INSTRUMENTS TRACEABILITY BY RFID: IS IT EXECUTABLE???

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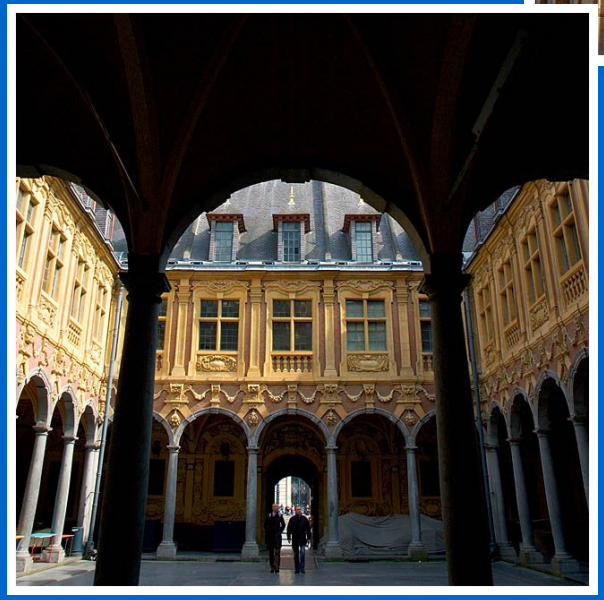
Lille : European Capital of Culture in 2004



Lille’s CHRU :

70 hectares
about 3000 beds
90 operating rooms
12000 employees

The department performs the sterilization for 70% of the hospital :

- Per day about 500 trays

and 1500 single instruments

- 48 employees
- 9 steam sterilizers
- 4 washer desinfectors
- 1 multi chamber washer
- 1 washing cabine

Our projects :

- Construction of one CSSD for the CHRU and 5 other hospitals of the neighbourhood.
- Capacity = 44m^3 / 24H including about 1000 trays
- Expected opening 2011

Traceability management in our CSSD :

Before 2006: with pens and paper!!

Necessity of a computing system for traceability and above all production management.

Goals:

- *To improve production management :*
  - *To quantify activity,*
  - *to have a thorough knowledge of trays' turnover,*
  - *to adapt workforce to the activity…*
- *to be* self sufficient *for the composition of trays*
- *traceability it self : in France proof must be provided for each tray or instrument that it has been processed according to the rule*

The different steps:

- Choice of the software: SEDISTE® (SEDIA)
- Choice of the material(equipment): 28 computers without keyboard nor mouse (especially in the washing zone and the clean zone)
- Choice of the support of traceability:
  - Bar code
  - Datamatrix
  - RFID
- Setting up in two phases:
  - trays' traceability
  - instruments' traceability

Choice of the support of traceability :

- Freedom regarding to the software which can work with any type of marking
- Choice between:
  - Bar code
  - Datamatrix
  - RFID

	Assets	Inconveniences	Notes
Bar code 	basic Low cost	Only identification unreadable if water, dirtyness Reading in the axis	Fitted for trays Unfitted for instructments
Datamatrix Made by laser or drill 	Low cost (a lot of new instruments are now sold with a datamatrix code for the same price) Can be made in the CSSD Cost of the drill machine = about 15000 euros	Only identification Hard to read Reading time unreadable if water, dirtyness	
Infodot (datamatrix self adhesive)	Low cost (1 euro each)) Easy to install	Idem unsticking, using up	
RFID 	Data storage Quick Reading by contact	Cost : expensive Tag for tray: 4 euros chip for instrument = 6/7 euros : a chip should be sealed on each instrument. instruments have to be sent in a factory (4 days)	Writing and rewriting in the memory are possible. (100000 cycles)

RFID: what is it ???

- **Radio-frequency identification** (**RFID**) = automatic identification method relying on storing and remotely retrieving data and using devices called RFID tags or transponders.
- An RFID tag = object that can be applied to or incorporated into a product, animal, or person for the purpose of identification using radiowaves.
- Some tags can be read from several meters away and beyond the line of sight of the reader.
- Most RFID tags contain at least two parts.
  - an integrated circuit for storing and processing information, modulating and demodulating a (RF) signal
  - an antenna for receiving and transmitting the signal.
- RFID tags come in three general varieties: *passive*, *active*, or *semi-passive* (*battery-assisted*).
- Passive tags require no internal power source, (they are only active when a reader is nearby to power them),
- semi-passive and active tags require a power source, usually a small battery.

