RFID - Call for Mobilizing Ideas
Project "Safe and integrated transfusion process" Safe transfusions and total blood traceability in the ward thanks to RFId technology

Introduction

It has been recognized that blood transfusion errors remain under-reported owing to a lack of awareness about transfusion-related adverse events among the hospital staff and inadequate feedback system in most of the transfusion centres[1]. As also the authoritative Serious Hazards of Transfusion Programme (SHOT-UK Scheme) highlights, the main risk of transfusion adverse events is mainly process-related rather then infectious: while infective risk related to transfusion is sinking more and more as a result of ever increasing past expenditure of blood safety, less attention has been paid to improving the safety of the transfusion chain within hospitals[2], although there are many critical points in the transfusion chain.

The Istituto can be considered a forerunner in the usage of RFId in the European hospital sector, as it is moving towards RFId technology in many clinical areas (blood transfusions, tissue bank operations, general patient identification,..).

Background and AsIs process description

The Institute's Transfusion Centre (SIMT) belongs to the Department of Experimental Oncology and provides blood bags and other services to all other wards. The staff dealing with the transfusion process consists of six laboratory technicians and six biologists/doctors.

Each transfusion uses a bag containing the blood component required by a specific patient, and is prepared according to a precise procedure. A label is affixed to the bag, showing all the necessary information, and then the operator does a final check and sends it to another operator who takes it to the destination ward. On arrival, a doctor supervises the transfusion, as it is carried out by a qualified nurse, and records on the patient's notes the transfusion. The basic architecture consists of three information systems: the analytical laboratory (DN-web), the central clinical and health system (legacy), and the application which controls all the regional transfusion organisations (EmoNet). However, the three systems do not operate in an integrated way. There is also a lack of detailed reporting on the final part of the process: for example the Transfusion Centre had no informations about the status of the units delivered (if transfused, if stored in the ward, if wrongly issued and so on). In fact the analysis now in progress both in the Istituto and in Niguarda Hospital[3] on

[1] Sharma, Kumar, Agnihotri, Source of preventable errors related to transfusion, Vox Sanguinis, 2001,(81):37-41

[2] Stainsby, Russell, Cohen, Lilleyman, Reducing adverse events in blood transfusion, British journal of Haematology, 2005, (131):8-12; Murphy, Kay, Patient identification: problems and potential solutions, Vox Sanguinis,2004,87(Suppl.2);S197-S202; Murphy, Staves, Improving the safety of blood transfusion by re-engineering the hospital transfusion process with patient ID systems, John Radcliffe Hospital of Oxford, June 2001.

[3] The Ospedale Maggiore Niguarda "Ca'Granda" is the leading hospital in Milan since 1939. It is national reference hospital for emergency events and the only regional point of care qualified to perform any kind of tissue and organ transplant. The Hospital has 1.540 doctors and 740 nurses, 54.000 yearly admissions (both ordinary and Day Hospital) and 3 millions First Aid Station treatments.

the transfusion process point out some critical points, that can be summarized in three key topics:

- Lacks in process controlling capability due to poor information record and communication within actors belonging to different departments;
- Absence of fast, safe and unambiguous identification system for patients, sample tubes and blood bags;
- Paperwork and manual activities scarcely supported by existing IT systems.

As a consequence of these considerations, from October 2005 to December 2006 the corporate management of the Istituto set the objective of reengineering the transfusion processes, using RFId to provide traceability in the interests of safety and efficiency; so, a pilot project has been implemented in the Allogenic Bone Marrow Transplantation Unit (TMO), a new ward belonging to the Department of Oncology since 2001, which represents one of the excellence Departments of the Istituto.

Working with Fondazione Politecnico di Milano and HP, the Istituto's ICT staff implemented an experimental RFId application, which allows the interaction of two existing compartmentalised systems and supports the operators involved in the transfusion process. The results of the pilot project have been surprising: managers are well impressed about the quality and quantity of information, which makes the processes efficient and well supervised, guaranteeing a high quality of service to patients. Also medical staff and nurses feel quite comfortable with the system; the System Usage Rate is a particularly meaningful indicator among those recorded in the panel established for process monitoring and ROI evaluation: the mean rate has shown above 90% from the fourth month of testing, drawing near to 98,4%.

