

RTLS Location Accuracy and Its Affect on Hospital ROI

Why Location is Everything in RTLS for Healthcare

Introduction

Although the decision to explore RTLS may be easy, the actual evaluation of competing technologies and vendors is often made more difficult by excessive hype, and frankly the confusing and often misleading information around ROI.

RTLS is both a simple technology and a sophisticated multifaceted information flow. For most hospital administrators, the decision to explore a Real-Time Locating System is easy. There are myriad documented values for hospitals – hard dollar financial savings and soft dollar productivity, patient care and patient safety returns – at hundreds of hospitals across the country.

Underlying RTLS technology has a direct impact on location accuracy. Oftentimes, the difference between zone level, room level and bed level positional accuracy is overlooked or hidden in the evaluation process. For some technologies, the infrastructure add-ons to improve positioning accuracy have huge impacts on price; for others, the underlying technology simply cannot adequately return room to room locationing, at any price.

This paper has been developed to specifically underscore why location accuracy, and specifically, room and bed level locationing, should be at the crux of your RTLS decision criteria.

Locating Is What RTLS Is All About

The question hospital administrators often ask is “what level of location accuracy is good enough?” And that answer can be somewhat complex. In order to extract the maximum return on investment from an RTLS deployment, a scalable infrastructure with the right location accuracy is key. Hospital administrators should start an RTLS evaluation with their specific primary operational goals in mind, but also incorporate a strategic vision towards future emerging applications and the efficacy of the chosen technology for these additional use cases.

Understanding the locating technology proposed by your vendor is critical; sometimes the actual physics of the underlying technology prevent it from achieving specific room-to-room location accuracy; other times, there are significant hidden infrastructure and maintenance costs required to improve accuracy to achieve clinically significant results.

Defining Location Accuracy

Location accuracy is defined as the ability to locate equipment, patients or staff within a specific, confined area. RTLS can have a range of location accuracy from zone to room to bed to bay level. For example, **Zone level accuracy** may tell you the location of an item on the correct floor or within a group of rooms (Building 1, Floor 2; or 2 West). **Room level accuracy** locates a person or asset in a specific room (patient room 210, or Operating Room 3). **Bed or bay level accuracy** locates a person or asset in a specific sub-location within a room or in an open bay (patient room 210, Bed 2 or ED exam 1)

Seeing is Believing

Before selecting a RTLS for your facility, the required degree of location accuracy must be determined to support your hospital's specific operational goals, both today and in the future. Different operational goals require differing degrees of positioning. To effectively analyze the performance of RTLS for your needs, make sure you see a demonstration of the location accuracy of the system under consideration for yourself, in your specific facility, and to your satisfaction. Don't let marketing materials be your only source for validation. Site visits to other installed hospitals can be useful, but you should still require a proof of concept in your specific facility before you move ahead. The bottom line – don't simply rely on the demos, multi-media presentations and the often-orchestrated site visits - the true value and return of your RTLS deployment depends on success in your facility.

Accuracy Dependent RTLS Use Cases

There are a variety of use cases for RTLS where the full return on your investment depends on room, bed and even sub-room level positional accuracy. These uses cases involve asset management, patient tracking and staff locating applications.

Most experts will agree that patient tracking and staff locating applications demand a high level of positional accuracy. And in order to effectively address patient throughput and capacity challenges, room, bed and bay level accuracy in RTLS has become the minimum standard.

Therefore, the objective of this white paper will primarily address and educate you on why accuracy matters - even if only considering RTLS for asset management.

Top 10 Reasons Why RTLS Location Accuracy Matters

1) Staff Utilization and Satisfaction - The success or failure of any new technology is primarily dependent on staff adoption. If staff members are reluctant or refuse to embrace the new technology, your investment will never be fully optimized.

With RTLS, primary components of the value include saving staff time, easing frustration by reducing search times and specifically, eliminating non-value added tasks from nursing staff. Easily finding assets, patients and the required skilled staff member for patient care are key goals of RTLS. If your RTLS system provides only zone level accuracy, staff will still need to search an entire floor (or multiple floors), or large groups of rooms to find what or whom they need. While staff efficiency and satisfaction may improve, the overall usefulness of the RTLS system and the associated adoption rate is likely to fall off; staff hoarding behavior is unlikely to change; and rapid response times for clinical care are severely diminished.

