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French Biobank Secures Specimens

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To improve patient care, Nice University Hospital tracks surgical samples for diagnosis using radio frequency identification.

By Bob Violino

Mar. 28, 2011—Nice University Hospital, a multipurpose public health-care institution located in Nice, France, has been working with the international Secure Communication Solutions (SCS) organization since its creation in 2005, to bring innovative technology solutions to the health-care sector. This collaboration resulted in the creation of an RFID-based system that provides greater traceability and security of samples in the hospital's biobank, a cryogenic facility that stores surgical specimens for diagnosis and prognosis, as well as for clinical and translational research.

At any given time, Nice University Hospital has roughly 57,000 biological samples stored in its biobank. Until recently, the facility relied on a manual, paper-based traceability process that involved attaching paper documentation to all samples. This process was time-consuming and error-prone, and could result in lost samples and compromised security.

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Specimens are placed in individual cryogenic tubes identified with passive HF 13.56 MHz RFID tags.

In July 2010, the hospital, along with SCS and other partners, launched the MISTRALS pilot, designed to improve patient care by reducing the risk of errors. The goal was to develop a more efficient, accurate and secure way to identify specimens within the biobank, and to track them as they moved from the hospital's pathology laboratory to the biobank.

"A key challenge for the health-care IT sector is certainly the strong requirement for data security and data management, associated with an increasing need for confidential data exchange," says Paul Hofman, the hospital's biobank manager and one of the RFID pilot's leaders. "In the MISTRALS project, we aim to [address these challenges] by ensuring the traceability and timely delivery of the biospecimen samples."

The MISTRALS trial, completed at the end of 2010, was successful, and hospital officials are now considering a much broader rollout of RFID technology for tracking medical equipment and other items throughout the facility.

Collaboration

According to Hofman, Nice University Hospital came up with the idea for MISTRALS—which stands for Mutualisation Informatique des Systémes Technologiques pour la Recherche phArmaceutique et La Santé (or, roughly translated, research on the use of information technology for pharmaceuticals and health)—in response to a call by the French Ministry of Industry to promote RFID technology in health care. Cécile Lagardère, the hospital's IT manager, says the facility received financial support from the Ministry to develop the RFID technology for the French health-care sector.

"The purpose of the project was to evaluate the benefits of the RFID technology in the human biobanking field," Hofman says. RFID offers a number of advantages over other tracking technologies, Lagardère adds, including the lack of a line-of-sight requirement, tags' ability to withstand cold temperatures and other harsh environments, long read-range capabilities and the ability to track items in real time.

After selection by a surgical pathologist, specimens in the cryotubes are weighed and frozen in nitrogen.

The planning for MISTRALS commenced in 2006, spearheaded by the hospital's biobank and managed by Hofman. The biobank department worked in conjunction with the hospital's Surgical Unit Organization and Management-Operating Theatre Sterilizing Service and the Information Systems Department. A consortium of vendors from SCS—including IBM, Psion, STMicroelectronics and Tagsys RFID—provided equipment and expertise.

IBM developed the overall system, Hofman says, in collaboration with the hospital's IS department. The company provided the end-to-end architecture for the solution, Lagardère explains, including its WebSphere middleware, which enabled the hospital to build, deploy and run the RFID application.

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Frequentiel, a French systems integrator specializing in the field of identification, traceability and mobility technologies, worked with the hospital's IS department and the vendor partners to integrate the RFID hardware with existing IT components already in place at the hospital, such as an administrative database. The company is also helping the facility to monitor and evaluate the system, as well as make ongoing improvements.

After conception, Hofman says, the project went though the typical development phases of an engineering project—initiation, planning and design, execution, monitoring and controlling. The system was tested extensively at IBM's Solutions Lab Europe, located in La Gaude, France. The decision to go live was made in December 2009, he adds, and the system was launched approximately six months later.

Once the system was developed, the École Nationale Supérieure des Mines, a French engineering school in Saint-Étienne, analyzed the RIFD data's longevity to determine if the information would still be available after several months and/or years of being archived at low temperatures. This was important because the hospital wanted to obtain a sense of how long the data would continue to be available on tags stored at such temperatures. The school's analysis, to date, shows that the information remains present on the RFID tags for no more than 12 months, and experiments are still in progress to determine if that amount of time can be extended. Hofman does not indicate for how long samples are typically kept.

How It Works

In the operating room, the specimens are placed in individual cryogenic tubes identified with passive

high-frequency (HF) 13.56 MHz RFID tags, provided by STMicroelectronics. Each ISO 15693-compliant tag has a 64-bit unique identification number. The tags, Lagardère says, are designed to provide up to 40 years of data retention and a million read/write cycles.

The cryogenic tubes are moved from the operating room to the hospital's pathology lab via pneumatic tubes—a process that takes less than a minute to complete. After selection by a surgical pathologist, specimens in the cryotubes are weighed and frozen in nitrogen. The tubes are then moved to the biobank, where they are scanned into the hospital's administrative database (via a Tagsys fixed compact RFID station in the biobank) and are then placed into long-term, cold storage on racks.

When personnel need to locate particular samples or conduct an inventory of the cryotubes, they can use handheld HF RFID interrogators to read the tags.

