KU LEUVEN

Material Handling : tracking & tracing

Use of barcodes and active or passive RFID labels in the optimisation of logistic care processes.

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Material handling : full traceability through the use of information as defined in GS1 standard

The information required for a full traceability in the entire supply chain from raw material tot endproduct and up to the end-user is available in a standardised way in the barcode or linked with an RFID-tag.

Different kind of information can be stored:

- **GTIN : global Trade Item Number :** for the identification of a pharmaceutical product (individual and secundary packaging)
- **GLN : global location number** : identification of legal, physical or functional locations (eg. addres of hospital or care center, storage location ..) .

Material handling : information as basis for traceability (next)

- **SSCC: Serial shipping container code** : unique identification of the logistic unit (eg.pallet, colli..)
- **GSRN : global service relation number** : identifies an agreed service between the user (patient) and the supplier (doctor)

EG. A patient receives a unique number when admitted in the hospital which will be used to link all information with his electronic file during his stay in the hospital .

On top of these, other attributes such as lotnumber, serial number ,bestbefore date can be stored in the barcode and made available through simple scanning, avoiding errors .

Material handling : tracking and traceability by using barcodes – different types of barcodes

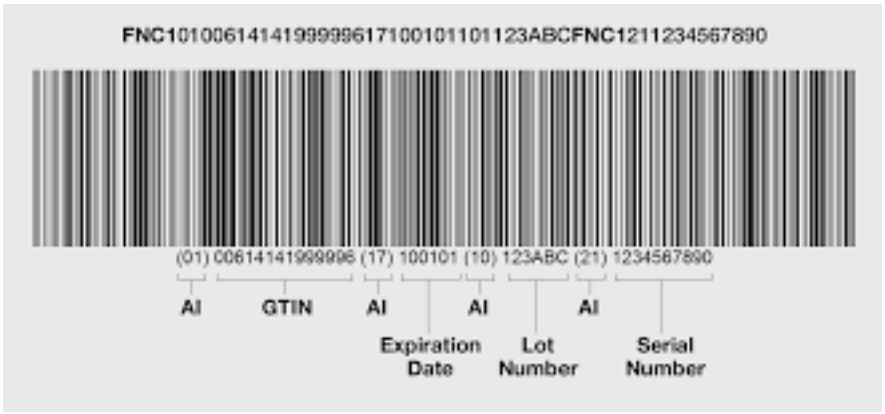
- EAN-13 : linear barcode, contains only GTIN and used for primary packaging of medication boxes
- ITF-14 : linear barcode mainly used for direct printing on cardboard boxes, contains only GTIN

- GS1-128 : linear barcode with GTIN,GLN ,SSCC or GSRN information as well as lotnumber and bestbefore date ; mainly used for implants

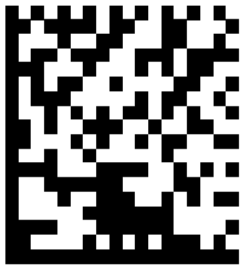
- GS1-Datamatrix : 2-dimensional code, very compact, square shaped and may contain up to 2335 alphanumeric data or 3116 numbers

Type of barcodes – retrieving the information by scanning the code

EAN 14



GS1 128



GS1 datamatrix

Material handling : tracking and tracing

Use of – RFID tags : active and passive tags

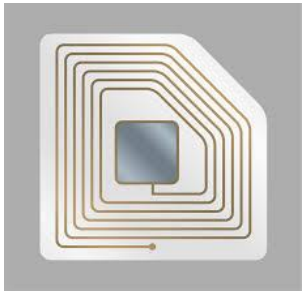
- Dependent of the application an active or passive RFID-tag will be used. Active RFID-tags contain an internal battery making it possible to work independant of an external energy souce whereby the tag can be read over bigger distances from the reader

- Passive RFID-tags have no battery and can only be read when activated by a radiofrequency field of a nearby reader. The distance for the read-out of the signal is limited
- Semipassive RFID-tags have a battery which is only used in the neighborhood of an RFID-reader and are mainly used for tracking of goods with a relative high value.

