A Guide to Healthcare IoT Possibilities and Obstacles

In this e-guide

In this e-guide:

Patients and providers both stand to benefit from the Internet of Things (IoT) in healthcare, whether they're using mobile medical applications or wearable devices to capture health data, or keeping tabs on the location of medical devices, personnel and patients.

There are a few known enemies to the expansion of IoT in healthcare, however. There's the danger of overloading physicians with too much data, security policies that can't keep up with the BYOD and mHealth era, and more.

In this e-guide, you'll uncover some IoT use cases in the healthcare industry, common challenges many organizations are facing, and what's coming soon for healthcare IoT.

▚ Section 1: Examples of Healthcare IoT

IoT can be used to supplement patient treatment through remote monitoring and communication, and to keep track of patients as they move through a healthcare facility. Read on to discover the specifics of these IoT deployments.

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What's the potential of pairing data analytics and IoT in healthcare?

Kristen Lee, News writer – SearchHealthIT

In this Ask the Expert, Rasu Shrestha, M.D., talks about the role of data analytics and the Internet of Things (IoT) in healthcare. Shrestha is chief innovation officer at the University of Pittsburgh Medical Center (UPMC) and is president of the UPMC Technology Development Center. He drives UPMC's innovation strategy and works to transform the organization into a more patient-focused and economically sustainable system. Here is what Shrestha had to say about the potential capabilities that could result from a partnership between data analytics and IoT in healthcare.

We want all of these intelligent insights provided to us at the right level of actionable information at the point of care. So we need to bring it back to where it's relevant, whether it's [for] the consumers or the patients or for clinicians. And when you look at the promise of the Internet of Things and everything that we're making progress [with] in terms of analytics, it brings to us a whole bunch of other capabilities and solutions that we are only dreaming about today.

One of the big things that we struggle with quite a bit in healthcare today is downtime. We've got all of these machines, so to speak, all of these systems that we're dependent on, and machines tend to break down. Machines tend to have a need to be taken offline for patches and for upgrades. One of the

things that would be very promising for us in healthcare is to have not just one machine that we depend on [but] a network [of machines] that we depend on ... These devices are connected to a secure cloud, are connected to a secure network of this Internet of connected Things, would monitor the health of the network at large, would monitor the health of themselves -- they'd be self-healing technologies. There'd be technologies that alert us of systems that are in danger of failing, or specific machines or devices that are in danger of failing, and that way ... we have this connected network of an intelligent healthcare system that is essentially never down. So this is a vision that I think would actually be possible, if we were to push analytics and the reality of Internet of Things forward in the right direction.

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Emerging IoT technologies in healthcare

Kristen Lee, News writer – SearchHealthIT

SearchHealthIT visited Stanley Healthcare's Experience Center in Waltham, Mass., which has simulated hospital rooms -- such as the emergency department, post-anesthesia care unit (PACU) and medical-surgical intensive care unit -- for the company to demonstrate its Internet of Things (IoT) offerings.

In this video, Joel Cook, senior healthcare solutions director at Stanley Healthcare, described the ways in which many of Stanley's customers use IoT in healthcare. For example, hospitals take advantage of the technology for real-time location services with badges that can track patients, staff and medical devices. "Many of our customers are using this equipment for asset management," Cook said. Such assets include infusion pumps, wheelchairs, defibrillators, scales and other items that employees tend to tuck into out-of-sight corners yet are needed frequently for treating patients.

Another area in which many of Stanley's customers look to IoT in healthcare is patient flow.

With Internet of Things devices, clinicians "in the PACU ... can see what's going on in the ORs, where they are in the case, and can therefore interpret when people are going to arrive in PACU," Cook explained. "And likewise, people up on the med-surg floor can see what's going on in PACU" and prepare for new patient arrivals.

In addition to real-time location services, Stanley's IoT devices also help with environmental monitoring -- for example, checking the temperatures of refrigerators or IT closets -- and hand hygiene compliance.

In North America, the lack of hand hygiene in hospitals has been a longtime problem. Cook said that about 100,000 people die from hospital- or healthcare-related infections in North America every year. Greater hand hygiene can help decrease hospital-acquired illnesses.

