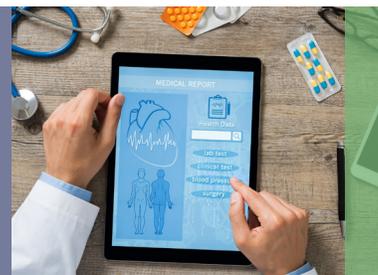


Care Delivery Transformation and the Internet of Things as-a-Service



Over the last decade, the Internet of Things (IoT) has entered our daily lives in the form of home automation, with sensors being added to fire alarms, door locks, and thermostats. For early adopters, IoT, a collection of mobile devices, smart applications, and wireless equipment that use internet connectivity to communicate with one another, was an exciting reality.

Today, HIT vendors and advisory firms are focused on how IoT can be used in healthcare environments and how it enables providers to apply evidence-based knowledge to clinical data and make treatment decisions.¹ When data from IoT devices is aggregated onto a cloud-based service platform, healthcare organizations can deliver new services that positively “disrupt” traditional care delivery methods.

Imagine an asthmatic patient who is discharged from a hospital with instructions to follow up with her primary care provider in one week. The patient has her medication, inhaler, and a list of symptoms to watch for that can impact recovery. With home-based sensors and applications monitoring house temperatures, vital signs, and medication compliance, the patient’s data points can be integrated into software that automatically alerts care coordinators of any changes. The care team can initiate interventions to address potentially adverse events at the home or relating to the patient’s ability to self-manage. The information made available by IoT technologies could lower readmission rates and equip healthcare providers with new strategies to treat patients outside the four walls of the hospital.

Harnessing the Power of IoT Technology to Improve Care Delivery

Collectively, IoT devices, such as wearables and remote monitoring devices, form a connected care ecosystem both inside and outside the health system that provides unique value and an improved experience for patients, staff, and other end users. With integrated service platforms that repackage products and services to establish new care delivery methods, health systems can simultaneously decrease costs while improving the quality of care.²

Burwood Group believes that “IoT as-a-Service” will transform traditional care delivery models and create a new industry paradigm. For example, advanced elderly home care can be improved with continuous monitoring of sensor arrays and biometric devices that provide clinicians real-time clinical information.³ At the hospital, the same connected care service platform would alert providers of changes in patient status and trigger notifications for early detection and intervention.

¹ Domingos, Pedro. “Get Ready for Your Digital Model.” Wall Street Journal, November 12, 2015.

² Hospitals and Health Networks: Clinical and Business Analytics: Delivering Real-Time, Predictive Intelligence. June 2016. Vol. 90, Issue 6, pp. 50.

³ Rota, Jerome. “How to Bring the ‘Internet of Things’ to Life.” Wall Street Journal, April 28, 2016.

IoT devices will assist in tracking and monitoring patients as they transition from the care facility to their home, improving the patient experience across the entire continuum of care.⁴

With this service platform in place, providers and healthcare executives can see improvements in patient retention and satisfaction. The care delivery transformation described here offers several advantages for healthcare organizations:

- Data aggregated by IoT devices can improve physicians' treatment plans and make diagnosing patients easier and more accurate. It will help guide treatment in a timely and effective way.
- With real-time patient monitoring, care plans can be adjusted on the fly. This decreases office visits and potentially avoids readmissions.
- Care coordinators and population health workers will have additional tools to track patients and intervene when appropriate to keep patients from risk of further complications.
- Telehealth visits will be enhanced with the availability of real-time clinical data, while also providing a lower-cost alternative for patients with mobility or transportation issues.
- Building and facility automation is possible through surveillance. Temperature and humidity level sensing can keep ORs, labs, and freezers at optimal conditions.
- Patients and families will have greater peace of mind knowing they or their loved ones are being monitored continuously for status changes and that low impact interventions can be quickly implemented if needed.

