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Beyond Equipment Tracking

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By Richard Tabbutt

When real time locating systems (RTLS) were introduced to hospitals, the main objective was to bring order to chaos in tracking equipment. With scores of diagnostic and therapeutic devices in use and on the move throughout a facility, tracking became imperative to bring greater visibility and certainty to their location and status, allowing facilities to better manage their deployment, use and maintenance.

Today, RTLS is not just about equipment tracking. Advances have seen expansion of applications that include use for automated nurse call cancellation and logging, "smart rooms" that have enhanced patient-caregiver interaction producing high levels of patient satisfaction, and significant improvements in patient throughput and scheduling management. Much of this has been enabled by new, advanced technology that provides for room level accuracy, a capability that is not available with simple Wi-Fi tags. The bottom line is that certain RTLS is bringing hospitals a significant financial return at a time when they need it most.

The Nuts, Bolts and Software

Today, increasingly sophisticated hardware is placed throughout the hospital to continuously locate and track equipment, staff and patients in real time. There are two different types of RTLS hardware that can be deployed in the hospital. One is low accuracy or low-resolution tracking. This is typically carried out by Wi-Fi tags that use the hospital's existing Wi-Fi access points. Though inexpensive, low accuracy resolution means that tagged entities can be located only to within a wing of the hospital, but the room cannot be specified. Items could be in the vicinity of 10 different rooms or more, and possibly on a different floor because Wi-Fi goes through building walls and floors. While this low-cost implementation can help in locating and managing equipment, its lack of room-level location accuracy greatly limits its usefulness. As the hospital expands its RTLS deployment to include emergency department (ED) and operating room (OR) to drive throughput improvement, patient room management, nurse call cancellation and other applications, room level accuracy is a minimum requirement.

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Newer generations of RTLS provide room and even sub-room level location accuracy. One type of RTLS, based on ultrasound technology (USID), even will be able to locate a tag to within 1 inch in 3D space. This can be deployed in a manner as to provide both the more coarse and clearly defined area granularity for initial equipment needs. It can also be scaled and enhanced later for room or sub-room location accuracy. Because room-level accuracy is an absolute requirement for any RTLS application beyond coarse equipment tracking, these newer RTLS systems should be seriously considered even if the hospital just wants to initially deploy RTLS for equipment management. Expanded applications can then be seamlessly deployed, and the equipment will be even better managed.

From Manual to Automatic

Visibility or management software integrated with RTLS hardware not only tracks the people and equipment and its use, but also provides information about status. In the case of equipment, it can provide information on where it is, whether maintenance or upgrades are needed, whether it has been used or cleaned, when and by whom, as well as other important information. Software brings up information screens to various departments that need to access equipment, whether it's in radiology or a nurse's station. It also can be concurrently pulled up in the bio-medical engineering department that needs to find, maintain, upgrade or service the equipment. Advanced features include RTLS enabled alerts and messages, which can be directed to individual stakeholders and can also be displayed on mobile smartphones and similar devices. In most institutions, the RTLS screens are ubiquitous and in use across the enterprise with varying levels of emphasis.

The management software has become increasingly sophisticated, providing a wide number of automated applications that

were previously manual. These include automatic nurse call cancellation, as well as automatic logging of the nurse's response, which in most states is required by law. By allowing the responding nurse to immediately address the patient's clinical need, it supports better patient and nurse interaction and care. Nurse call RTLS/ USID is becoming the standard today. Almost all new nurse call systems are being installed with high-accuracy RTLS integrated systems. It also enables compliance with the statutory requirements, and ease of logging and reporting. Moreover, as nurses often forget to manually cancel the call, and the "time to respond" is a metric for patient satisfaction statistics, the automatic nurse call cancellation feature helps improve (i.e. correctly depict) the nurse call response metrics.

At the Departmental Level
The ED is a key department where RTLS with high accuracy USID is being deployed, primarily for increasing throughput. RTLS systems have proven to reduce wait times, track patients through the triage and treatment through disposition. Tracking transactions such as when medications arrive and when they are administered greatly increases the throughput in the ED. Patients are tagged and tracked, and visibility and management software is employed for the people who are managing the department. RTLS reduces the risk of overcrowded waiting rooms due to excessive wait times, which can lead to patient developments and/or ambulance diversions to other hospitals.

RTLS also provides solutions for surgery departments that face scheduling challenges such as surgeries that often run long, cancel or are interrupted by emergencies. In emergency and surgery departments, both staff and patients can be tracked to much better manage and even automate scheduling.
RTLS has not only proven to be utilized for operating rooms, pre-op area, and in all of the peri-operative scheduling and post anesthesia care unit (PACU) areas, the systems also have enabled families to know exactly where their loved one is in the surgery process. This has proven to be a great patient satisfaction factor in the surgery department. In the OR, RTLS applications enable better throughput with the same resources, resulting in more revenue with wider margins.