As hospitals struggle to lower operating costs and remain competitive, IoT in healthcare may offer a way to tighten budgets and improve a patient's journey through a medical facility. "[Hospitals] have to have better patient experiences, better outcomes for those patients," Cook said. "They have to manage populations of people, and they have to do that as efficiently and effectively as possible."

Watch video now.

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Section 2: Healthcare IoT Challenges

The progression of healthcare IoT, or the Internet of Medical Things, is not without its challenges. Some physicians and health IT departments are still adjusting to using and securing mobile devices during work. Could IoT-derived data be too much for them to handle?

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🔖 New healthcare IoT ideas on the rise

Shaun Sutner, News and Features Writer – SearchHealthIT

Download this podcast.

At Boston's Brigham & Women's Hospital, clinicians in a recent pilot used tablets enabled with near field communication (NFC) and a new mobile app to replace cumbersome and expensive medication bar code-reading carts at patients' bedsides.

Stephen Miles, a research affiliate at the Auto-ID Labs and Center for Biomedical Innovation at the Massachusetts Institute of Technology (MIT), was part of the project.

In this podcast, Miles, an Internet of Things (IoT) expert, says new healthcare IoT applications are becoming increasingly affordable and easy to use because of the high frequency NFC radio frequency identification mini-chips in many new smartphones and tablets.

However, Miles says the "Internet of Medical Things" hasn't truly arrived because medical device vendors haven't agreed on common communication protocols, among other reasons. Hospitals often use devices from many different manufacturers, each with its own proprietary standards, he points out.

Another impediment is the lack of a national patient identifier system, Miles says. A national patient ID would help identify patients and the devices and medications they use, just as the Internet identifies users by their computing devices' IP addresses, he says.

And security remains a major problem in adapting IoT to medical settings, Miles says. One thorny issue, for example, is how to track the transport of narcotic-based medications so workers doing the bar code scanning don't know the precise content of the package.

But Miles says the U.S. Department of Health and Human Services' meaningful use program and the value-based care approach it spawned have in turn spurred healthcare IoT by dramatically expanding the quantity and scope of digitized health data to be analyzed and tracked.

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⚑ Hype and uncertainty surround IoT in healthcare

Reda Chouffani, Co-founder – Biz Technology Solutions

The role of the Internet of Things (IoT) in healthcare has grown to the point where it was the subject of educational sessions at the health IT industry's mega-conference, HIMSS 2015. The varied applications of IoT in healthcare involve the use of popular technology topics such as big data, cloud, predictive analytics and machine learning. But those subjects cover only part of how the Internet of Things can be deployed; it holds the potential to enrich the healthcare industry and other vertical markets.

Where the IoT trend is heading and how organizations can prepare for, evaluate and apply it in healthcare are issues that have yet to be settled. Health IT departments are under enough pressure without adding the unknown ramifications of deploying a new technology such as IoT without first defining a business strategy.

Technology has been a valuable tool for physicians, allowing them to manage patient data, access it from their mobile devices and share it with care teams. The introduction of mobile technology such as smartphones, tablets and wearable devices has provided both patients and providers with new tools to access during and after a care episode.

Cost-effective Internet of Things devices

There has been a recent push in healthcare for small, low-maintenance, cost-effective devices to collect health data. The Raspberry Pi 2, MinnowBoard MAX and Galileo are development boards that can be added to devices to allow them to connect to sensors and capture information, crunch data with processors and then transmit that data to a number of destinations, including cloud-based data repositories.

Many available IoT devices run on free operating systems. This open architecture encourages innovation and creativity among developers and opens the door for those on tight budgets to find a product that fits their needs at an acceptable price. Microsoft recently put its support behind this trend by introducing Windows 10 IoT Core, which offers developers a kernel through which they can innovate and alter IoT-enabled devices.

IoT in healthcare accessories under development

A number of accessories have already been developed for IoT in healthcare. The e-Health Sensor Shield tech kit, made by Cooking Hacks, offers software to support capture of vital data such as pulse, oxygen in the blood, body temperature, airflow, galvanic skin response and blood pressure. The kit, compatible with several IoT devices, is an example of the value of IoT in healthcare.

Healthcare IT executives are aware that IoT can be used to collect data useful to clinicians. Having the option to send patients home with a small device to monitor their conditions and recovery is likely to be widely adopted and funded by either hospitals or payers. But the use of IoT in healthcare is not limited to capturing patient data; it also offers hospital IT departments opportunities to gain insights to other areas in the hospital.