When technicians or other personnel need to locate particular samples or conduct an inventory of the cryotubes, they can use handheld HF RFID interrogators from Psion to read the tags.

While the pilot was largely a success, Lagardère says, there were some difficulties. The main implementation challenge, she notes, involved figuring out how the RFID system would function best in an actual hospital environment, compared with how it worked at the IBM lab.

Officials determined, for example, that the system could not be utilized in a sterilized environment, so actual interaction between readers and surgical samples could only be accomplished outside of the operating rooms. What's more, during the trial, the hospital realized the handheld readers were not ideal for the health-care environment. The devices are designed for industrial tasks, and are too heavy and large for the application the hospital is running. Still, Hofman says, the facility has no plans to change readers at this point, since the issue does not affect system performance, and there are no handheld readers specifically designed for such an environment.

Early Benefits

The hospital has tagged roughly 1,000 cryogenic tubes to date, and plans to continue tagging biospecimens over the coming months.

One benefit of the RFID system, Hofman says, is that it enables the hospital to know when specimen tubes are moved from one location to another, thereby helping the facility to keep track of them. Managers can also monitor the time it takes for a particular tube to be moved from the pathology lab to the biobank.

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"The traceability of information, both clinical and pathological data, will be excellent with this system," Hofman says, compared with the paper-based process. For instance, information such as patient name, gender, age, histological results, follow-up visits and treatment can be written to a cryotube's tag, without any risk of this information being lost.

In addition, the process allows individuals working in the biobank to save time when searching for samples, so they can focus on other activities and tasks, such as preparing nucleic acids and conducting molecular pathology experiments. The hospital estimates the RFID system provides more than a 50 percent time-savings, compared with the manual, paper-based tracking method.

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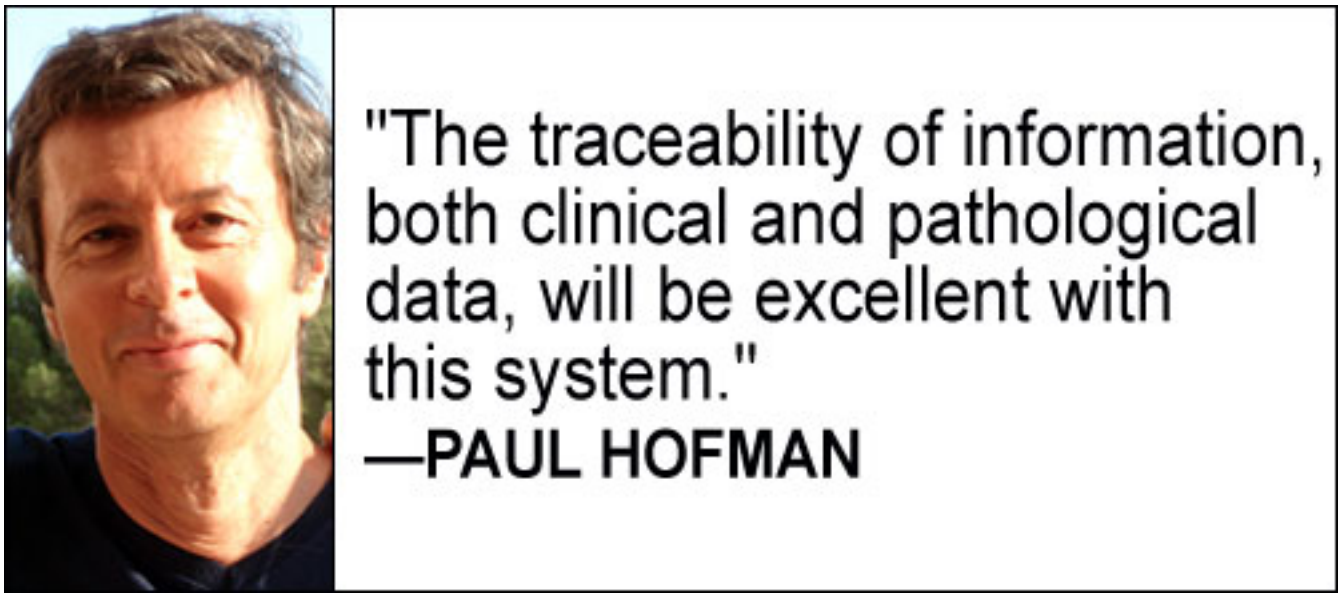

At least one other hospital in France, the Paoli Calmettes Cancer Center Institute, in Marseille, is considering employing the RFID system for tracking surgical specimens. The biobanks in the two hospitals are part of the Provence Alpes Côte d'Azur Tumour Bank network, an association of tumor banks located in various hospitals throughout Southeastern France, "and we want to extend the RFID application in biobanking through this network," Hofman states.

With the success of the initial deployment, University Hospital Nice is now evaluating the possibility of expanding its use of RFID into other areas of the facility as well, to provide more extensive tracking and tracing capabilities. "One area that needs to be addressed is asset management," Lagardère says. "Equipment is lost and stolen. The ability to instantly locate a mobile asset would have a major positive financial impact."

The success of MISTRALS has given hospital officials the necessary confidence to think big when it comes to radio frequency identification. "In 2011, we plan to expand the RFID technology [to] logistic processes," Lagardère states. "From the logistic platform to services, every delivery will be traced."