Material handling : tracking and tracing

Use of – RFID tags : active and passive tags

- RFID or Radio Frequency Identification :



passive RFID-tag

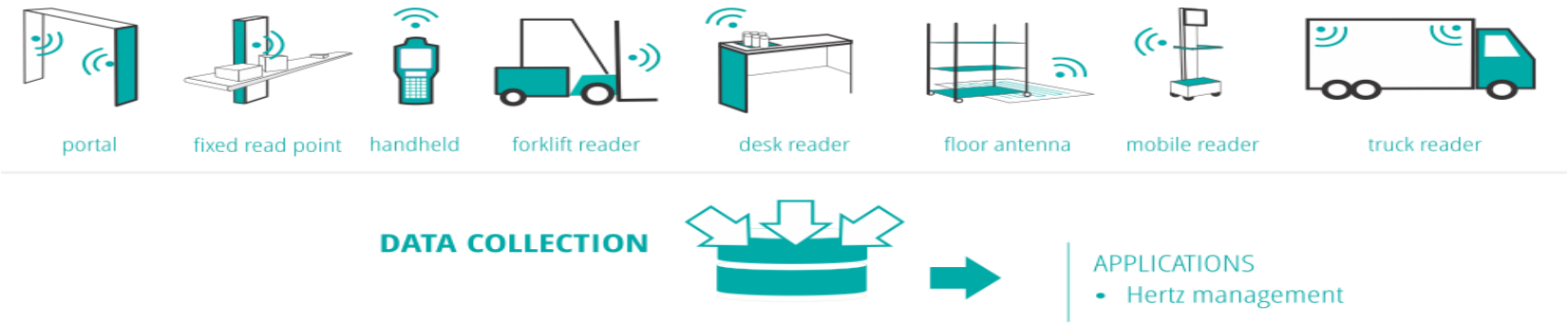
active RFID-tag

Material handling : tracking and tracing of materials

Possible applications with barcodes and RFID-tags

1. management of material flows, stockmanagement and automated replenishment
2. Management of patient safety, child abduction safety, safeguarding against patient flight
3. Inventory control and registration of the use of expensive implants
4. Full traceability from manufacturer to end-user with possibility for a quick recall
5. Use of scanning (people, medication, patient) in safe medication administration
6. Use of passive RFID-tags in the management of the flows of professional clothing

Different ways of reading an RFID-tag in the supply chain



Automatic reading when passing a portal : eg. exit of a storage room

Reading on a transport belt

Using a handheld scanner device or mounted on a forklift

Automatic detection with a desk reader

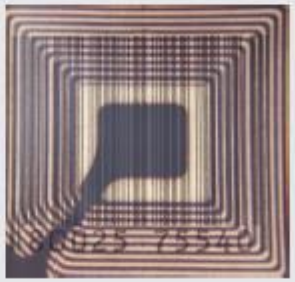
Detection of the signal with a floor antenna or a mobile reader mounted on a cart

Mounted in a truck, used for online localisation of the truck and monitoring parameters of the load such as temperature

Stockcontrol and registration of use of expensive implants

Implants are kept in consignmentstock and when withdrawn for use automatically scanned and linked to the patient , guaranteeing traceability.

- Transparantie:
  - Rfid – technology
  - elektronisch
  - kostenreductie



Data supplier.

Data hospital

tarification

Re-order

Link 2 patiënt

Communication to Pharmacy software

Entrance control

Storage control (smart shelf)