IoT's future depends on maximizing benefits

Several hospitals have already adopted some form of IoT to track the location of assets, as well as collect other data elements such as temperature in areas where it is critical to stay in a certain temperature range.

Some technology analysts, however, consider IoT a disruptive technology and are concerned with its level of data security and its ability to meet healthcare compliance requirements, such as those regulated by the FDA. The future of IoT in healthcare may hinge on resolving those concerns and maximizing IoT's core benefits, such as immediacy, transparency and price point.

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Can we expect the Internet of Things in healthcare?

Reda Chouffani, Co-founder – Biz Technology Solutions

The Internet of Things is not new, but has been gaining more attention and traction lately. The concept of the Internet of Things entails the use of electronic devices that capture or monitor data and are connected to a private or public cloud, enabling them to automatically trigger certain events. One such use case is that of garage-door openers that initiate when the owner's car is nearby or a when the owner sends a command from a mobile device.

The demand for connected devices spans multiple industries including the energy, automotive and consumer spaces. For each of them, the need for devices that can report or react to certain things provides a new level of convenience, efficiency and automation. Healthcare practitioners are closely watching the development of this trend to see if the Internet of Things will be a part of their future.

Electronic devices have been used to schedule maintenance for cars, or report any trouble areas to a mechanic so they can be addressed. Smart devices can also be used at home, where smart thermostats can collect data about the homeowners' schedule and temperature preference, and adjust it accordingly.

Internet-connected devices have been introduced to patients in various forms. Whether data comes from fetal monitors, electrocardiograms, temperature monitors or blood glucose levels, tracking health information is vital for some patients. Many of these measures require follow-up interaction with a healthcare professional. This creates an opening for smarter devices to deliver more valuable data, lessening the need for direct patient-physician interaction.

Some hospitals have begun implementing "smart beds" that can detect when they are occupied and when a patient is attempting to get up. It can also adjust itself to ensure appropriate pressure and support is applied to the patient without the manual interaction of nurses. Another area where smart technology could be an asset is coupled with home medication dispensers to automatically upload data to the cloud when medication isn't taken or any other indicators for which the care team should be alerted.

Internet of Things technology implementations will likely raise concerns around data privacy and security. While most of today's devices use secure methods to communication information to the cloud, they could still be vulnerable to hackers. The U.S. Food and Drug Administration offers guidelines for medical devices, and regulators will likely continue to regulate connected devices used by patients. While we have yet to see a huge number of adopters of the Internet of Things in healthcare, its popularity is undeniably on the rise in other industries.

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Barriers to conquer before IoT in healthcare helps Mrs. Smith

Kristen Lee, News writer – SearchHealthIT

One aspect of the Internet of Things (IoT) that hasn't gotten a lot of public attention is how this network of devices might someday have a positive effect on hospital workflows.

Rasu Shrestha, M.D. -- chief innovation officer at the University of Pittsburgh Medical Center (UPMC) -- foresees the day when Mrs. Smith, the patient currently in Room A-20, might be the ultimate recipient of IoT in healthcare.

For clinicians, Shrestha said, there's a need to devise more intelligent ways to aggregate data across all patient devices, assimilate it and make the data available to everyone within the workflow of the care of that patient.

"So we might be interacting with our clinical information systems, we might be rounding on our patients, [or] we might actually be seeing Mrs. Smith, whose data I actually have access to," Shrestha said. "So how do I get an intelligent, condensed view of all of the activities that Mrs. Smith has been going through over the last six months to a year? Then, for Mrs. Smith, how do we make sure that we're able to integrate some of the capabilities of these devices into the things that she does on a day-to-day basis?"

For example, if Mrs. Smith needs to communicate with her care provider concerning a certain event -- maybe one of her sensors started beeping

while she was at home because it crossed a threshold set up ahead of time -- that could be an opportunity to send an alert to a provider, which could then trigger a phone call and an interaction between Mrs. Smith and her caregivers.

"Managing the workflow intelligently around all of the devices that are part of the Internet of Things, I think that's something that needs to be thought through a lot more thoroughly than where things are now," Shrestha said.

Poor data accuracy defies IoT in healthcare

From Shrestha's seat, workflow is one of many challenges ahead before healthcare IoT can be fully realized.

