



Novel ways of dispensing drugs

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Disclosure statement

Conflict of interest: nothing to disclose

Who am I?

- Hospital pharmacist in UZ Leuven, Belgium
- Coordinator of distribution
- University hospital 1955 beds – 8300 employees



Question 1

Is pharmacy automation a necessity?



Question 2

Does the implementation of automation in the pharmacy dispensing process enhance error reduction?



Question 3

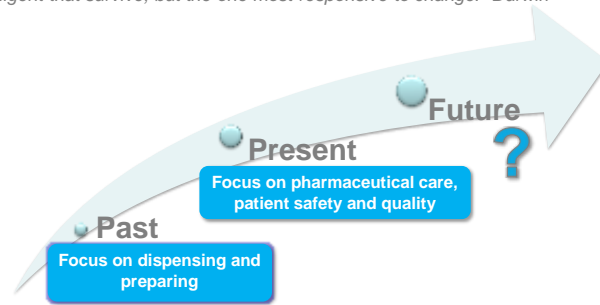
Is automation a way to reduce staff members?



Hospital pharmacy – the past, the present and the future

- Profession in change

"It is not the strongest of the species that survive, nor the most intelligent that survive, but the one most responsive to change." Darwin



Medication management process

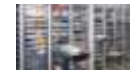
Prescription by
physician



Validation by
pharmacist



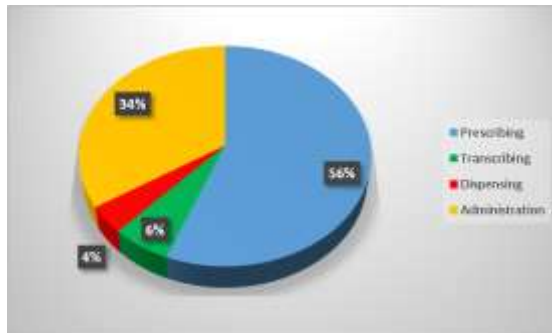
Dispensing



Medication
administration
to patients

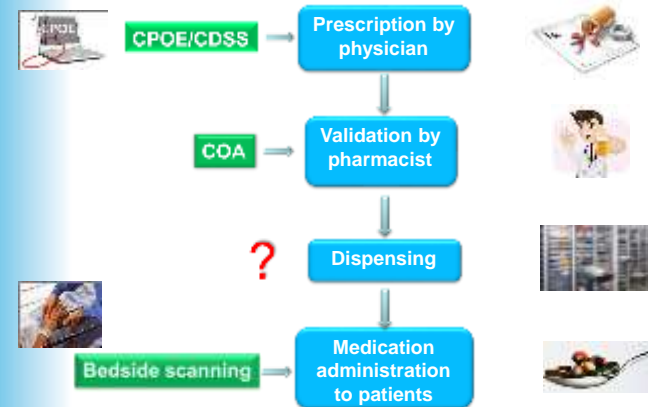


Medication errors



Bates et al, JAMA 1995 Jul 5;274(1):29-34.

Medication error reduction



Pharmacy dispensing

- How can we improve the dispensing process?
- To get the five rights right every time
 - Focus on improving efficiency 'lean'
 - Focus on error reduction



→ Is automation the answer?

Carousel technology

What?

- Medication storage and dispensing system with rotating shelves



How?

- Carousel spins to appropriate shelf, manual or computerized
- Light on work surface under correct bin 'pick to light'
- Required scan of product or bin
- Picking of boxes and unit-doses
- Restocking by product scan
- Can be refrigerated



Where?

- Pharmacy



Carousel technology

Pro's and con's?

- Maximizes floor capacity and storage conditions
- Improved picking accuracy
- Inventory control
- Traceability
- Flexible



- Downtime procedures
- Not fit for all products
- Manual operation

Box picking system

What?

- Automated dispensing of full boxes
- A box can contain a single item or multiple items

How?

- Different types
 - A-frame
 - Robotic box pickers



A-frame



- Automatic high-volume picking system



- Articles are filled manually in special channels
- Channels with different heights



- Intelligent ejectors for shooting boxes onto the central belt



- Orders are automatically separated, collected and deposited in order containers

A-frame



A-frame

Where?

- Used by wholesalers. Suitable for pharmacies?
- Option to consider by logistics platforms?
- Filling orders for multiple hospitals?

Pro's and con's?