The new great project for transfusion traceability – How it will work (see Figure 1)

Because of the excellent results from the pilot project, culminated in the IDC EMEA 2007 Award for ICT Innovation, the Istituto will receive a new round of funding from the regional government for a 2-year initiative to extend the solution to the entire cycle of transfusion, to evaluate the applicability to tissue banks[4] and to collaborate with other hospitals in Milan (like, for example, the Niguarda Hospital), which the regional government is pushing to adopt the same model.

As a matter of fact, the the new phase of the project will aim at:

- Mapping transfusion processes in all involved Institutions and developing a high-level parametrical application model of high significance, that can be customized through parametrization;
- Reengineering the RFId pilot application, including new functions (like tracing of blood sample tubes in order to close the entire loop of transfusion), improving system integration with the laboratory application (DN-Web) and the regional blood bank network information system (EmoNet), implementing a WiFi network to enable real-time synchronization of data between servers and handheld devices;

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[4] Total traceability of surgical specimens from the operating table to the Oncological Tissue Bank: improved control over a time-and temperature-sensitive items and better (collateral project).
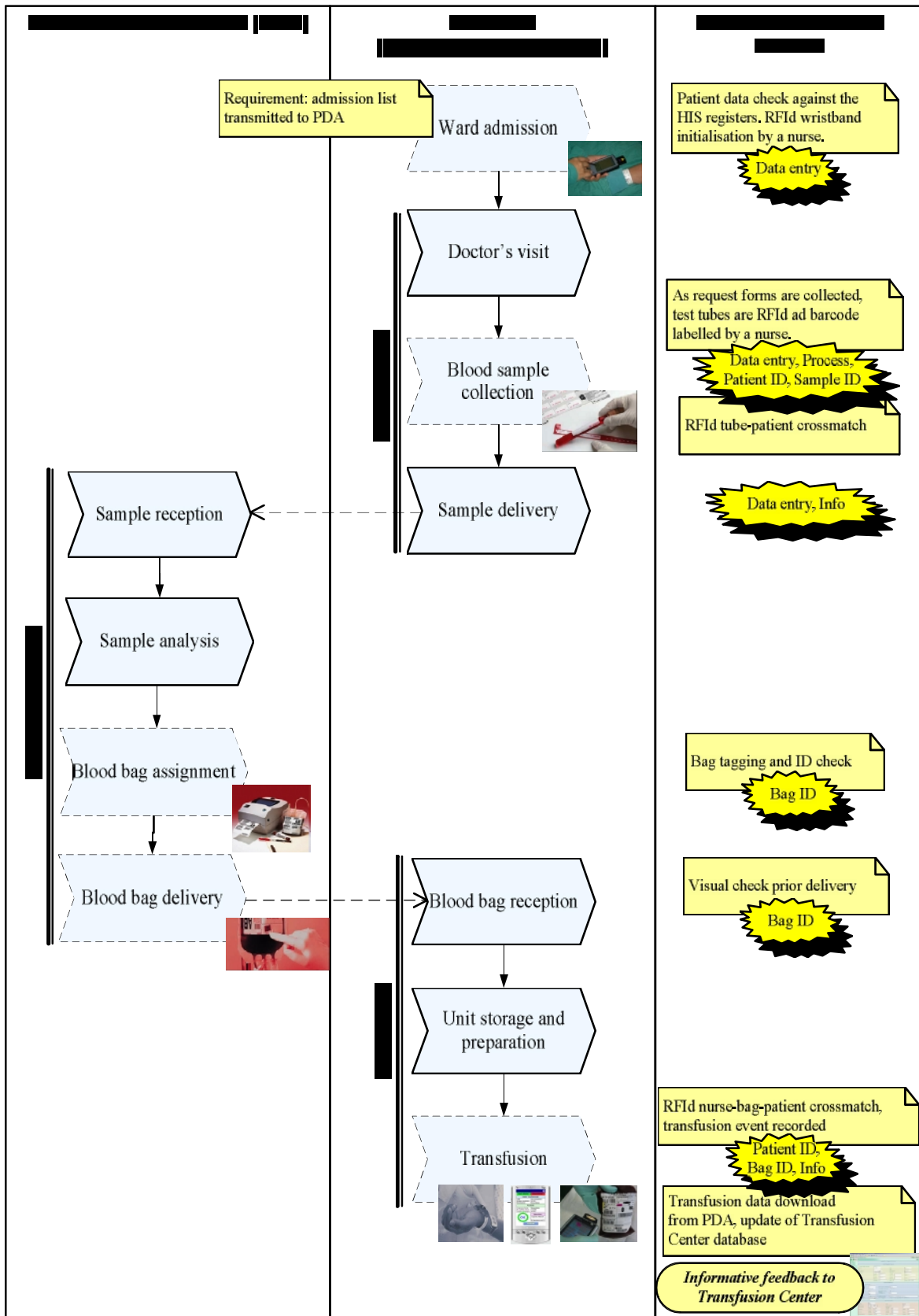
Figure 1: Diagram of the transfusion process being reengineered, with planned actions and critical issues being solved.