Health systems are beginning to recognize the benefits of leveraging IoT technology in the care environment.⁵ Texas Medical Center and AT&T have been experimenting with a wireless wheelchair. Mercy Virtual Care Center in Missouri is using telemedicine and remote patient monitoring to create what may be the first patient-less hospital.⁶

However despite growing adoption of IoT solutions, healthcare executives will be challenged to understand and manage the impact IoT will have on the organization. They must have a plan to filter the

large amount of data being created into actionable and clinically relevant insights. Hospital leadership must align strategic clinical and business goals with the capabilities of IoT and work with key stakeholders to decide which programs to pursue and how to design and implement them.

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The following factors must be considered when considering strategies for IoT technology implementation:

Evaluate Your Security Posture. Be Proactive.

With the rise in mobile device usage and wireless equipment in hospitals, there remains a gap between a true connected care environment and the ability to protect sensitive patient data. Burwood's consultants work with our healthcare team to address these issues and establish programs to minimize risk and limit damage if an attack should occur.

The proliferation of smart devices that comprise IoT gives malicious attackers virtually millions of devices to infiltrate. A growing concern is that consumer devices are plugged into the internet and forgotten, without scheduled firmware or malware updates – leaving the window wide open for a data breach.

Within health systems, IT teams can take steps to address cybersecurity vulnerabilities and put protocols in place to consistently monitor their environments. The health system must take time to know their employees and their behaviors and understand what is coming into and out of the hospital that might post a network threat. Additionally, awareness of the hospital airspace via monitoring devices will alert leaders to vulnerable situations, and once identified, they can act accordingly.

IoT Requires Interoperability

In many ways, IoT opens the door for interoperability as it facilitates the exchange of data across systems, reaching clinicians, labs, hospitals, pharmacies,

4 Glaser, John. "How the Internet of Things Will Affect Health Care." Hospitals and Health Networks, June 4, 2015.

5 Swim, Richard. "Understanding the Wireless Spectrum in a Healthcare Facility," Biomedical Instrumentation & Technology, May/June 2013.

6 Howard, Beth. "Are Virtual Care Clinics the Wave of the Future?" U.S. News & World Report, August 17, 2016.

and patients.⁷ And as the number and variety of devices entering hospitals continues to increase, interoperability must also be reexamined.

Smart devices, IoT sensors, and wearables must integrate into clinical workflows, as well as patient and family lives, in order to fully leverage the impact these technologies can have on patient care. In conjunction with interoperability, health systems must consider suitable use case development and IoT technology training and adoption needs.

Foster Clinician-Vendor Collaboration

As technology advances, integration methodologies for enhancing clinical workflow, without delaying care delivery, will be vital for IoT success in healthcare. A big challenge for health systems considering IoT integration is ensuring collaboration between vendors and clinical informaticists on operational and clinical processes. Vendors and clinicians must collaborate to develop innovative solutions. Creativity along with scalable implementation cycles must be synergistically integrated for IoT to provide the best clinical and financial outcomes for patients and providers.

Maximize End User Adoption

IoT platforms are predicated on provider and patient adoption. In the past, poorly understood clinical workflows and inefficient designs have hampered end user adoption in many technologies deployed in healthcare settings. Physicians, in particular, have been less keen towards EMR usage, voice recognition dictation, and hand held devices. New third-party and extension software applications have grown out of the need for improved adoption and compliance.

Adoption rates increase when intelligent engineering and workflow knowledge is in place that addresses end user requirements. Ongoing feedback on workflow from clinicians and other end users back to vendors is the best way to maximize adoption.

IoT device data must be easily uploaded to secure, cloud-base repositories for analysis by providers. From here, providers return care instructions back to their patients. Clinicians, therefore, must be assured that the data being collected, stored, and analyzed is relevant and easily distinguishable from in-actionable noise or they will lose confidence in the solution.

Prepare for Data Storage and Maintenance Needs

As one would expect, the more devices generating data and sending it to a common repository, the greater the challenge for data storage. Maintenance, too, becomes a cost concern. Healthcare facilities can incur significant costs to store and mine data collected from thousands of devices. Determining what data to keep and to discard is a necessary data governance requirement. For organizations promoting population health and prevention, the desire to give patients devices may also bring additional costs to a service program. We expect that as acceptance widens, more healthcare organizations will adopt IoT strategies and the future will be shaped by new regulations and legislation.

