Stock management of implants through RFID technology

ABSTRACT

The Complexo Hospitalario de Ourense [Ourense Hospital Complex] has carried out a proof of concept for an innovative system, based on the use of Radio Frequency Identification (RFID) technology, to optimise stock managements of implants. This case study describes its scope and results.

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Background

Stock management of implants consigned to hospitals through a supplier is considered to be a task for hospital purchasing managers. However, there are other parties involved to whom the functional and financial importance is of interest. These include: the supplier, who has a business relationship with the hospital and over time keeps track of restocking the material used, and continually reconciles stock and invoicing; the surgeon and nursing staff, who need information regarding stock to plan operations and who after using said materials are responsible for entering the information in the patient's medical records; the purchasing staff, who must keep track of the stock, its use and the allocation of a product, to validate payment and close the circuit of traceability which is required for implants by law.

Proof of concept

The *Complexo Hospitalario de Ourense* [Ourense Hospital Complex] has carried out a proof of concept for an innovative system which satisfies the abovementioned requirements. This trial is based on the use of Radio Frequency Identification (RFID) technology. Now completed, it is a good time to discuss its scope and results. The Chinese proverb "*The longest journey beings with the first step*" is perhaps more appropriate than the technical and commercial disclosure of its achievements.

The system is based on two fundamental points: the development of the *Servizo Galego de Saude* [Galician Health Service] management system and the recurrent monitoring that this Hospital Complex in particular carries out of third party warehouses. Without these premises, developing this type of application would have an infinity of needs leading up to its implementation, demanding more urgent, less comprehensive solutions. The test carried out is a reflection of the attitudes adopted by the organisations which aspire toward improvement insofar as their basic needs have been covered.

Optimising stock management processes

The project provides a systemic approach to all the processes it covers. Although it can be improved in terms of efficiency and information requirements, the test carried out ensures that, from a technological standpoint, all the technologies involved have been successfully integrated.

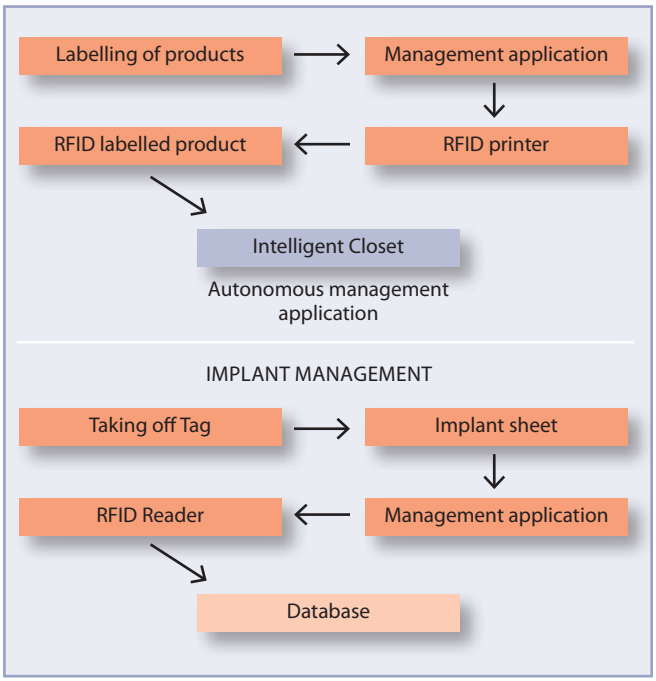
When an item with these characteristics is received by the hospital, the warehouse management system enters the products into the specified database assigning a unique code to each product which serves as a unique key for the rest of its attributes (GS1 Identification Key, expiry date, lot number, serial number, etc.). There are three ways of entering this information: by manually entering all the item's data and variables into the system; using a barcode reader capturing the GS1-128 bar code; or by way of an EDI DESADV message (Electronic Data Interchange – Despatch Advice). Once that data interchange is defined, the management application sends it to the RFID unit where a label is printed, a Smart Tag, and is stored in its memory, entering it into the database as a product stored in the warehouse in an intelligent closet, which as far as the system is concerned, is seen as another sub-warehouse.

The intelligent closet

The intelligent closet is a clinical cupboard, made of stainless steel and managed by controlled-access RFID technology in which more than 230 articles can be stored.

Inside, 6 antennas have been suitably placed, which are run by an RFID reader through a multiplexer. The application that manages the closet also allows it to be accessed with a personal ID card, read by a RFID proximity reader, and once access has been validated, the closet opens. The access is recorded. Once the doors close again, a switch activates the Smart Tag reader which identifies each item through a reading cycle using the antennas.

The information obtained is compared with the previous reading, and the replacements or removals made are recorded and stored in a temporary file for the person who entered the closet, including the date, time, movement of items, etc. Each time the closet is closed, it performs a complete inventory in 30 seconds, updating the stock.



Surgical procedures and medical records

At the same time, if an operation is planned which will involve devices stored in the warehouse, the clinical database is accessed and the patient's details and medical record number are imported and recorded using RFID in another Smart Tag. This is attached to the implant sheet and brought into the operating room with the rest of the patient's documentation.

Once the surgical procedure has been completed, the Smart Tags of the articles used are attached to the implant sheet and using a desktop computer RFID reader, all the products used during the surgical procedure are entered. The information is then stored in another temporary file which must be reconciled with the file containing the information about the items taken from the closet.

Immediately after an item has been entered into a set of medical records with an RFID label reader, the product is considered "consumed" and the tables that reflect this movement are updated in the purchasing department.

Reconciliation

Once a day, outside of working hours, the system launches a reconciliation and inventory process, performing several

readings of the items stored in the closet to thereby obtain a 100% accurate count of stock. Using this information, it updates the quantities on which the next movements will be based and reconciles the removal of goods against the information from the implant sheet readings. The differences are then dumped into another file allowing the management systems to validate their use and pinpoint their origin.

When the whole process has been completed, the supplier has a list of items to be restocked and the current stock in the closet. This information is available within 24 hours, by way of EDI, which can be accessed on the Internet. With this information, the entire cycle of replenishing, invoicing and restocking can be started.

Conclusion

As the current project stands, it would be premature to call this a pilot test, let alone a successful case study. Nevertheless, this trial has demonstrated that RFID technology is reliable enough to consider solutions of this scope, and that integrating management systems and technology does not requite great effort. Accurate, trustworthy information can be obtained without the decisive intervention of the user.

It is important for this project to continue, due to the financial value of the resources it watches over and the challenge it involves. The aesthetic and design elements of the closet should be improved mechanically, minimising reading times and costs. One RFID reader should be able to control several closets. A display should be added, so the surgeon does not have to open the closet to find out what is in stock. A "0 series" should be achieved, both in its production and in the application that manages the process, so it can become an industrial product.

ABOUT THE AUTHOR

Benjamín Rodríguez Nespereira (Industrial Technical Engineer) is Assistant Director of Financial Resources of the Ourense Hospital Complex and Manager in the Galician Health Service Logistics for an Innovation Project based on the use of automatic identification technology and electronic transmission (Barcodes and EDI messages). He is Professor of Health Logistics at the Galician Health Public School Foundation. Mr. Nespereira is currently the president of the Health Sector Committee of GS1 Spain.