Different sorts of RFID tag :

- Low-frequency :
  - LF: 125 - 134.2 kHz (reserved for animals) and 140 - 148.5 kHz
- high-frequency : HF: 13.56 MHz
- Some standards have been made regarding RFID technology especially ISO 18000

How does it work???

RFID's technology

software

Module
Reading/writing

TAG

Module* Reading/writing =*link between software and tags

Application ⟷ **Devices**

one TAG RFID is linked to one object

Our choice = RFID

- Marking of trays= plastic tag RFID choosen for
  - easiness
  - speed reading
  - low frequency 125KHz
  - storage of data
- RFID readers (pens)


Bloc ccv
carotide 1

video

The RFID tag is read at each step of the process:

- No need to touch the tag with the reader (reading at a distance of 10 cm)
- even on wet or dirty tags
- On the tag the name of the tray and the owner department is written

Evaluation of use of RFID tags on trays after 2 years :

- positive
- easy
- Quick, rapid
- The only problem :reader linked on an USB port = not secure (disjunctions)
- Attempt with a reader without cable: OK

RFID is successfull for trays‘ traceability

- Step 2 = settle a RFID transponder on each instrument

Why instrument's traceability :

- French rule on the health safety (security)
- Improvement of instruments management :
  - In the CSSD : it becomes easy to reconstitute the trays even with less qualified people
  - In the operating departments: gives knowledge about instruments 'turnover (Losses, repairs….)

Why RFID??

- Because successful for trays
- Data storage (2Kbits) reading, writing and rewriting
- Life time (the same than instrument)
- Same readers for trays and instruments
- Speed reading
- As an innovative project it benefits from EU aid grant
- Now providers of orthopedic equipments and implants are beginning to tag their devices with RFID

issue??

- Lack of experience and studies in the field of sterilization

- Lack of interested producers
- Cost
- How settle a RFID tag on each instrument ??
- Find an RFID tag which can resist in sterilization environment : high temperature, high pressure, ultra sonics, baths in detergent disinfectant oft repeated…..

first experimentatio

- Metal tag manufactured by MBBS
- = the only one on market prescribed for instruments
- = the only one on market which can resist in sterilization environment
- the chip (and antenna) is in a watertight steel protector
- ø 7.4 x 2.6 mm

- low frequency (125KHz)

- Have to be attached by sealing to the instrument (in a factory)
- Experimentation on 2 brain surgery trays which our employees didn’t use to reconstitute

Need of working on with users (surgeons):

- To determine tag location on instrument
- Marking management
- Trays composition : keep out old and/or non often used instruments
- Don’t forget to tag spare instruments in of loss or during repairing….
- For the new instruments: producers should be able in the future to sell tagged RFID instruments

Balance:

Positive:

- Possibility of recomposing the tray without particular education (not only with RFID)
- Easiness of reading : RFID tag clearly visible
- Reading time :

  example : tray with 40 instruments = 1 min 45

Negative:

- leaving the instruments 4 days to seal the tag in a factory
- if loss or damage: no tagged instrument to substitute
- new instruments should be sent too to the factory to seal the RFID tag
- Cost 6/7 euro per instrument

Positive:

- Productivity improvement by saving time :
  - comparison's times shows really shorter times for recomposing a tray of RFID tagged instruments

  Example tray with 40 instruments unknown for the employee (except ordering in the tray)

  RFID : 1 min 45

  Datamatrix : 3 min 30

  without any coding : 20 minutes

- Quality improvement : less errors in trays recomposition
- Saving time for the education of new employees

- Saving costs:
  - Trays can be recomposed by less qualified people
  - Better knowledge of instruments turnover leading to purchase optimization

but……

- Impossible to seal tags ourselves

⇨In manufactories (instruments producers)

- It lasts 4 days between sending and getting back instruments
- Impossible to send all in one time
- Planing to tag spare instruments
- Cost 6-7 euros for each instrument
- We have 2600 trays and ??? single instruments….