Poor data management is one of those obstacles.

"Today [there] isn't really that much of a standard around how data is being captured, and the accuracy of the information ... may not be as accurate as we might hope for it to be."

Furthermore, lack of interoperability only adds more barriers to capturing data and making sure information is accurate. With dozens, if not hundreds, of different device manufacturers -- all of which may have different standards and communication capabilities -- it is a challenge ensuring that these devices can "talk to each other," Shrestha said. And it's not only a matter of simply talking to each other, but also sending "the right messages in the way that the smart grids and the networks that we're trying to create

would actually understand and have that level of interoperability," Shrestha said.

He added that it's up to organizations to step up and take charge when it comes to data management and interoperability between multiple devices. Healthcare IT professionals need to work to create the right level of communication protocols among the disparate services that exist out in the marketplace -- not just within clinical information systems, but across all types of devices and equipment -- in order for IoT in healthcare to become more widespread, Shrestha said.

IoT adds to hospital network risks

Privacy and security challenges also exist when it comes to IoT in healthcare. Shrestha explained that within healthcare organizations there are already many different devices on the same network.

IoT will add an extra layer of complications because "you're also dealing with networks that are well outside of the secure networks that we typically have created in our healthcare facilities," he said, such as having a medical device connected to home networks, public Wi-Fi, or cellular signals, and feeding information back to a hospital's network. All of those outlying networks "may not be as protected as we need for it to be in healthcare," Shrestha said.

"There has to be deeper levels of security parameters that we put in place -- deeper levels of audit trails and other types of security, envelopes, a mesh of security," he added.

🔖 FDA and UL weigh in on security of medical devices, IoT

Shaun Sutner, News and Features Writer – SearchHealthIT

As IoT increasingly moves into healthcare, and data from wearable health devices flows more from consumers' wrists to physicians' charts, the Food and Drug Administration (FDA) is trying to keep pace with the fast-evolving technologies.

Meanwhile, a well-known private organization interested in the safety and security of medical devices has stepped up its efforts in these arenas.

UL watching IoT developments

Underwriters Laboratories (UL), the more-than-century-old industrial and electronics testing company firm, is one of several companies approved to perform safety testing by the U.S. Occupational Safety and Health Administration.

In interviews with SearchHealthIT, Anura Fernando, UL's principal engineer for medical software and systems interoperability, said the FDA's recent moves in the areas of IoT and wearable devices -- as expressed in its non-binding but widely disseminated guidance documents -- have been influential. However, Fernando noted that with the playing field of the new

technologies so vast and unsettled, it's sometimes hard for the agency to keep up.

"They're really in a tough spot," said Fernando, who has served on the FDA Medical Device Interoperability Council. "It's very challenging in this rapidly moving market. They have to balance safety and effectiveness and innovation. It seems clear-cut but sometimes it's not. It's truly a tough balance."

One recent political development has the potential to further alter the health IT landscape. The House of Representatives has approved the so-called 21st Century Cures bill, which would boost FDA funding and ease regulatory hurdles for more advanced medical devices, a prospect that has alarmed safety advocates but pleased vendors.

FDA guidance suggests cybersecurity steps

In the meantime, the FDA has deregulated consumer wellness devices through several guidance statements over the last two years. The agency's policy essentially says that the devices are low risk and do not need FDA approval unless they make specific medical claims.

The agency has also assumed a loose oversight toward most consumer mobile medical apps, as it said it would not enforce stricter standards but reserved discretion to do so if needed.

At the same time, amid growing worries about the security of medical devices and IoT, the FDA last year issued a cybersecurity guidance that details best practices for their management. The cybersecurity policy sets forth basic security standards, such as multifactor authentication, limiting user access, strengthened passwords, layered authorization and breach detection procedures.

While some in law enforcement and health IT think IoT cybersecurity is a big and growing problem in healthcare, Fernando said not only is the FDA guidance on cybersecurity clear, but most reputable providers are following best practices for the security of medical devices.

FDA official outlines health IT policies

In a statement provided to SearchHealthIT, Bakul Patel, associate director for digital health at the FDA's Center for Devices and Radiological Health, said the agency wants to stimulate innovation in health IT, mobile health, general wellness, interoperability and cybersecurity, while also protecting patient safety.

