes. While introducing bar codes to drug labels markedly improved the dispensing of prescriptions, IoE makes it possible to go a step further. Doctors know that response to medication differs from patient to patient. Today's biometric and sensor technologies enable doctors to obtain immediate feedback on a drug's efficacy. Rather than wait two weeks to observe a patient's response, instant action can be taken. Smart pills alert physicians if an Alzheimer's patient fails to take a scheduled dose. Blood pressure cuffs alert doctors and patients if adjustments need to be made.

Many procedures benefit from the intelligence provided by Big Data resulting in lower error levels and better patient care. Most important, IoE gives caregivers the information they need to transform healthcare delivery from a "disease-centric" discipline, to a system focused on promoting and maintaining wellness.

Why Now?

The confluence of Big Data and small medical devices is rapidly transforming the world of medicine. The proliferation of sensors - from Apple watches and Fitbit wrist bands to home glucometers and blood pressure cuffs - give consumers instant access to personal measures of well being. Instant information changes expectations and redefines what's possible. Traditional boundaries in care and delivery are disappearing. As IoE transforms healthcare, providers must innovate in order to remain competitive.

Why Cisco?

From the genesis of the Internet, Cisco has successfully navigated through massive industry change, moving from wired to wireless, from wireless to BYOD anywhere, and now to IoE. Our technology securely captures, segments, transmits and analyzes data for healthcare providers. We take disparate bits and bytes and turn them into useful intelligence. What's more, we make actionable data possible, actions that result in optimal choices and creative healthcare solutions.

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