

mHealth: a pathway to the intelligent hospital

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Like the glass that is either half empty or half full, the hospital can be viewed as either (I) a fossilized delivery model incapable of redemption, or (II) a time-tested institution in need of lubrication. Either way, no one is suggesting that it's a well-oiled machine.

Today's hospital is a dynamic environment in which clinical staff, patients, and assets are continually in motion. Daily operations rely on a complex orchestration of information, people, processes and physical assets, within increasingly distributed service architecture. In such a fluid environment, where information is often siloed and clinical processes occur independently, duplication and waste are endemic—with a crippling effect on quality, efficiency, cost and patient satisfaction.

In their search for solutions, hospitals are re-engineering themselves as “intelligent” institutions—enterprises that employ knowledge and technology tools to leverage their human and capital assets. These tools are not just a clinical lubricant—they are ushering in a new era of care delivery.

mHealth is central to this strategy, applied as both purpose-built tools and as the foundation of integrated clinical solutions across the range of hospital operations. Over the past 3 years and with astonishing speed, mobile health has been catapulted from the wings to healthcare's center stage, and as the mHealth market continues to mature, it is finding the hospital environment a rich field for innovation. Innovation introduces fresh thinking about clinical communication and collaboration, affordable and accessible care, and the integration of complimentary health technologies. Through mHealth innovation, hospitals are extending their reach, creating new patient-provider

touch points, capturing and sharing clinical knowledge at the point of care, and addressing healthcare's intractable problems of cost and quality. Both inside the hospital and beyond, mHealth innovation is serving as an incubator of the intelligent hospital.

mHealth adoption in the hospital is being driven by favorable economics (reimbursement trends, cost pressures), systemic gaps in care (lack of specialty physicians, lack of patient access), and a new focus on the patient experience and clinical excellence. But it's also driven by advances in technology—expanding broadband network coverage and web-based applications, improved video communications technology, the convergence and standardization of health technologies, and increasingly powerful, smaller, cheaper equipment. There is also a subtle but influential human factor: the culture of healthcare delivery is changing as providers and patients become comfortable with an electronic dialogue and the efficiency and convenience of virtual medicine in an already stretched industry. Collectively, these trends are reordering the structure of hospital based services and tellingly, the provider-patient relationship.

Knitted with complementary technologies, mHealth is building best of breed clinical solutions for the intelligent hospital. From simple solutions aimed at patient outreach and education, to more sophisticated applications like telemedicine and remote patient monitoring, the catalogue of hospital based mHealth tools continues to grow. And it is changing the calculus of hospital based services—mHealth is a clinical service extender that allows hospitals to remain connected and involved in patient's health outside the



Figure 1 Like the glass that is either half empty or half full, the hospital can be viewed as either a fossilized delivery model incapable of redemption, or a time-tested institution in need of lubrication. To solve the problem and improve the hospital care, hospitals are re-engineering themselves as “intelligent” institutions. mHealth is central to this strategy, from simple solutions aimed at patient outreach and education, to more sophisticated applications like telemedicine and remote patient monitoring. In the intelligent hospital, mHealth and RTLS are being mated. RTLS have been employed to establish granular asset and personnel location awareness, bringing order to clinical workflows.

hospital walls, and between encounters.

Emblematic of this “clinical convergence” of mHealth and hospital services is the marriage of RTLS and mHealth. In the hospital, Real-Time Location Systems have been employed to establish granular asset and personnel location awareness, bringing order to clinical workflows (*Figure 1*). RTLS is being employed to streamline staff activities, to monitor patient throughput and wait times, and to allocate human and physical assets in areas like the ER and OR. As a standalone solution this real-time insight can dramatically alter the course and resource consumption of hospital operations. It’s a powerful clinical tool in its own right, but in combination with mobile, RTLS can surpass location awareness and establish “contextual awareness” of people and things—a seamless integration of information technologies that reveals a wealth of information about the status and flow of hospital operations, delivered on demand, on the fly.

In the intelligent hospital, mHealth and RTLS are being

mated to stage-manage patient movements throughout the facility, to make predictions about likely bed use, admissions and discharges over the next several hours. With RTLS and mobile inspired contextual awareness, the intelligent hospital can glean insights into operations aimed at cost reduction, process optimization and clinical service quality. Here are some examples:

Extendable work flow solutions

Hospitals are building upon single purpose clinical solutions like hand washing monitoring, as the springboard towards a range of sophisticated mobile/RTLS patient care analytic and reporting tools, made available in real time.

Remote patient monitoring

In the facility, staff can monitor (and act upon) patient throughput, wait times, and high value asset allocation. With multi-parameter monitoring devices for post-acute care, these tools are cheap; prevent unnecessary health events and hospital re-admits.

Wearables

Multipurpose watch or badge captures location and process data in regard to patient services, enterprise workflows, and consumptive tasks. In nursing services for instance, wearable RTLS badges and wristbands are being mated with mobile and BI technologies, delivering a patient engagement and behavior change tool.

Business intelligence and modeling

Mobile enabled RTLS data—including big data—can reveal a wealth of information at the staff level about the speed and effectiveness of clinical operations, identify weaknesses, allocate resources, and model solution sets. With these analytics, hospitals can make efficient use of staff time, allocate equipment, adjust appointments, boost quality and compliance, and increase capacity.

Implantables

Somewhat forward leaning, implantable devices like the cardioverter defibrillator (that can be controlled electronically) can significantly reduce follow up visits and health events, while locating patients in distress.

As an illustration, RTLS demonstrates how mHealth innovation isn't just shaping the next generation of hospital operations—it is a “force of mass disruption” to establish patterns of care that translate into patient satisfaction and clinical efficiency. And we're still at the beginning—there are huge opportunities to populate the intelligent hospital with mHealth knowledge solutions.

Looking ahead, mHealth innovation is keenly tuned to the user experience—there are now biometric monitors that capture data via ear buds, mHealth coaches that intuitively modify care plans as new data is obtained, and noninvasive diabetes testing and reporting tools. In the intelligent hospital, the convergence of mobile with boutique solutions like RTLS means better POC information,

better coordination of assets, effective patient engagement, streamlined processes, and better outcomes. For the patient and the consumer, this convergence means better control of their health issues, better coordination with their care team, and perhaps most importantly—a sense of inclusion.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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