The Interdepartmental Impact of RTLS
Due to their nature, RTLS applications have a major impact on ED and OR departments where the environment is highly dynamic with people and equipment rapidly coming and going. Other departments, such as radiology, are also impacted because they have a high degree of interaction with the ED or OR. Take the common daily instance of a patient who comes into the ER with head trauma. The patient almost always goes directly to CT or MRI. The imaging department is constantly on call for emergency cases and adjusting schedules to deal with them. The interaction and interdependence between departments argues for highly functional and reliable RTLS systems to help manage the complexities by introducing full operational patient-related transparency between departments.
Return on Investment Efficiencies gained through RTLS are broad and can have a significant effect on reducing waste and enhancing the bottom line. Some key categories include:

- **Better patient throughput --** While RTLS impacts patient throughput universally in a hospital, it has a particularly strong influence in the ED. The ED is under a constant challenge to move a mostly unpredictable flow of incoming patients through diagnosis, treatment and final disposition. Delays in any of these processes slow up the entire ED, causing beds to be occupied longer than necessary and patient wait-times to increase. It can even lead to diversion of non-ambulatory patients. With new ED management software coupled with RTLS patient tracking, throughput can be substantially improved. Similar dynamics exist in the OR with the potential for throughput gains. As patient throughput improves, so does the financial performance. The modest software/hardware investment required yields significant gains in both revenue and cost reduction, producing returns in very short periods.
- **Improved equipment utilization/provisioning --** It is intuitive that when a piece of equipment is utilized efficiently there is usually less need for redundant equipment, saving hospitals significant money in new purchases and maintenance. Monitoring equipment uptime and the status of the equipment can also have a significant financial impact, as it is a factor in the efficient deployment for examinations, and therefore examination volume and revenue.
- **Enhanced staff efficiency/utilization --** As caregivers spend less time on documentation, chasing equipment and dealing with workflow bottlenecks, they will find more time focused on patient care. Consequentially, hospitals can expect a number of improvements, such as fewer medical errors, better quality of care, better patient outcomes and satisfaction, and enhanced throughput, all of which have a major financial impact. Moreover, as workflow efficiencies are realized, there is the potential to optimize staffing levels, lowering overtime and overhead.

Other financial drivers that RTLS addresses include:

- better regulatory compliance (Joint Commission recalls);

- reduced litigation risk if recalled and equipment is inadvertently used;
- reduced late detection of falls;
- reduction of patients leaving the ward or hospitals, such as Alzheimer patients;
- automatic HIPAA compliance in smart rooms where private patient information displayed on a screen is automatically turned off when a caregiver is moving away from the screen;
- log-on automation enabled by RTLS helps to reduce time the caregivers spend with computer log ons and offs.

RTLS has indeed come a long way from its original use and is opening up new horizons in the efficient management of assets, staff, patients and the bottom line. As hospitals continue to integrate RTLS systems into their daily regimen, they will become even more adept at leveraging them to the point where they will begin to use retrospective data captured by the software. This can be mined for in-depth analysis and bring hospitals to the next level of knowledge, insight and process and productivity improvement.

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What Is an RTLS Enabled Smart Room?

"Smart rooms" are essentially technology-enabled patient rooms designed to greatly enhance interactions and communications between patients and their caregivers, improving outcomes through better care. A key part of this relies on USID RTLS. The main objective of smart rooms is to give clinicians more focused quality time at the bedside by addressing every day, time consuming workflow and documentation challenges. Smart rooms were pioneered at the University of Pittsburg Medical Center and jointly funded by IBM. The Cerner Smart Room has also been introduced as a component of Cerner's CareAware solutions. These systems rely in part on healthcare workers who wear small ultrasound tags from Sonitor Technologies.

When a staff member enters a patient room, the smart room systems identify and display the person's role and identity, which patients can see on wall-mounted monitors. The systems concurrently provide real-time electronic medical record (EMR) patient information to the clinician, including vital signs, test results, medication that has been prescribed and those that are due, and a variety of other patient history and care plan data relevant to that clinician. This integration greatly leverages the hospital's EMR investment by giving immediate access and documentation capabilities at the bedside. Errors are reduced, time is saved and outcomes are improved. In addition, patients have expressed high levels of satisfaction due to the enhanced levels of care. USID RTLS play a key role in smart room technology and provides essential room level accuracy, without which these advanced systems could not function.