IoT cybersecurity can help protect data collected and disseminated by devices. It can also preserve accurate functioning of devices to ensure they perform reliably, because cyberattacks can damage devices, Fernando and others have noted.

"At the FDA, we are excited that this convergence of medical devices, connectivity and information that encourages patient engagement also

holds the potential to provide enhanced care to patients," Patel said. "Our priorities are to continually understand the benefits of such technologies and provide clarity that will facilitate innovation that is in the best interest of public health."

The FDA is collaborating with the Federal Communications Commission and the Office of the National Coordinator for Health Information Technology. Last year, the agencies released a joint health IT report about the risks involved with medical devices and apps.

The report articulates a "risk-based" approach premised on the idea that the risk and corresponding regulation of medical devices and apps should be based on their health IT functionality, not the platforms they reside on; in other words, the agencies formally recognized the legitimacy of devices as platforms for the delivery of digital healthcare.

More to come with clinical decision support software

Some of the guidance documents issued in late 2014 and this year were contained in the FDA's fiscal 2015 "roadmap."

One key topic listed in the roadmap on which the FDA has not yet spoken is medical-device-related clinical decision support software, a growing sector related to IoT that boosts the role of connected devices by tying their use more directly to clinical decisions, Fernando noted.

Fernando said the FDA has already done much work in establishing universal device identifiers for medical devices in IoT applications, but said he expects further clarification.

A welcome next step, Fernando said, would be some kind of tagging of the metadata generated by connected devices that would allow data to be closely tracked as it travels between devices or between devices and networks.

"Doctors are starting to ask, 'Can I trust this data and is this data really from my patient?'" he said.

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🚩 **Section 3: What's Next for Healthcare IoT**

Connected medical devices and applications are already part of the Internet of Medical Things, but how much they will integrate into patient care and other aspects of healthcare remains to be seen. This guide section dives into how IoT can be used to collect patients' biometric data and monitor them after they've been discharged from a hospital. Keep reading to see what other possibilities could be realized through healthcare IoT.

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▐ Analysis of mobile health apps, BYOD security

Shaun Sutner and Kristen Lee, SearchHealthIT

Download this podcast.

Just as other industries have, healthcare has embraced mobility enthusiastically.

Citing a Food and Drug Administration (FDA) report, the American Medical Association in a release this week noted that about 500 million smartphone users around the world will be using a mobile medical app this year. That number is expected to spike to 1.7 billion smartphone and tablet users by 2018.

Along with the explosive growth in mobile technology comes extensive concerns about the security of bring your own device practices, mobile health apps and even wearable health devices and connected medical devices that are part of the Internet of Things.

In this podcast, SearchHealthIT writers Shaun Sutner and Kristen Lee talk about their research into mobile health IT security, which is the focus of the upcoming issue of *Pulse*, SearchHealthIT's digital magazine.

A major issue Sutner discusses in his *Pulse* story is the lack of security of many of mobile apps, a worry explored in-depth by a recent Ponemon Institute study.

Providers have countered security vulnerabilities in mobile health apps by testing apps themselves, setting up in-house "app stores" and using containerization technology to wall off their apps from users' other apps on devices.

As Lee reports, while the mood among healthcare CIOs and CISOs is grim when it comes to mobile security, data integrity on tablets and smartphones is only a facet of larger worries about the security of healthcare data networks.

Also, such security concerns are not deterring providers from moving into the world of mobility because mHealth has so many demonstrable benefits, including patient engagement, telemedicine and value-based care.

Meanwhile, Sutner says in the podcast that the simultaneous proliferation of wearable health technology, from consumer fitness trackers and smartwatches to more sophisticated, FDA-approved Class II devices, is raising its own security and privacy issues.

As for telemedicine, Lee reports that state regulators in Texas recently bucked the trend of states giving reimbursement parity to telemedicine by making it harder for doctors to prescribe drugs remotely and for patients in Texas to receive remotely prescribed medications.

🔖 Healthcare IoT, Epic-Cerner battle focus of HIT Squad

Kristen Lee and Shaun Sutner, SearchHealthIT

Download this podcast.

Rasu Shrestha, M.D., chief innovation officer at University of Pittsburgh Medical Center, is a leading thinker about cutting edge health IT tools and systems.