Safe medication administration and bedside scanning of the patient

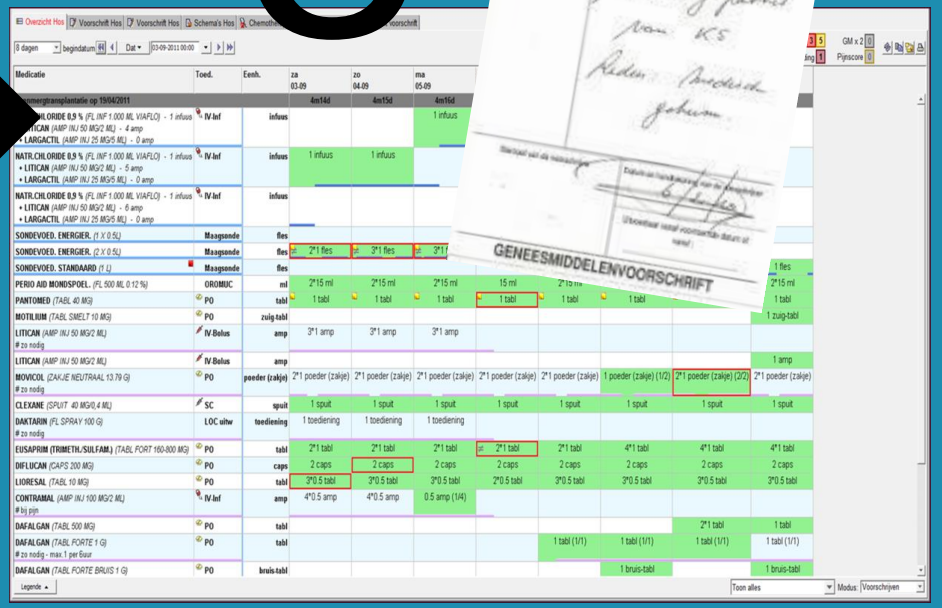
ID medication

ID patiënt

ID nurse

Bedside scanning

e-



Elektronic Medical prescription

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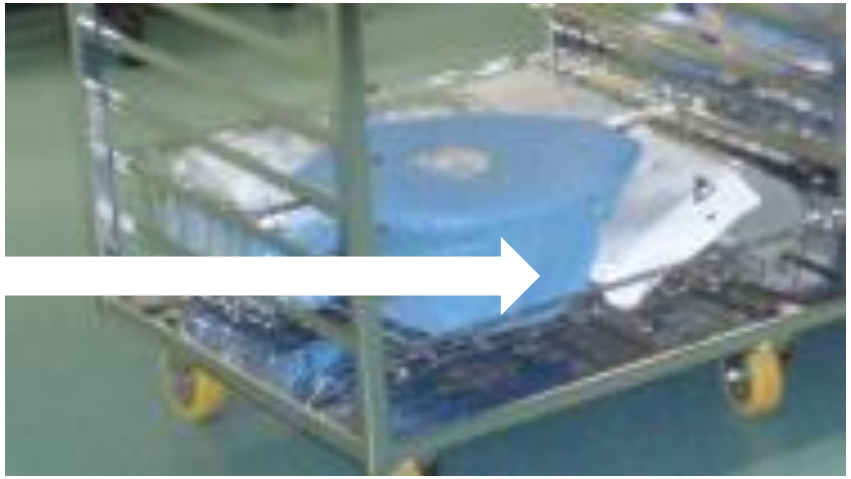
Tracing of medical instruments from the proces of sterelisation, storage and use in the operating theater

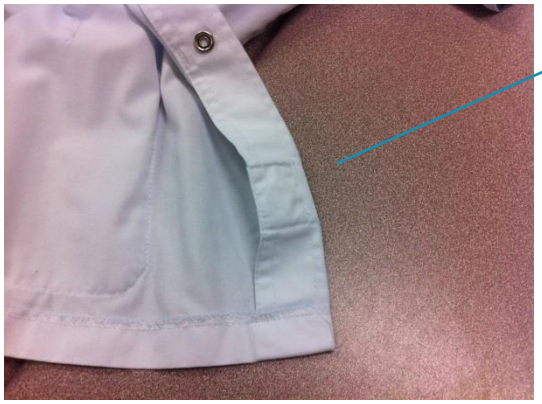
- instrumentbox labeled with a barcode



Use of passive RFID-tags in the distribution of professional clothing : a case story