(Legenda: Data entry: manual data entry; Info: information not being recorded, or stored locally without forwarding to other actor, ID: univocal and safe item identification problem; Process: process improvement potential to be exploited)

- Validate the achieved results extending the reengineered RFId system to the entire Transfusion Department of the Istituto (i.e. to apply tags to all 13,000 blood bags dispatched every year) and also to selected wards of other partner hospitals in the Region.

All professionals (especially nurses) in the selected wards will use the system (as TMO ward staff is still doing with the pilot system implemented in 2006). When patients are admitted, their names will be checked against the data in the registers of the central information system by using handheld terminals, fitted with both RFId and WiFi antennae. The nurse then will give the patient a wristband and will initialise the tag bedside, so that the patient can be safely identified. After blood request forms are collected, a nurse will affix both RFId and barcode labels on the blood test tubes, and proceed to sample collection: each specimen will be checked by a crossmatch between the tag on the tube and the one on the patient's wristband.

Doctors and operators then will use PDAs to transmit and acquire information, by means of RFId labels affixed to each bag by the Transfusion Centre as it is assigned. The nurses receiving each bag will use their PDAs to record the time of arrival and read the patient's wristband to match the data, thus ensuring that the correct transfusion bag has been received. The transfusion operator also will use the PDA to identify himself by means of a badge, and then continue with the procedure, recording both the starting time and the finishing time of the process, together with a set of useful data relating to it. The new RFID system will make transfusions absolutely safe: if there is a conflict between the data read from the specimen or from the bag and the patient's wristband, the system immediately will issue a visual and acoustic alarm, and halt the application (thus covering two phases which are proven to be the most common source of error).

Staff in the Transfusion Centre will be also able to receive electronically information from the ward about the transfusions performed (near-miss events, messages from the doctors or nurses, reasons for misuse..) and to monitor the status of delivered blood bags. When the patient is discharged the staff is responsible for deleting information embedded in the disposed wristbands.

Measurable and sustainable results aimed and innovative formula of the project

1. The solution needs to reconcile a high degree of safety with a technology that is non-invasive neither for patients nor for staff, and which is also easy to deal with, because it will be used by all the health personnel involved;
2. With the assistance of Fondazione Politecnico di Milano (project manager, consulting and technology assessment partner) and Hewlett-Packard (technology partner), the Istituto Nazionale Tumori will be able to combine know-how, best practice and coherent methodology to draw up a high quality pilot project;
3. The project will succeed in supporting the information flow all over the process, creating a link between applications which were completely non communicating and enabling process control;
4. The change management activities and the user-friendliness of the application will continue succeeding in rising great user interest and high usage rates;
5. The initial experimental use of RFId technology with a primary focus on traceability, process safety, compliance with procedures and immaterial benefits will now be deepened with actions targeted at other key elements like efficiency and cost performance improvement;

6. The use in the Italian Healthcare sector of new technology focusing on the enabling role of Information Technology on process governance instead on the diagnostic aspects of technology (machinery);

7. The challenge of developing a comprehensive application standard model for process management and operations running, which can be diffused at a regional scale.

