Can RFID technology promote a safer blood supply?

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Radio frequency identification technology, or RFID, has inspired many novel applications of late, including efforts to study magazine reader patterns, access restricted areas, locate stolen vehicles and track luggage at major airports.

A new application under investigation at the University of Wisconsin-Madison would further expand the RFID frontier into a vital health-care concern: Ensuring the safety and quality of the nation's donor blood supply.

The UW-Madison RFID Lab, based in the College of Engineering, has partnered with three national blood centers to study the feasibility and develop prototypes for using RFID to manage the entire supply chain in blood transfusion medicine. The team has already completed feasibility studies related to safety and economic benefits and is in the process of testing a prototype RFID system to identify, track and monitor the condition of blood products.

Alfonso Gutierrez, UW-Madison's RFID lab director, says the project began three years ago when Rodeina Davis, CIO of the Milwaukee-based BloodCenter of Wisconsin (BCW), inquired about whether RFID technology could be an upgrade over the current use of bar codes to track blood. BCW became the first of three partners in the research study, joined by Carter Blood Care in Dallas and Mississippi Blood Services in Jackson, Miss. Collectively, these three centers collect more than 500,000 blood donations annually.

"The major driver of this project is improving patient safety by providing greater assurances of giving the right blood to the right people," says Gutierrez. "Blood products are also susceptible to many conditions, such as age, temperature and human error, that can nullify their medical value. We are looking at supply chain improvements that will lead to better safety and quality, and also achieve efficiencies that would pay for the technology."

Davis says bar-coding technology is restricted to line-of-sight, unit-by-unit readings, and is of no use when bar-coded materials are in sealed boxes. "With the ongoing volume of shipments to hospitals every day and the quality checks required, being able to read multiple items simultaneously, without a line-of-sight restriction, can improve efficiency and enable faster reaction times," Davis says.

Adds Gutierrez: "This is a project that takes into account the entire supply chain — as we say, 'from vein to vein.'" The intent is to find the "pain points" that can lead to human or system errors and use RFID in a way that properly aligns the technology with the real problems.

Blood transfusion errors remain a concern in heath care. Gutierrez cited a 2005 U.S. Department of Health and Human Services report of 1,322 national medical treatment centers that together reported more than 32,000 transfusion-related adverse reactions during the 2004 year. That number is not statistically large compared to the estimated 25 million transfusions that are performed each year, he says, but any mistake can be significant in matters of patient safety. The most common mistakes included sample errors, handling mistakes in the lab, labeling problems and improper storage.

Engineering and business Professor Raj Veeramani, director of the UW-Madison E-Business Consortium that hosts the RFID research effort, says that while the team is developing its prototype RFID system for the

blood bank environment, it is also beginning work on the hospital end of the study. Along with BCW's Davis, Veeramani is the campus principal investigator of a National Institutes of Health grant that will support a partnership with several hospitals, including the University of Iowa Medical School and Mississippi Baptist Health.

The Brookfield, Wis.-based technology firm Syslogic is also a direct partner in the project. The company will be involved in identifying some of the problem points in the hospital environment and helping hospitals address those issues using RFID-enabled products.

"This project is a testament to the kind of multi-disciplinary research and technology transfer that UW-Madison is uniquely positioned to do," Veeramani says. A number of UW-Madison faculty and students lent expertise in areas such as health systems engineering, supply-chain management and wireless communications.

One completed part of the project examined the financial feasibility of using RFID together with bar codes in the blood center setting. Disposing of donated blood due to mishandling or other concerns costs more than $200 per unit, and a typical mid-sized blood center may need to discard 15,000 to 20,000 units each year. By improving the identification and quality control through RFID, the researchers estimated it could save the blood banking industry more than $9 million per year after full implementation and result in 40,000 to 45,000 fewer units of blood products needing to be discarded.

The RFID industry is only scratching the surface of the technology's potential in the health care and pharmaceutical fields, Gutierrez says. For example, the UW-Madison team is starting to assess RFID as a way to better monitor and maintain "mobile assets," such as IV pumps and other devices that doctors move from patient to patient. RFID would not only identify their locations across the hospital, but the technology can

also notify users when maintenance is needed, Gutierrez says.

"The blood supply is a very good application in my view because it's such a major part of the safety and quality of health care," he says.

Davis adds that the industry enthusiasm has grown now that some basic measures of financial viability have been demonstrated. "Tough questions such as, 'can we afford it?' and, 'is our cost recoverable?' are business questions that previously had no answers due to the number of unknowns."

Source: University of Wisconsin-Madison