

Patient-Staff Communications

Integration with Staff Location Systems



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Market Need

Automatic staff location systems are becoming more integral to patient-staff communications installations for purposes of intercom communication to staff, light indicators in the corridor, display on call answering clients, and integrated reports of staff and patient-staff communications activity. Cost limits these systems to high-end patient-staff communications systems, with integration available from all major competitors in that market, including GE, Rauland, Hill-Rom, Zettler, Westcall, and others. GE Security Marketing estimates that staff location systems are now considered in 50% of all patient-staff communications sales.

Technology

While RF triangulation systems are currently a hot topic, they do not yet have the accuracy and response times necessary to quickly identify the location of mobile staff as in a patient room or in a hallway just outside of the room.

Currently available location systems for the staff location in the healthcare market are IR based. This technology is more accurate when determining location within room boundaries because the IR signal does not penetrate walls as RF signals can. The basic premise of IR systems is a personnel or equipment badge that emits a signature signal every 2 to 10 seconds (less for equipment, which typically moves less) and is received by a network of sensors and forwarded on to signal processing hardware and software to deliver a badge movement message to clients, including patient-staff communications. Badge transmission ranges are from 15 to 30 feet best case, with low battery, wall covering, and sensor shielding attenuating the

receptivity. Designers must compromise between badge size and battery life, and rate and power of transmission.

Hybrid systems exist which transmit both RF and IR signals. The RF transmission, however, does not pinpoint the location to the level that the IR transmission does. It is useful to communicate button state, battery state, sleep state, and on-premise existence of a badge when the badge is out of range of an IR sensor, or the badge is hidden from the receivers.

Other schemes involving RF transmission from badges and beacons in the rooms have been experimented with but are not in use in US hospitals.

Availability

Several brands of system have been implemented. Dukane, Rauland, and Zettler all use a third party system designed by Versus. Executone at one time used EIPas, who is still actively seeking partners as the Executone product is no longer available. Hill Rom has made location an integral part of their system, while it remains an option with other patient-staff communications vendors.

Performance

GE (formerly Dukane) has had installed patient-staff communications systems integrated to Precision Tracking and Versus (formerly Precision Tracking) IR based systems since 1996. Site studies involving diagnostic measurements within the patient-staff communications system indicate that given the line of sight limitations of IR, facilities can expect 75% reliability of data collection from these systems.

The main reliability problem is conformance to wearing the badge properly. Badges must be worn outside of clothing, and chest height to get effective broadcast of IR signals. Badges can flip, be covered by hair, other badges, or labcoats even when initially worn properly. Reliability can improve to over 95% with rigorous retraining and monitoring of badge usage.

In addition to compliance issues, battery life has an effect on the range of transmission, even before a battery low indication is available from a badge. A comprehensive preventative maintenance battery replacement policy is the best way to improve reliability in this area.

Other areas that can affect reliability include sensor placement and shielding to ensure sensors are reading from only their respective rooms.

Responsiveness of a system is based on the badge transmission timing, the sensor locations, and the reliability of badge transmissions as discussed above. With badge transmissions every 3 seconds, and taking into account the probability of missed transmissions due to staff compliance, successful transmissions 1 of 3 times is not unreasonable. Therefore, it can take up to 9 seconds to communicate a new location, plus the time for patient-staff communications to display the location. GE's integration is typically from 3 to 20 seconds response time.

It is critical that sensors cover an area without dead spots to gain optimum response time. Key points to remember are that badges may be uni-directional, only transmitting forward. If this is the case, 15 foot transmission does not mean that sensors can be placed in adjacent circles of a 15 foot radius (30 foot centers). Rather, the one direction transmission requires that the sensors be placed in overlapping circles of a 15 foot radius, or at 15 foot centers.

Regulatory Issues

The UL 1069 standard lists five fundamental patient-staff communications operations.

1. Call annunciation at a nurse's station (audible and visible)
2. Call annunciation at the dome light
3. Call placed indicator on the patient station (visible)
4. Zone annunciation (audible and visible)
5. Call reset / cancellation

Regulatory issues for location system integration are the same as those for wireless phone integration, which UL 1069 is now evaluating. Since location systems typically can initiate the cancellation of a call, they are affecting a fundamental operation, and therefore should be subject to evaluation and listing by UL, including schematic, BOM, and component submittal of all devices. This creates a problem in using ubiquitous off-the-shelf solutions (PC's, routers, switches, etc.) that change frequently. Solutions include designing an integral system that is fully listing a system to UL1069, or providing a system that can be installed to locate staff but not cancel calls, and recommending this configuration for hospitals desiring UL1069 compliance. GE Security has opted for the latter under the current market conditions. For those customers that would prefer arriving staff cancel calls to UL 1069 listing of their system, the system can be installed with an alternate configuration that permits this mode of operation.

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