2) Asset Tracking vs. Asset Management - Any RTLS system can provide basic asset tracking to an approximate location within your facility. However, there is a significant difference between asset tracking (knowing approximately where something is in your facility) and asset management (having specific, contextual information about equipment utilization to drive purchase and rental decisions). Only with room level accurate locating are you able to truly understand how your assets are being utilized. How often are they really in use patient rooms? How long do assets sit in dirty utility closets? Where are hoarded assets being hidden?

3) Maximize your ROI - Specific asset management applications provide the primary return on investment for RTLS, and these require more specific location accuracy. While there are some RTLS vendors that argue zone level accuracy is adequate, thankfully, today's hospitals don't have to settle. Cost effective, purpose built RTLS with room and bed level accuracy are now available. These RTLS solutions provide a true return on investment, and deliver a substantial ROI.

Consider theft reduction, inventory of equipment, par-level management, rental program management and equipment utilization management. While a zone level accurate RTLS can be sufficient for a slight improvement in BioMed/Clinical Engineering search times; true asset management to change hoarding behavior and increased utilization to drive down overbuying/over renting, all require room and bed level accuracy.

4) Theft/Loss – Expensive hospital equipment often leaves your facility, or is moved from its departmental owner. These incidents can involve inadvertently discharging patients without removing therapy devices (for example, wound vacs); malicious intent (deliberate theft), unauthorized inter-departmental “borrowing” and devices that get accidentally tossed out with the laundry. A zone level RTLS can tell you if equipment is no longer in your facility or maybe even your department once it's gone, but a room level accurate system that incorporates location tracing and true chokepoint notification, can provide you with actionable information to prevent these losses in the first place.

5) Equipment Utilization - Knowing the approximate location of equipment may be helpful, but knowing the actual disposition of equipment is vital to understanding true utilization of that equipment. Only a room level accurate RTLS will report how much time equipment spends in clean/dirty utility rooms or patient rooms. This utilization data provides actionable information to determine your true equipment needs when purchase or rental requests are submitted.

6) Par Levels - If a unit's par level is 15 IV pumps, a zone level RTLS could tell you that there are 15 IV pumps in a specific unit. However, only a room or sub-room accurate system would confirm that of the 15 pumps, 5 are available and 10 are unavailable in the dirty utility room. You must have this level of detail to ensure usable par levels are maintained. Once these workflows are established and accuracy is maintained, then clean, working equipment will flow to patient units for optimization and to diminish the hoarding behavior patterns.

7) Rental Management – Equipment rental programs provide a means to accommodate higher census, disease-specific therapy and condition-specific equipment, without increasing your capital equipment budget. But these programs are oftentimes mismanaged or abused. Only with room and bed level location accuracy can you determine if a specific rental asset is still in a patient care area beyond its clinical need, or whether your own equipment has become available and can now be used to eliminate the need for a continued rental.

8) Asset Management in the OR - Efficient throughput of patients in the surgery department is of vital importance. Case delays often result when clean, working equipment is not where it's supposed to be. Room level accuracy eliminates excessive search times and delays. Excessive room-to-room searching can be disruptive to the OR for other reasons as well, where searching multiple, occupied ORs causes a potential infection control issue. OR doors should remain closed at all times to mitigate the potential transmission of infection.

9) Patient Safety/Order to Care Delivery Time – Finding critical care equipment quickly is vital in the hospital setting. When life safety equipment is suddenly needed for an ICU patient, time is of the essence. While zone level accuracy can narrow the search, room level provides staff with an exact room to locate the equipment. Taking this even further, room-level accurate RTLS that incorporates true asset status (clean/dirty/needs repair) can eliminate searching multiple rooms, or locating equipment that isn't available, to reduce precious time and treatment delays to a patient in need.

10) Patient Billing - Bed level accuracy (including sub-room locating in semi-private rooms) also provides hospitals with the ability to gather billing information based on the exact location of utilized equipment or skilled staff resources. Having RTLS data that confirms when and for how long specific equipment or specific staff resources spent in a patient room can help reconcile billing for the therapy.

While Accuracy Matters, Workflow Improvement Matters, Too

Once you have confirmation of bed-level accuracy, you must consider the process improvement changes required to address the problems your hospital is facing, and develop a plan for optimization to yield results. When selecting a solution provider, evaluate their category knowledge, software and workflow process improvement expertise to guide you in driving meaningful outcomes. An RTLS workflow and ROI analysis can be customized to show significant financial return to your bottom line through controlling costs, accurately documenting equipment status and history, helping to reduce risk management situations, and returning nursing time to patient care. The goal with your RTLS implementation should be to streamline operations and make the most of your owned resources. This can especially be relevant for hospital systems with more than one location, where the capacity to centralize functions and minimize duplication of services is paramount. A complete RTLS ROI Analysis will include:

- Equipment quantity comparison (owned and rented)
- Equipment utilization (related to observed inventory and fixed asset list)
- Right sized equipment recommendations based on improved utilization with excess quantity identified
- Infusion pump line study (multiple line infusion devices only)
- Nursing time spent on equipment functions (i.e. cleaning, searching, hoarding, etc)
- Financial savings related to operational and financial efficiencies gained
- Overall ROI Analysis

Upon completion of the survey and site assessment process, process, have your vendor return a proposal for RTLS installation, including an ROI evaluation and a Consulting recommendation that matches your facility's specific needs.