One of the not-too-far-off scenarios Shrestha envisions is healthcare systems with networks of connected medical devices that, in essence, take care of themselves by alerting the network when they're not operating optimally.

The device networks, part of healthcare IoT, would be coupled with sophisticated analytics and hooked up to the cloud, Shrestha told SearchHealthIT reporter Kristen Lee.

Lee and SearchHealthIT reporter Shaun Sutner are SearchHealthIT's "HIT Squad."

In this podcast, Lee and Sutner talked about Shrestha's healthcare IoT ideas, how one Florida healthcare provider is using revenue cycle management software, and what CMS' updated meaningful use attestation numbers say about the battle for supremacy in the EHR market.

Not surprisingly, the attestation numbers from the one-million-line CMS database show that Epic Systems Corp. is the dominant EHR vendor in both the inpatient and ambulatory markets, Sutner said in the podcast.

However, Cerner Corp. is relatively close behind, and, in fact, is ahead of Epic in combined stage 1 and stage 2 attestations. Epic is number one in the more difficult stage 2 category, though, and Epic is tops in more than twice the number of states than Cerner.

In the meantime, a relatively small vendor, eClinicalWorks, is the top vendor that focuses nearly exclusively on small physician practices as opposed to larger practices and hospitals.

SearchHealthIT editorial assistant Corlyn Vorhees crunched the CMS data from a database that contains the attestation efforts of 748 vendors.

As for Lee, she also talked about how Orlando Health, a Florida healthcare system, said it is saving money by attaining greater accuracy in billing and being able to write off more bad debts using a revenue cycle management system from VisiQuate, Inc.

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When it comes to healthcare big data the risk is worth it

Kristen Lee, News writer – SearchHealthIT

Big data in healthcare will open up vast amounts of data to healthcare organizations and providers, allowing them to get a deeper look into the data, extract valuable insights and ultimately enable them to improve patient care. At the same time, opening up that data can possibly create more vulnerabilities that hackers can take advantage of, said Joel Vengco, vice president and chief information officer at Baystate Health in Springfield, Mass. In this Q&A, Vengco discusses the potential security issues healthcare big data brings to the table, what can be done and whether it's all worth it.

What's the potential of IoT and healthcare big data? What are the concerns?

Joel Vengco: There's a lot of value to having that data exchanged more liberally but then it's a double-edged sword ... A lot of things stem off of big data as we discussed -- privacy and particularly security -- and as we start to really go down this path of true big data and Internet of Things, security, particularly cybersecurity and information security, become cornerstones of any IT organization. And so in the past we've had security teams and we've had structures in place that we rely on to ensure that we're compliant with HITRUST [Alliance] standards or HIPAA standards, but now that we're really creating more gateways and more access to this data, I think we're going to

find information security [and] cybersecurity to be really the focus of IT outside of the applications that we service on a day-to-day basis. And that's going to be a big challenge because as you know, healthcare data on the black market is worth much, much more now than even credit information. So that kind of accessibility of the data that we're providing today is really going to push more of us to focus on how to create strategies for information cybersecurity going forward.

So opening up the data is good for people within healthcare but it also means you're making yourself vulnerable to attackers?

Vengco: Exactly. Exactly right.

That's a tough place to be.

Vengco: It is a tough place to be ... I certainly hate to say it as a CIO, but that's what keeps me up at night. And when you think about these big companies like Sony and Home Depot and Target and even large insurers who, let's just say, have bigger IT budgets and yet they can't seem to stop some of these attacks, it's pretty scary for a lot of health systems, you know?

What do you think healthcare organizations can do in order to better protect themselves? Is it about constant vigilance? Is it about developing better security tools?

Vengco: It's a little bit of a lot of those things. A lot of these infiltrations happen because your employees internally aren't being as careful as they should be and you're not training them well enough, perhaps. It's not

necessarily just their fault. It's a team game, this is like a team effort. So you have to make sure that they're well trained but that they're also vigilant on their own. Because as soon as they put an app [out there] that has a gap in it or a hole in it, and that's what the bot was waiting for or that's what the hacker was waiting for, now they're in with one user and they can sort of crawl through everything else. That's what happened at Sony, really. They actually accessed one user or a couple users and it proceeded from there. That's really the Trojan horse issue. How do you stop someone from coming in through another gateway even if it's not a front end? Maybe somebody clicked on a link through an email that they thought came through an internal division and all of sudden folks are in. So that's a part of it. And, of course, security tools are huge too. The maturity of those is continuing to evolve, and healthcare is certainly behind in terms of those tools that they've either purchased or implemented ... We need to continue to strengthen our security posture. So policy, technology and the people are really important in fighting against that kind of cybersecurity issue.