- Fast
- Accurate
- Inventory control
- Traceability
- For large quantities
- Flexible



- Expensive
- Downtime procedures
- Suitable for hospitals?
- Boxes only
- Not fit for all products

Robotic box picker



- Random storage
- Up to 60 000 packages per machine
- Refrigerated unit option
- Fully automatic input option, second belt for semi-automated filling
- (Multiple) picking heads for box picking
- Packages are put in correct transport box
- Conveyor system for transportation

Robotic box picker



Robotic box picker

Where?

- In the pharmacy
- For replenishment ward stock
- Manual transport or by conveyer belt

Pro's and con's?

- Accurate
- Inventory control
- Traceability
- Ward replenishment
- Nightly input



- Expensive
- Downtime procedures
- Not fit for all boxes
- Not fit for unit-dose dispensing
- Automatic input fast enough?

Robotic item picker

What?

- Automated pharmacy system that provides unit-dose packaging, storage and dispensing
- Mostly oral solids

How?

- Depending on providing barcoded unit-dose packaging in the beginning or endphase.
- 12- or 24-hour supply of barcoded, patient-specific medication

Robotic item picker – storage in barcoded packaging



- Deblistering or cutting blisters or bulk packages
- Preparing medication canisters
- Picking and packaging in unit-dose bags



- Transfer unit-doses to storage
- Up to 50 000 barcoded unit-doses



- Picking and assembling of unit-doses to 12- or 24u supply
- Unused medication can be returned to storage

Robotic item picker – storage in barcoded packaging



Robotic item picker – storage in barcoded packaging

Where?

- Suitable for hospitals
- Preparation fase always in the central pharmacy
- Storage and picking stations can be central or decentral
- Option to consider by logistics platforms

Pro's and con's

- Accurate
- Traceability
- Inventory control
- Secured medication storage at the ward
- Reduced nurse time in the medication process



- Expensive
- Downtime procedures
- Limited assortment
- Waste
- What when barcodes on unit-doses by pharmaceutical industry becomes standard?

Robotic item picker – storage in containers



- Deblistering and storage in containers or canisters



- RFID enabled canisters for drug identification



- Simultaneous printing and picking
- Unit-dose, combi-dose and multi-dose packaging
- 12- or 24u supply

Robotic item picker – storage in containers

Where?

- Suitable for hospitals
- In the central pharmacy

Pro's and con's?

- Accurate
- Inventory control
- Traceability
- Reduced nurse time in the medication process



- Downtime procedures
- Only solid orals
- Waste – no returning
- Contamination
- No data on stability
- What when barcodes on unit-doses by pharmaceutical industry becomes standard?

Robotic item/box picker

What?

- Automated solution for medication dispensing
- unit-doses, multi-doses, boxes, refrigerated products

How?

- Modular high density storage with several picking station
- The correct bin is picked and placed in an access drawer
- Pick to light, drawer unlocked
- Product barcode scanning for verification



Robotic item/box picker



Robotic item/box picker

Where?

- Suitable for hospitals
- In the central pharmacy

Pro's and con's?

- Accurate
- Traceability
- Inventory control
- Fit for most products
- All barcoded unit-doses can be scanned (industry, out- and insourcing)



- Expensive
- Downtime procedures
- Manual operation

Automated dispensing cabinets

What?

- a drug storage and dispensing cabinet

How?

- Secured storage of medication
- A variety of access levels are available (limited access to controlled substances)
- Medications are removed on a patient-specific basis near the point of care
- Controlled and tracked drug distribution



Automated dispensing cabinets

Where?

- Can be used for medication, medical devices and implants
- At the ward, OR, cathlab, procedure room



Pro's and con's?

- Accurate
- Inventory control
- Secured storage
- Immediate access
- User access limitations
- Possible solution for tracking medical devices and implants



- Expensive
- Downtime procedures
- Waiting time at peak moments

Automated dispensing cabinets

Alternative

- Open access
- Fast picking process



Conclusions

- Enhance **patient safety** by reducing errors in the dispensing process
- Optimise the dispensing process '**lean**'
- **Automation** can help
 - How far you can go depends on the hospital's characteristics
 - Size, type, budget
- There is no **supermachine** (future?)
 - Still manual operation
 - Combination of different processes
 - Not an easy process

Conclusions

- Also automation of **transportation** to consider
 - Supply and drain of boxes or cassettes
 - Conveyer belt?
 - Pneumatic tubes?
 - Automated guided vehicle system?



Take home messages



It's all about efficiency and error reduction

Automation can be helpfull

Focus on CPOE, barcoded unit-doses and bedside scanning

Further pharmacy automation depending on the hospital's characteristics and needs

Interdisciplinary collaboration

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