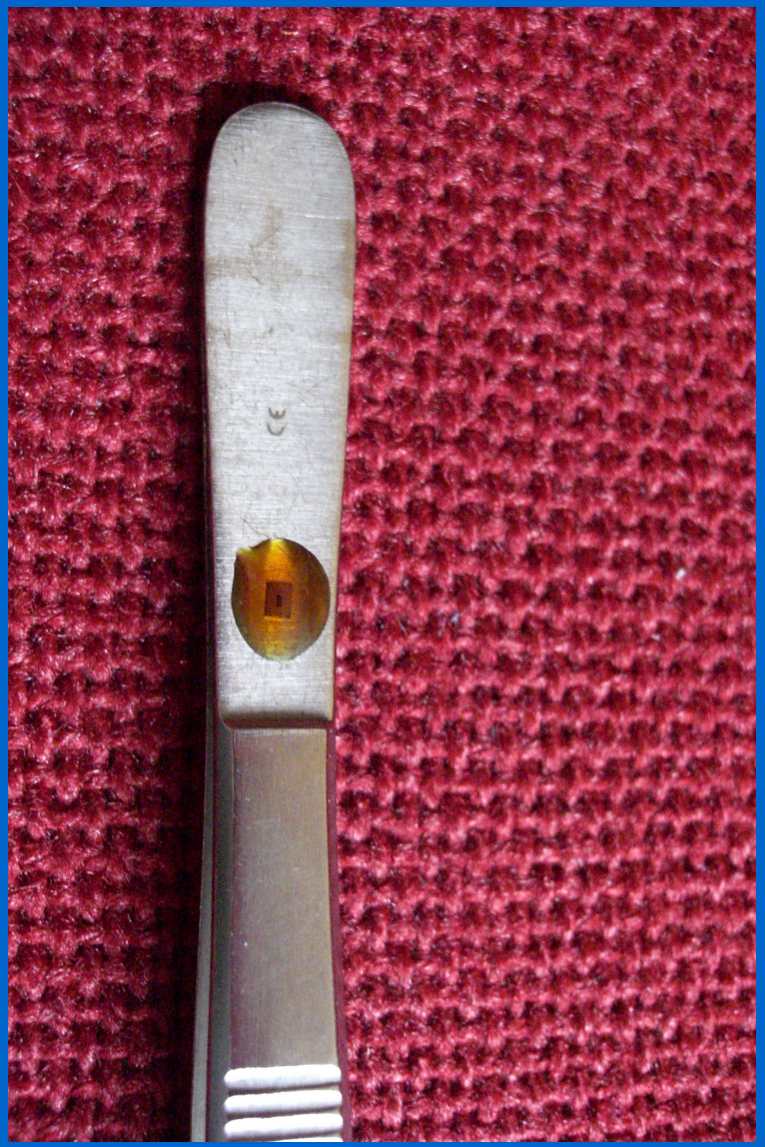
- **Conclusion : very hard to manage in a large CSSD , but much easier in a little one or for specific trays**

- A lot of advantages but 2 major inconveniences:
- Compulsory return at the manufacturer = impossible to manage it in our hospital
- Cost (The major part of the cost is represented by logisitics)

- So comes the idea for a new experimentation….

2d experimentation:

- Ask chip producers to help us to find a solution to link the RFID tag (or chip) ourselves in the CSSD (no sealing)
- Idea = to stick
- Issue: glue is generally removed by ultrasonics
- trials with different types of glue (1 or 2 components)
- chip 13.56 MHz



Results:

- trials with differents types of glue from different fields (aeronautics, space shuttle…) ⇨ planes'wings are now stuck but it's impossible to find a glue which can stand the test of ultrasonics and sterilization process

(because of inoxidizable steel)

Conclusion:

- instruments traceability with RFID tag : it works !!
- Assets compared to Datamatrix :
  - Life time (2500 cycles = about 10 years)
  - Data storage
  - Easiness of reading ➡➡ saving time
- RFID is THE way of coding for the future in the field of sterilization just like it is now the main way of coding in other fields (industry, logistics, supermarket distribution…..)

Conclusion:

- Issue: it is too soon in the field of sterilization
- we have to find solutions to link the RFID tag with the instrument ,
- it seems impossible to consider for instruments that we have already bought
- for new instruments : if we all ask producers to provide RFID tagged instruments , it should be workable
- For now it remains a good experimentation with a huge comer for the future.

- For the future = let's imagine different ways of coding in the CSSD (RFID for new instruments, Datamatrix for those we had before, …) and different readers
- For our hospital we made this decision:
  - Datamatrix (we have bought a drill machine for our instruments)
  - We go on to ask producers to market RFID tagged instruments

Thank you for your attention !!!

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