Do you think the benefits of healthcare big data outweigh the privacy and security concerns and risks?

Vengco: I think they do ... When we think about the different things we can discover with the availability of big data, it's limitless. I think healthcare struggles still today with having access to that kind of data and it struggles with true discovery of perhaps new ways to treat patients, of new processes or methods to keep patients well because we don't have all of that empirical data in a single place. We've got pockets of it and we've got sample data, and that's good, but I think when you have petabytes and petabytes of data, that really significantly changes the game of medicine and the way we care

for people. So I do think there's a lot of benefit there. It's still scary nonetheless.

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⚑ Tech futurist talks Apple Watch, IoT in healthcare

Shaun Sutner, News and Features Writer – SearchHealthIT

Frank Palermo is senior vice president of digital at global IT consulting firm Virtusa Corporation. With a background as an IBM software engineer and experience in tech research and development, Palermo is interested in Apple Watch and Internet of Things (IoT) applications in healthcare. He talks with SearchHealthIT about the future of Apple Watch in healthcare, which he thinks is robust; improving the patient experience through using IoT in healthcare; and the benefits and dangers of sharing data generated by wearable health technology devices.

How can hospitals use Apple Watch or IoT in healthcare?

Frank Palermo: If you look broadly at mobile and [IoT] in the provider side of healthcare, they really have made progress in recent years, whether it be equipment tracking through RFID [radio frequency identification] tagging, whether it be using tablets from a patient care perspective -- many medical questionnaires are now on tablets. All of your medical records can be digitally accessed and your vitals are going in, so the whole foundation has been set... [I think of] the watch as a very sophisticated monitoring device for patients both during the in-hospital episode of care and after.

It's the whole recording of biometrics, and how quickly those biometrics can be integrated. The whole outpatient side of it is where it really gets interesting, with medication adherence. Most post-care follow-up is not really compliant. So the patient leaves the hospital: Are they doing what they're supposed to be doing? The device can be used as a way to either remind, schedule or track. What are the things that have to be done in care episodes, from taking medication to maybe doing the right number of PT [physical therapy] exercises, and follow-up appointments? There's a whole set of care management possibilities.

Why Apple Watch as opposed to other smartwatches? Is it just because so many doctors are in the Apple ecosystem?

Palermo: Why Apple is generally successful is because Apple just doesn't release devices. They release platforms and ecosystems, so they provide a lot of what's needed, whether it is [Apple] HealthKit or integration with other wearables. App providers are already thinking about [Apple] Watch apps. So they kind of create this end-to-end capability that I think really streamlines adoption. And the way they design interfaces and represent the information in these various form factors is effective. So whether you're using Glances or other features of the watch -- it's a little bit of a training period -- once you start to get used to it, it sort of becomes a way of life and an expectation. Go back to the original wheel on the iPod. When we first had that control, I don't think anybody quite knew how to use it or what the heck it was, but it rapidly became one of the best paradigms. It was almost like the old RIM [Blackberry] trackball for email. It's these new paradigms. Apple really has a knack for designing into the product things that make them desirable, and that desirability drives adoption.

Apple Watch already has health apps. Athenahealth has one. Vocera has one for clinical communications. Dexcom has a blood glucose monitoring app. Even Cerner has an Apple Watch app. So that's just right out of the gate. With health-and-fitness-tracking wearables already popular in the consumer market and on Apple Watch, what about more technical FDA-approved Class II medical wearables? How prevalent will wearables and IoT in healthcare be in five or 10 years?

Palermo: It just gets down to practicality and affordability and the cost side of it. I'm sure they'll come out with some lower cost models around the watch, but the price point is still going to be pretty high. Thinking about wearables, some of the Class II devices, whether it be a Phillips Healthcare digital diagnostic-type of device, or Phillips Lifeline-type devices, I think the price points of those devices are going to be pretty compelling. So I don't think they go away. What happens is maybe the watch begins to interoperate with them, or maybe there's a set of things that these Class II devices are doing that can integrate into the broader watch applications.

