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Featured Articles

Scanning the future of hospital radio-frequency identification systems

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RFID

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Hospitals are increasingly considering the implementation of radio-frequency identification (RFID) technologies to track medical equipment, patients and staff. Because RFID has been touted by manufacturing and distribution industries as a key technology to increase efficiency and better manage supplies, the healthcare sector with its limited resources and complex organisations is an obvious market for the benefits that RFID companies can promise. In spite of these hopes, however, RFID systems have yet to prove themselves in hospitals. RFID technologies generate significant social issues – such as increased workload and surveillance of personnel – so hospital administrators need to consider carefully before they invest.1

RFID overview
RFID technologies are classified into two main types based on their source of power: passive and active. Passive technologies do not contain any power source within the RFID tags themselves; instead, passive RFID draws its power from readers that activate the tags when they come within range. This type of RFID technology is relatively inexpensive and commonly used in devices such as ID badges to gain entry into buildings or placed on consumer products as part of antishoplifting systems. Passive RFID is a highly reliable technology, provided the tags pass within range of the scanners designed to read them.

Active RFID technologies, in comparison, have their own battery and emit signals that are picked up by stationary readers. While active RFID tags are considerably more expensive than passive tags, they have the advantage of being able to track items or people in real time as the tags move within a space containing readers. Unfortunately, active RFID tags are not as reliable as many technology companies claim. The current goal for accuracy within hospitals is to correctly locate a tagged item within 10 m about 90% of the time (and within 5 m about 50% of the time).2 In current practice, active RFID not only has poor room-level accuracy, but it can also give incorrect information about which floor of a building the tag is located on.

RFID technology in hospitals
Although hospital administrators may define many of their organisation's problems in terms that are familiar to other industries that have successfully implemented RFID systems, the physical infrastructure of most hospitals is not ideally suited to this technology. Supply management, locating critical equipment and identifying patients and staff with active and/or passive RFID is difficult, if not impossible, given that most hospitals are multistorey, have multiple points of entry and exit, and accommodate a diverse array of activities and personnel.

Because of these constraints, RFID systems are better suited for some purposes than others. For example, the use

of passive RFID to verify the identity of patients and to ensure the correct prescribed medications or blood transfusion may be a highly effective way to reduce medical error. In contrast, locating fairly small items, such as infusion pumps, by using an active RFID system may not provide accurate enough detail to make the investment of resources and staff time
worthwhile.

Social implications of RFID systems in hospitals
In addition to the technological limitations of RFID systems, there are a number of social and organisational issues of which hospital administrators and personnel should be aware as they consider implementing these systems.

First, RFID technologies can significantly increase the workload of hospital staff, particularly that of nurses. Because the burden of using scanners to identify patients and medications as well as locating equipment through RFID systems often falls on nurses, the technologies that are meant to increase efficiency take more time and add responsibility for nurses.

Secondly, some RFID systems have a surveillance modality, which creates privacy concerns for hospital personnel.3 Specifically, active RFID tags are constantly producing data about their location within the system. When tags are linked with individual hospital staff's identities, the data can be analysed to make inferences about individuals' productivity. Although some RFID proponents have designed tags that can be turned off when staff members are on a break, there are also important concerns about the implications of these systems for patient care. If hospital administrators are concerned about efficiency, the time nurses spend with their patients – as seen through the data produced by RFID systems – may seem like nonproductive time. As a result, the system could compel nurses to cut back on the care they provide to patients. Moreover, hospital administrators could attempt to make inferences using available RFID data to assign responsibility for medical error and discipline personnel accordingly, even though the data produced by RFID systems do not provide a full picture of the complex hospital environment.

Thirdly, some RFID technologies have privacy implications for patients. When RFID tags are located in temporary hospital ID bands, or when permanent implantable devices are linked with patients' identities, the unique identifier embedded in the RFID chip can be obtained fairly easily by people who want to capture that information.4 This means that the hospital's medical record systems containing information about patients must compensate for the poor security of the RFID tags to ensure that patients' personal information or medical records cannot be compromised, especially as more health information technology systems are put online and made accessible remotely through web interfaces.

Conclusions
Although the technology industry continues to proclaim the benefits of RFID technologies for healthcare, the actual advantages of the existing systems are unclear. If hospitals elect to implement RFID systems, they must choose to do so in ways most appropriate to their own needs and with an honest assessment of the current limitations of the technologies.

Moreover, hospitals need to take into account the complex social issues that accompany the implementation of RFID technology. Without identifying ways to avoid burdening staff with new responsibilities, monitoring their activities inappropriately, and invading the privacy of both staff and patients, hospital administrators might find that they have invested in systems that not only fail to solve the problems they were intended to ameliorate, but also negatively impact upon staff satisfaction and patient care.

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