In accordance with best practices in the management theory, the project team is establishing a complete KPI (Key Performance Indicators) panel for process monitoring and benefits evaluation. The schema in Figure 2 shows the high level map used to develop this panel, distinguishing material from immaterial benefits.
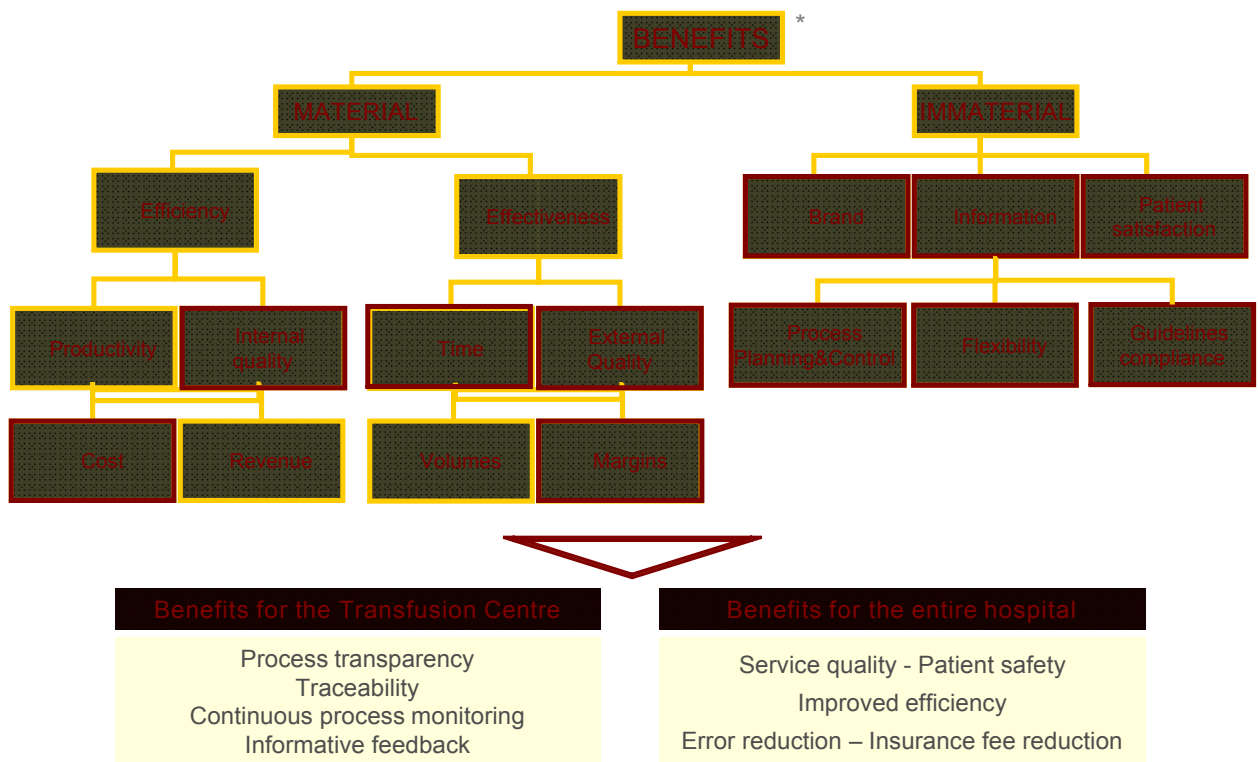
Figure 2: Key performance indicators map. Highlighted (in dark frames) the benefits achieved