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In this e-guide

Healthcare IoT, Apple Watch ready to change patient care

Shaun Sutner, News and Features Writer – SearchHealthIT

In part two of a two-part Q&A, Frank Palermo, senior vice president, digital, for IT consulting firm Virtusa Corporation, talks about using Internet of Things (IoT) to improve patient satisfaction in the "hospital of the future." Palermo also discusses security vulnerabilities of healthcare IoT, as well as the healthcare benefits and privacy and security hazards of the Apple Watch.

So before we talk about the hospital of the future, how is the Internet of Things changing healthcare?

Frank Palermo: We've talked a little about the monitoring of health, whether it's [Apple] Watch or Jawbone or Fitbit, that whole idea that I can now collect your individual biometric data, that's kind of the first wave.

Now, taking regulatory and compliance stuff out of the way, you're beginning to share that data. Then, whether you're a payer or provider, you're basically sending that information on a real-time basis. Can it start to move care to more preventative care, so people are now looking at your health metrics on a periodic, real-time basis? Can the watch at some point be doing real-time EKGs and look at heart patterns and be able to predict a stroke or a heart attack before it happens and basically send you alerts, saying basically, 'I'd like you to step into the clinic?'

But there's an ugly side of that, too, which comes down to security and would people use that as a way to categorize you and decide how much they charge you and assign you to a higher risk pool and begin to base premiums on this? All this stuff has to be balanced.

How do you address security-related vulnerabilities in IoT healthcare applications? Also, how do you deal with the lack of a single IoT standard in healthcare?

Palermo: Security is obviously the big topic. Hardware devices, whether it's [Apple] Watch or something else, have to have security protocols built in, just as there's firewall and virus protections built around computers and networks. This same kind of diligence has to be done at the wearable device layer. How do you make ... a thermostat, a watch or a wearable have some kind of physical protection and isolation capabilities?

Security and protocols have to get standardized and evolved, whether that's encryption or other mechanisms for the transmission of data. Ultimately, this comes down to policy and governance and education, making sure people understand how their data is being used, when it's being used, and being able to have fine-grain access to data. How do you turn off data sharing, and ultimately, what is the chain of custody of that data? Who owns that data?

Will the hospital of the future be built from the ground up, with smart beds, smart doors, smart rooms, smart everything?

Palermo: Like anything, if you're building the store of the future or the bank branch of the future, if you're building it from ground up you have a lot more

flexibility, but at the end of the day, what's paramount is the patient experience side of it.

Even though a lot of progress has been made with devices in healthcare, I still think the whole front end of that process is still pretty elongated around the administration side. How do you get registered when you walk into a hospital? That should be a lot more streamlined. Today, most of the experience in a hospital is still around the administrative side and not so much around the patient side. It's all about waiting and going through registration. If you were to measure the cycle time, even for an ER visit, the least amount of time is probably spent seeing a doctor. There's a tremendous opportunity to just redesign that whole process flow and take advantage of connected information and make it more about the patient.

Are you thinking healthcare IoT applications like RFID [radio frequency identification] tagging of patients and family members to improve information about wait times, for registration, for surgery start and exit times?

Palermo: Those are some of the things I'm alluding to, but even more interesting is if I were to come in and be presented with a 'care kiosk' where I start to enter my symptoms. They already have access to my patient record. So I click the hospital app on my mobile phone when I'm on my way to the emergency room, [and the hospital app] knows who I am and what I'm coming in for.

Now you walk up to the kiosk and there's a QR [quick response] code on your mobile device. The kiosk is not asking you who your insurance is. It's

there to help the care process. It's saying: 'Describe to me a little more about the symptoms that led up to this episode,' to help diagnose. 'How long has it happened? Have you tried this remedy? How'd that work?' It involves all the stuff that might happen during the first five minutes of the doctor actually coming to see you, and uses analytics to start to diagnose a range of options -- all before you even see the doctor or a nurse.

The minute I walk in the door of the hospital, it should be about me, even if it's e-care. It's about improving the depth and quality of care, and maybe this is where [Apple] Watch or the wearables come in. You're able to put together a more customized experience.

Kind of like in the retail business, using technology to improve customer experience?

Palermo: Yes. Organizations that take care of patients can learn a lot from retailers, that's for sure.

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