

Technology for surgery

'Intelligent OR' taps technology for patient and material logistics

Three ambulances are headed for the hospital with victims of a multivehicle accident. A fourth ambulance is also en route carrying a 52-year-old man with chest pain.

Calls come in from the EMS team, which begins streaming real-time vital signs and diagnostic information to the ED. Realizing multiple critically injured patients are on the way, the ED director activates the hospital's "war room."

In the war room, key personnel immediately start to coordinate activities. This high-tech control room brings together information from critical systems like the live stream of vital signs, ECG readings, and video of assessments by emergency responders.

The war room is the nerve center of the Intelligent Hospital, a demonstration project showcasing state-of-the-art technologies for integrating and delivering data on patient care and resources (sidebar, p 14).

In the war room, the team receives and acts on data on the incoming patients and current hospital operations, enabling them to set priorities, manage logistics, and communicate with key managers and clinicians.

They check on ED capacity and ICU bed availability. They view the status of OR cases and send electronic alerts to the OR manager and trauma surgeons.

When the victims arrive, those needing surgery are transferred to the OR. In the OR, the surgical team views their vital data on integrated boom-mounted displays (Skyvision platform from Skytron). The displays show critical information the team needs, such as data from the patient's record, physiological monitoring, digital x-rays, and lab results.

Tapping a screen, the circulating nurse can route the images from any system, whether laparoscopic video, vital signs, and other sources connected to the platform, to any of the OR's display screens for viewing by the surgical team.

When a surgeon needs to consult with an outside specialist, the nurse can route the image or video signal to the specialist's office where he or she can call up the image on her PC and offer guidance back to the OR.

The applications may seem like StarTrek, but "all of these systems are currently available," says Keley John Booth, MD, an anesthesiologist who organized the Intelligent OR display for the Intelligent Hospital demonstration at the 2012 Health Information Management Systems Society (HIMMS) conference in Las Vegas (www.intelligenthospital.org).

Intelligent OR infrastructure

The Intelligent OR is supported by a wired and a wireless network that enables integration of systems such as video signal routing, device control, RTLS (real-time locating systems), and RFID (radiofrequency identification) that can be used to manage workflow, the supply chain, and communications.

A hospital can customize the system by selecting the appropriate infrastructure,

including hardware and software, and working with the vendor to develop business rules for its selected applications, explains Bryant Broder, senior product manager for Skytron, a sponsor of the Intelligent OR pavilion.

For technophiles, the infrastructure can include a number of types of systems: Infrared (GEN2 IR), WiFi Plus, Zigbee (wireless standard 802.15.4), RTLS, and passive RFID.

It's estimated 10% to 15% of hospitals currently have RTLS or RFID systems, and that is expected to grow by 30% by 2015.

These are some examples of "intelligent" applications:

Patient flow management

A system that includes RTLS can help to manage logistics by tracking patients through "milestones of care." Patients and staff can wear RTLS locator tags that automatically signal when they enter or leave an area, explains Mary Jagim, BSN, RN, CEN, FAEN, chief nursing officer for IntelligentInSites. The company provides a flexible RTLS software platform (www.intelligentinsites.com).

For instance, an RTLS system could:

- show how long a patient has been in the preop area and when a staff member last left the patient's room
- display when a patient leaves the preop unit for the OR and send an automatic page to the anesthesiologist and surgeon
- send an e-mail or text from the circulating nurse to the patient's family updating them on the patient's progress
- enable the circulating nurse to signal the turnover team when the case is over.

Most patient tracking systems depend on a person remembering to enter a time, Jagim notes. With RTLS tags, data is captured automatically and can be collected by any electronic system, including the patient's electronic health record (EHR).

This automatic communication "can be used to drive the next step in the process," says Jagim. "It eliminates the waiting until someone has time to enter a time or a message. It's a more consistent process for managing patient flow."

Equipment management

A system with RTLS locator tags can be used to track patient care equipment, such as IV pumps. A nurse who needs a piece of equipment can pull up a screen on the OR PC and search for RTLS-tagged equipment in the asset management software, which will display where the equipment is currently located.

Temperature monitoring

To aid compliance with temperature monitoring, RTLS tags can be mounted in refrigerators, freezers, or storerooms and programmed to report data to a central location. An alert can be sent if the temperature is outside a specified range, and reports created for documentation purposes, Broder explains. If a problem occurs, and corrective action is needed, the correction can be reported automatically, such as, "Bio-



The Intelligent OR was part of the 10,000 sq ft Intelligent Hospital pavilion showcasing RFID/RTLS technology at the 2012 Health Information Management Systems Society conference.

medical technician Jones replaced the condenser on June 4, 2012," he notes.