A Word of Caution About Leveraging Wi-Fi for RTLS

While the lure of leveraging an existing Wi-Fi network for RTLS is quite tempting, your true return on investment from an RTLS deployment cannot be achieved with zone level accuracy. Some believe that an RTLS that leverages Wi-Fi to provide zone level location accuracy is "good enough" or "better than nothing". You've been promised a "location ready" Wi-Fi deployment, and sometimes, may have assumed an RTLS financial return to help offset your Wi-Fi investment. Unfortunately, other than the potential for minimal reduction in BioMed/Engineering search times, true hard dollar returns with RTLS can only be achieved with a room, and even bed level accurate system - and a Wi-Fi-based system without additional locating technology add-ons simply cannot provide this level of accuracy.

For more information on challenges with Wi-Fi RTLS, please request the whitepaper, "6 Major Problems with Wi-Fi RTLS That Cannot Be Ignored."

Summary and Conclusions

Financial returns, including a cost effective RTLS deployment, are indeed an important consideration for RTLS in healthcare, but you must be careful believing some of the hype. Cost reductions, productivity gains and revenue increases can only be achieved with a room and bed level accurate system.

Location accuracy is a critical factor in the RTLS decision criteria and it is important to understand how accuracy can affect the success of certain hospital applications. RTLS must support a variety of hospital operational requirements, both immediate pain

points and long-term strategic initiatives, that only room level and bed level accuracy can provide. Make sure to secure an ROI analysis, using metrics and numbers that are specific to your hospital, and request a demonstration of accuracy at your facility. Only then can you fully evaluate your total cost of ownership and true return on investment.

For more information on the primary evaluation factors and performance of various underlying RTLS technology, please review the RTLS Technology Evaluation Matrix below:

RTLS Technology Evaluation Matrix

Summary of primary evaluation factors and performance of various underlying RTLS technology

Evaluation Key: **Green** = Performs Well; **Yellow** = Limited Performance; **Red** = Poor Performance

RTLS TECHNOLOGY	LOCATION ACCURACY	LATENCY	EASY OF INSTALLATION / SCALABILITY	CALIBRATION / ON GOING MAINTENANCE	INTERFERENCE
Reverse "Controlled Scatter" Infrared (IR)	Assured room, bed and bay-level	Fastest location response time, data to server with 1.5-3 seconds	No mechanical installation (no drilling)	No ongoing calibration	Advanced IR eliminates line of sight challenges
Traditional IR / 433 MHz	Assured room, bed and bay-level as long as direct line of sight is available	Fastest location response time, data to server with 1.5-3 seconds	Restrictive tag placement to assure signal is not blocked - tags must be placed in clearly visible locations)	No ongoing calibration	Highly affected by interference. Direct line of sight is required for accurate location read
Wi-Fi / RF	Room-to-room positioning impossible. Requires additional technology for advanced accuracy	Best location response is 6-8 seconds and can be delayed up to 30 seconds	Requires wholesale repositioning of APs + additional APs	Ongoing calibration; either hospital staff burden or extra charge by vendor	Location traffic can interrupt / disrupt mission critical Wi-Fi apps
ZigBee / RF	Room-to-room location impossible	Best location response is 6-8 seconds and can be delayed up to 30 seconds	Infrastructure limited by electrical outlets; takes up limited hospital outlets; tamper challenge	No ongoing calibration; high replacement/ maintenance for sensors that become unplugged	ZigBee transmissions can be interrupted by Wi-Fi
Ultrasound	Good in rooms, challenging in open areas as easily disrupted by any high frequency sound	Light travels faster than sound therefore, response time slower than IR solutions	Battery powered receivers available, but must be partnered with Wi-Fi	No ongoing calibration	Noise can distort or even totally block location data

For more information or to request the white paper, **"6 Major Problems with Wi-Fi RTLS That Cannot Be Ignored"** visit www.teletracking.com/rtls or send an email to: rtls@teletracking.com