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Leverage Predictive Analytics & Evidence-Based Decision Making

Until recently, descriptive analytics have been used to review data retroactively and gain insight about past events. This data enabled care givers and managers to implement processes with the intent to improve outcomes. However, one could never determine if outcomes were improved until a new set of retroactive data was analyzed. This approach always left executives guessing if new processes were leading to better outcomes at appropriate returns.

With advances in technology and the advent of predictive analytics, care providers now have better tools to predict the outcome of populations before adverse events occur. With data from multiple sources stored in a common repository and analyzed by smart engines, providers can use real-time data to predict the likelihood of an event occurring and the best action to take with supporting evidence. IoT

point of care devices offer a key data stream that can determine compliance with care plans as well as risks of predictable failing health indicators.⁸

Monitoring patient data with IoT devices allows providers to intervene and actively take a role in improving patient's health and reducing risks from a remote setting. Think of an IoT platform delivered as a type of Early Warning System. IoT as-a-Service and the data collected from remote devices will play a key role in prevention and could change the way that providers deliver care in non-traditional settings.

Create a Roadmap for Technology Investments

Health systems challenged with reduced reimbursement rates are finding it harder to meet operational margins and are looking to invest in more cost effective delivery models. Some are seeking investments that create revenue generating services and products that impact service lines across the organization – IoT as-a-Service has that potential. Likewise, many healthcare organizations are challenged with additional population health bundles and are seeking to adopt new tools and technologies that provide improved real-time monitoring and management of large population sets. The emerging IoT technologies we have described thus far hold the promise of supporting a more comprehensive approach to care delivery.

Facilitate Innovation from the Top Down

Many facilities are in the process of creating the role of Chief Innovation Officer to research and propose solutions that align with the facility's care delivery needs. These types of forward-looking institutions are desirable places for highly skilled employees. Hospital leaders should encourage innovation and out-of-the box thinking to solve issues while attracting key talent. Dedicated and growth-oriented leadership teams are capable of making these changes happen.

Obstacles to changing the care delivery model are well known and hospitals have historically been risk averse when adopting new technologies. As IoT technologies become more ubiquitous in our daily lives, it only awaits a future where healthcare organizations seize the opportunities for it to enhance patient care.

Whether your goal is to reduce cost, increase patient outcomes, retain patients, improve patient experience or all of the above, reexamination your

health system's appetite for innovation is a critical starting point. The digitization of clinical processes requires a physical, cultural, and technical workplace transformation.

Contact us to learn more about the essential building blocks for an IoT as-a-Service platform for your organization. Please visit www.burwood.com/contact.

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Burwood Group Chief Medical Information Officer, Al Villarin MD FACEP, has 28 years of physician leadership and clinical informatics experience. He has been CMIO for two large academic multi-hospital medical centers in Philadelphia and New York. Currently enrolled in Northwestern University, Masters in Medical Informatics program, Dr. Villarin brings his years of clinical evidenced-based workflow analytics, RTLS, CDS backgrounds and forward thinking methodologies to support our clients needs.



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About Burwood Group

Founded in 1997 and headquartered in Chicago, Illinois, Burwood Group is a healthcare technology consulting firm that helps local, national, and international organizations bridge business strategy and technology solutions. During the past 15 years, Burwood Group has worked with over 170 healthcare organizations. Our clients choose Burwood Group to ensure their technology decisions and integrations improve the delivery of patient care. More information can be found at www.burwood.com/healthcare.

⁸ West, Darrell M. "How 5G Technology Enables the Health Internet of Things." Center for Technology Innovations at Brookings, June 2016.

⁹ Mims, Christopher. "The Internet of Things Is Here, and It Isn't a Thing." Wall Street Journal, August 15, 2016.