Inventory management

RFID systems can aid in supply management, collecting data on supply usage at the point of use and generating automatic orders based on business rules.

Logi-D (www.logi-d.net), a company specializing in hospital logistics, offers a 2-bin replenishment system with RFID technology, eliminating the need for manual supply counts. When the primary bin is empty, the user transfers its identification tag (with its RFID transponder) to a nearby wall-mounted RFID "reader" board. This automatically triggers a replenishment request to the materials management information system. Supplies are then drawn from the secondary bin until the next delivery.

RFID can also be used to manage high-value or consignment items. These items are tagged with a label

with an RFID transponder during the receiving process. Procedure rooms are equipped with "intelligent receptacles" that capture data when a clinician disposes of the item's empty RFID-tagged package in the receptacle. The system eliminates data entry and aids charge capture.

Logi-D recently introduced video and voice-recognition technology, which, combined with RFID, automates demand capture and streamlines case picking.

Instrument management

Just entering the US market is a Smart Table that can be used to account for RFID-tagged surgical instruments. The system's software is programmed to identify the instruments placed on the table, record when an instrument is removed, and account for instruments that are replaced.

The Smart Table uses small UHF-passive RFID chips attached to the instruments; the instruments' metal extends the read range for the chips. The table has an RFID reader with a localized zone.

Before the procedure, the RFID-tagged instrument tray is set on the Smart Table surface, and the system records the tray and its associated instrument inventory. Instruments can be arrayed on the table, and an updated preop instrument count is automatically conducted. Any discrepancies between the count and tray inventory are displayed on monitors by the accompanying software application.

After the procedure, the instruments are read after being set back on the Smart Table or on an optional separate table to provide the postop count.

The Smart Table costs around \$10,000, and RFID tags for instruments are \$2 or

What is the Intelligent OR?

The Intelligent Hospital is a demonstration project showing how clinical devices and systems can be brought together to provide real-time information on patient care and resources.

The Intelligent Hospital was a 10,000 sq ft pavilion at the 2012 Health Information Management Systems Society (HIMSS) conference in Las Vegas.

The systems, integrated with both wired and wireless networks, deliver information in multiple ways, including visual displays, smartphones, and other handheld devices.

The project features RTLS (real-time locating system) and RFID (radiofrequency identification) technologies.

The systems can be both distributed and managed through a central communication center called the "war room."

Included in the pavilion were an Intelligent OR, ICU, emergency department, and general patient units.

Intelligent OR

The Intelligent OR has the traditional infrastructure, including operating tables, surgical lights, equipment booms, and monitoring systems, as well as an integrated information infrastructure.

Physiological monitors, information systems, laparoscopic surgery systems, the electronic health record, and other clinical applications are integrated so images and data can be displayed on boom-mounted screens.

RTLS and RFID enable the identification and tracking of staff, instruments, medications, and supplies, providing for dynamic reporting on these assets.

more, depending on the quantity, says Tom Manzagol of RFID Global Solution (www.rfidgs.com), the company that provides the system. He says the tags, which are small ceramic disks applied with epoxy, have been tested to withstand several thousand sterilization cycles. The system can also be used for tracking instruments through reprocessing and could be used for unique identification of individual instruments.

Bigger role for mobile devices

Dr Booth predicts that tablet computers and smartphones will start to replace some of the lumbering COWs (computers on wheels) and even WOWs (wireless computers on wheels).

“These tablet devices are going to allow us to do everything a WOW can do on a light-weight platform,” he says.

Challenges remain for security, compatible software, and batteries that enable a longer-lasting charge.

“We are going to see leaps to the point where mobile technology becomes a mainstay,” he says, noting that “dozens of vendors present at HIMSS are pushing the boundaries.”

There still is work to do.

“We haven’t seen the killer implementation yet that really shows how you can integrate the EHR with a mobile platform in a way that makes sense and is user-friendly,” he says. ❖

—Pat Patterson

For more, visit www.intelligenthospital.org



The orange dots indicate potential applications of RFID/RTLS technology in the OR. Courtesy of Skytron.

Have a question on the OR revenue cycle?

Keith Siddel will respond to questions in the column. Send your questions to editor@ormanager.com

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