

Management Summary

Radio Frequency Identification (RFID) in Health Care

A consortium comprising the *Academisch Medisch Centrum* (AMC) at the University of Amsterdam, Capgemini, Geodan Mobile Solutions, Oracle and Intel have implemented and co-financed an unusual and ambitious project: RFID application in Health Care¹. In the period between September 2005 and January 2007 three pilots were designed, carried out and assessed. The project has demonstrated the potential added value of applying RFID to health care. This summary illustrates the valuable experiences and learning points acquired during the three pilot projects.

Applying RFID in health care: an ambitious, valuable undertaking

By combining three RFID applications (people, materials, blood products) in an extremely complex, high-tech environment (Operating Room complex, Intensive Care, and Blood Transfusion Laboratory), the level of ambition was very high for the pilots. Both during the detailed design and the implementation of the pilots the requisite adjustments were made to cope with any complications that arose. The consequence was that the project's budget and time was exceeded considerably. In the end, however, the three pilots provided extremely valuable insights.

Keeping track of people

By equipping people with active RFID tags, both patients and medical staff could be followed as they moved through the OR complex and into the IC. This made possible a more detailed and reliable recording of the processes involved in an operation. What is more, it appeared that there is an opportunity for reduced administrative transactions. Patient safety is directly influenced by the linking of the patient's name and date of birth on a screen in the OR. Indirectly, the patient's safety can in time be increased by having better insight into staff movements, particularly during operations. This insight should lead to specific process improvements aimed at a reduction in those movements, which in turn is expected to contribute to a reduction in the risk of infection.

Keeping track of materials

Keeping track of the circulation of materials around an OR gives direct insight into the consumption of those materials at the level of an individual operation. Keeping track of materials with RFID at the level of an individual product is still hardly done, even outside health care. For this reason this pilot has acquired the nature of a *proof-of-concept*, that has been completed successfully. Great progress has been made in the detail level and reliability of the recording, without incurring a significant increase in administrative tasks. Such detailed recording makes further optimisation of the logistical process possible – for example, by reducing consumption and levels of stocks. This makes a case for the introduction of RFID throughout the supply chain of medical materials. Any mistakes in preparing materials for an operation can be noted

¹ The project was carried out at the request of the Dutch Ministry of Health, Welfare and Sport, and was financed in part by the Ministry of Economic Affairs as coordinator of the Statewide IT Agenda. Matching funds and resources have been provided by the consortium partners themselves.

immediately, thus preventing unpleasant surprises during the operation. However, the latter was not implemented in this pilot.

Keeping track of blood products

In the context of European legislation, it is becoming necessary to keep continual track of blood products within the hospital. The application of temperature-sensitive RFID tags offers a solution here: they can easily be attached to the blood bag and read out. The use of active RFID tags makes it possible to locate a blood bag. In addition, after being used in the OR and IC it can easily be ascertained which blood products have actually been used up, which will also increase the completeness and reliability of the transfusion record. Thanks to better insight into the actual consumption of blood products, the logistical process can also be optimised. In addition, it will be possible to assess the conditions under which returned blood products have been kept, thus increasing the percentage of re-usable blood products. The effect is expected to increase when the application is extended to the whole transfusion chain. An added benefit will then be a reduced registration workload when receiving the material in the hospital. However, further research is needed into the relationship between the ambient temperature, the temperature recorded by the RFID tags and the actual (core) temperature of the blood products.

Increased accuracy thanks to RFID

The combination of the three pilots is providing a number of additional advantages. Firstly, the OR can be given a clear warning on the monitor screen if the blood products present do not accord with the patient. The OR staff think this is a positive development. Secondly, the linking of the materials to the patient is beneficial: if defects or problems with materials are noted afterwards, it can quickly be checked what patients these materials were used for. These patients can then be invited specifically for an examination at the hospital.

Learning points usable for future research

From the technical viewpoint, the project encountered a number of setbacks and gained a lot of experience. Below is an overview of the valuable learning points that came to the fore during the three pilots.

Risky interference

The traditional passive RFID technology selected in this project proved to be impracticable in the direct surroundings of medical equipment. The more modern active RFID technology can better be used, provided precautions are taken carefully. It proved impossible to exclude risky interference between RFID signals and medical equipment, on the sole basis of technical and scientific literature. Specific tests have been carried out to investigate such interference. With the insight provided, a number of technical and organizational measures were taken to prevent risky interference. In this way RFID signals could be kept at safe distances from medical equipment. All the measures taken have meant that during the pilots there was no form of interference of any kind between the RFID devices and medical equipment.

Variable acceptance

Patients have not raised any issues regarding their wearing RFID tags, in part due to careful education. Only a few individuals have refused to participate in the pilot. The acceptance among personnel was much more differentiated. Some groups were rather suspicious as to the way in which the collected data would be put to use. Others participated enthusiastically right from the start.

Very modern technology requires extra attention

The use of very modern technology requires extra attention during the installation, tests and implementation. A lack of experience caused unanticipated problems. Looking for the cause of these problems was hindered by limited access to the OR complex. In addition, there was no representative test room available to put the whole RFID installation through thorough testing, before installation in OR and IC. As a result, the time between making changes and noting their effects sometimes increased considerably.

Sharp project management essential

The project would not have been possible without the active involvement of a good internal project leader who knows the structure and culture of the organisation well. The internal project leader can, even informally, drive the different groups involved in the process towards success. Support from the top of the organisation, including the medical staff, the employees council and the board of directors, certainly proved to be essential with regard to the people pilot. Furthermore, anticipating possible consequences and early but well-dosed communications about the project and the specific role that those involved have to play were indispensable factors in the project's success.

RFID in health care, the first step has been taken

The conclusion is justified that RFID technology and its application in the health care environment is certainly not a simple standard application, but the possible benefits of it in the fields of transparency, patient safety and efficiency are absolutely worth the effort. A clear added value for the application of RFID in health care was demonstrated with these pilots. By means of a business case, it was possible to show how costs and benefits could be in proportion in a broader implementation. However, to simplify the application in the future, further research is needed on a specific number of topics, including the temperature relationships mentioned earlier. Thereafter, the challenge will principally be in analysing the data made available by RFID and to deploy them in substantive process improvements.

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