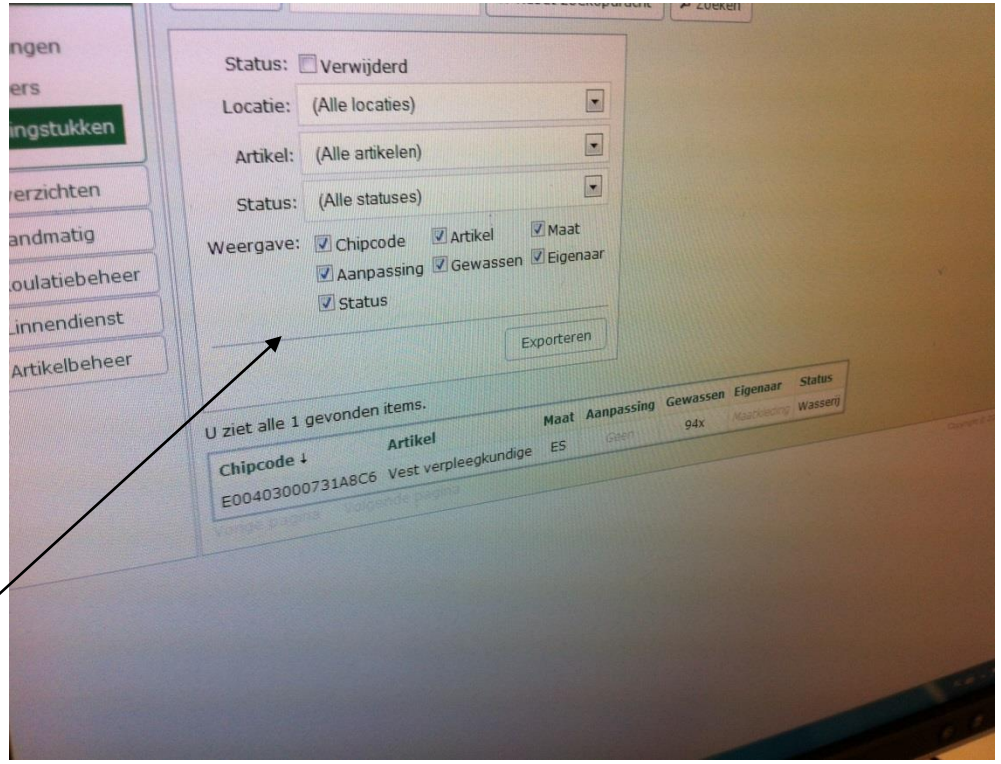
- Passive tags sewed in the professional clothing piece and linked tot basic information such as :
  - Type of garment : eg. trouser for male
  - Size of the garment : Large / medium
  - Profession using this outfit : nursing , doctors, cleaning or technical services ..
  - Unique number
- Tags are passive , heat and chemical resistant to withstand the cleaning and desinfection process of a laundry
- Each employe is entitled to a given number of pieces of specific clothing linked to the profession ; all this information is stored on the personal badge of the employe;
- Clothing is put on a coat rack on a continuous chain with individual adresses per coat rack; the system links the type of clothing with the address of the coat rack: an important advantage of a clothing dispensing machine is saving of space
- Upon issue, the available balance is first checked by reading the personal badge; the clothing is no longer personalized by name, resulting in fewer suits per person;

Professional clothing piece with a passive RFID-tag.



RFID-tag

Initialisation of the tag by reading the unique number and linking this with the type of clothing and size , new clothing is delivered with a tag, personalisation is done internally before the first use.



Reading of the new tag and linking the unique number with the characteristics of the piece

Use of passive RFID-tags in the distribution of professional clothing. Withdrawal and input of clothing for the laundry

Step 1 : the personal badge a status is shown on the screen of available pieces according to your in-and output balance

Step 2.: On the touchscreen you make a selection , automatically your count of pieces will be updated

Step 3 :The indicated piece will be presented for withdrawal

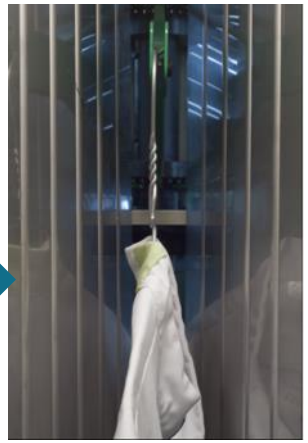
Step 4 : Dirty clothing is returned in the system on a belt while reading the tag and adjusting the individual balance.

Use of passive RFID-tags for the distribution of professional clothing
Modus operandi

the system is fed with all different types of clothing by hanging them on an infeed chain

Automatically the tag is read ,identifying the piece and transferring the hanger to the storage chain

Every hanger is now linked to a specific location and a specific profession. When requested for withdrawal the system will bring the required piece forward to exit gate. To limit the movement of the chain and speed up the process of withdrawal all types and sizes of clothing are maximum distributed over the chain



At the exit gate only the required piece will be presented.

Frontview of the distribution system with exit gate and touchscreen

Use of passive RFID-tags in the distribution of professional clothing (next)

- The number of washes per item is automatically registered via the cycles of entry and exit of the dispensing machine detected by reading the tag
- The system keeps track of the number and profession of people being served with professional clothing and will after an initial period make suggestions to improve the match between the population served and the inventory of the storage
- Since all clothing pieces are identified (profession, size, type of garment) and linked to an individual address on a hanger, sorting on demand can be done : eg. All male trousers for technical staff washed 10 times facilitating specific quality inspections

- Personel is still needed to load the system with new or washed clothings or to send dirty pieces to the laundry; the distribution is done automatically; the system is built in a modular way so that expansion of capacity is possible bij adding additional chains and distribution doors.