

# mHealth and Real-Time Location Systems

## A Pathway to Clinical Convergence

**O**VER THE PAST THREE YEARS and with astonishing speed, mobile health has been catapulted from the wings to healthcare's center stage. The single greatest contributor to mHealth's surge is industry innovation – innovation that introduces fresh thinking about clinical communication and collaboration, affordable care, and the integration of complimentary health technologies. It leverages favorable economics—mHealth solutions are relatively fast and cheap to bring to market and can be architected to existing public and private wireless infrastructures. Through innovation, mHealth is 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. In the home and in healthcare environments, mHealth innovation is rewriting the manual of healthcare delivery. And tellingly, via these solutions the patient is increasingly gravitating toward the center of the care team.

As the mHealth market continues to mature, it is finding the facility environment a rich field for innovation. Consider: the dynamic environment of today's hos-

pital in which clinical staff, patients, and assets are continually in motion is highly resistant to the coordination of the people, the physical assets, the information flows

and the processes that define healthcare operations. Collectively, this complex intersection of healthcare workflows and asset allocation, knowledge sharing, waste and duplication have a crippling effect on healthcare cost, quality, and patient satisfaction.

In their search for solutions, healthcare facilities are re-engineering themselves as “smart” hospitals – enterprises that employ knowledge tools to leverage their human and capital assets. mHealth is central to this strategy, applied as both purpose-built tools and as the foundation of integrated clinical solutions. Growing both organically and knitted with complimentary technologies, mHealth is building best of breed clinical solutions. Emblematic of this clinical convergence of complimentary technologies that is now underway is the marriage of real-time location systems (RTLSS) and mHealth.

In healthcare, RTLSS establish granular asset and personnel location awareness, bringing order to clinical workflows. RTLSS can be employed in monitoring staff activity, monitoring patient throughput and wait times, managing patient services in areas like the ED and OR. RTLSS can coordinate staff in a medical emergency and determine how much time is spent with a patient. It can track the physical movement of patients to minimize wait times, ensure their safety and keep family abreast of their progress,

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identify bottlenecks and expedite process flow through costly departments like the emergency department (ED). As a stand-alone solution, this real-time insight can dramatically alter the course and resource consumption of hospital operations. It can be integrated with clinical applications like the electronic medical record (EMR), Nurse Call, and other high acuity systems. And the technology is affordable – there are now single-use patient RTLS badges that can be discarded or recycled. 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 ITs that reveals a wealth of information about the status and flow of hospital operations, delivered on demand, on the fly. 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, hospitals can add a powerful tool to their arsenal aimed at cost reduction, process optimization, and clinical service quality.

Here are some recent trends in mHealth-RTLS convergence:

**Extendable Workflow Solutions.** Hospitals are building on single-purpose clinical solutions like hand-washing monitoring, as the springboard toward a range of sophisticated mobile/RTLS patient care analytic and reporting tools, made available in real time.

**Remote Patient Monitoring.** In a market expected to grow to [\\$5 billion](#) by 2020, RTLS and mobile are a natural fit for patient monitoring, particularly in the home, because of the convenience and cost savings these solutions can deliver. With multiparameter monitoring devices for elder care, Alzheimer and post-acute care, these tools are cheap, prevent unnecessary health events, and hospital re-admits.

**Wearables.** Most commonly associated with the fitness market, wearables are infiltrating clinical activities in which a multipurpose watch or badge captures location and process data in regard to

patient services, enterprise workflows, and consumptive tasks. It is a growing space—the miniaturization of sensors and wireless devices is sparking an explosion of wearables. In nursing services for instance, once wearable RTLS badges and wristbands are mated with mobile and business intelligence technologies, the solution set becomes 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 (which can be controlled electronically) can significantly reduce follow-up visits and health events, while locating patients in distress.

We are now seeing that mHealth innovation isn't just shaping the next generation of healthcare via connectivity and communication, it is also leveraging complimentary technologies to establish patterns of care that translate to patient satisfaction and operating efficiency. And we're still at the beginning—there are huge opportunities to bolt together boutique solutions within a mobile architecture. In addition to RTLS, Speech recognition tools are being employed via mobile devices for documentation, charge capture, scheduling and notes. Mobile video conferencing mated with robotics has spawned a new market segment – telepresence. In ever greater numbers, boutique health technologies are innovating to perform in a mobile environment, and that innovation cycle is accelerating – we now have “turnaround” innovation in the mobile device market.

Looking ahead, mHealth innovations are being designed with the user experience in mind—there are now biometric monitors that capture data via earbuds, mHealth coaches that intuitively modify care plans

as new data are obtained, and non-invasive diabetes testing and reporting tools. For the clinician, the convergence of mobile with boutique solutions means better POC information, better coordination of assets, effective patient engagement, streamlined processes, and better outcomes. For patients and consumers, this convergence means better control of their health issues, better coordination with their care team, and perhaps most importantly—a sense of inclusion. **JHIM**



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