“Would you tell me, please, which way I ought to go from here?
That depends a good deal on where you want to get to.
I don’t much care where –
Then it doesn’t matter which way you go.”

Lewis Carroll, Alice in Wonderland

In search of the Value of Automation
On dealing with the challenges in operationalising the solutions brought in automating the hospital pharmacy

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We would like to know:

1. Can you identify and quantify all costs and benefits of automation solutions that are relevant in your in the medication distribution process?
2. Do you know how to engage and persuade all stakeholders in an automation implementation project?
3. Do you have a better view of the levers and tools available to implement a new medication distribution process?
1. Introduction

In our vision we see a future ... today ... in which people and machines are changing healthcare as we know it. Healthcare is becoming more seamless across the health ecosystem.

- We see robots being patients housekeepers and companion avatars streamlining the patient intake process.
- Does this sound frightening to you? Do you think machines are going to replace people? Or do you believe, as we do that it's all about allowing people to work more efficiently, and where they are needed most.
1. Introduction

Worldwide annual supply of industrial robots
2005 - 2017*

Source: IFR Industrial Robotics 2014
“Cecil Graham
Lord Darlington
Cecil Graham

What is a cynic?
A man who knows the price of everything and the value of nothing.
And a sentimentalist, my dear Darlington, is a man who sees an absurd value
in everything, and doesn’t know the market price of any single thing.”

Oscar Wilde, Lady Windermere’s Fan

2. Motivation and drivers to automate
What motivates us?

- 1984 The Goal
- 1999 IoM
- 2006 HARM
- 2007 NIVEL
- 2007 The Black Swan
- 2014 AOK
- 2016 Capgemini

Why automate?

- Patient Safety
  - Reduce medication errors
  - Secure bedside scanning
- Cost Control
  - Reduce inventory, returns & spillage
  - Reduce repair work
- Process control
  - Reduce manual labour, Accuracy
  - Create lean process
- Floor space
  - Optimize use of “A-location”
  - Condensed use of space
Incentives for a new organisation

Key objectives and expectations

- To centralize medication dispensing, in order to
  - Facilitate the control of operations
  - Restrain manpower needs
- To focus staffs on their core job
  - Nurses
    - 0.55 FTE dedicated to pharmaceutical products every 80 beds
  - Pharmacists
  - Pharmacy technicians
Key objectives and expectations

- No de-blistering
  - No data on drug stability
  - Cross contamination hazard
- One solution fits all drug forms
- 24/7 solution
  - To handle the morning medical round main flow
  - To have a safe solution for off duty hours

The overall approach:
Flexibility inside a safety frame
FMEA

<table>
<thead>
<tr>
<th>Severity</th>
<th>Chance</th>
<th>Detection</th>
<th>Risk priority number</th>
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</thead>
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Business Case

- Cost/Performance
- Risk analysis
- Business Case
- Stakeholder analysis
- Context

"Soll" vs "Ist"
3. What to automate

- Bedside scanning
- CPOE
- Processes
- Storage & retrieval
- Packaging & labelling
- Smart pumps
- Dispensing
- Transport
- Compounding
- Smart pumps
- Decision Support Model
- Weight

Score
3.6
3.8
4.0
4.2
4.4
3.2
4. Overview of categories in automation

- **Storage & retrieval**
- **Dispensing**
- **Packaging & labelling**
- **Transport**
- **Compounding**
- **Smart pumps**

Purchase strategy

- Stock management automation
  - Carrousels (whole packages)
- Automated Cabinets
- Automated Medication Dispensing System
- Warehouse Management Software
Vertical carousels

• Ensure bulk distribution for ward stocks
• Ensure monthly delivery for some long stay beds
• «Besides » dispensing for unit dose delivery
  – Drug forms not handled by the robot (bottles, ...)
  – Labelled with patient name, room number, dosage, ...
Unit dose

- Packaged by the robot
- Most of the drugs are overwrapped
- If supplier delivers bulk: rewrap
- Tablets, capsule, bags, eye drops, ...
- Blind double check
Therapies production

- One bag by dose to be administered, bound by a ring
- Sorted by administration time
  - Evening morning noon
- Number of rings for 24 h depends on each bag thickness
Automated Cabinets

- New/modified orders are taken in charge by the robot up to 5 pm, delivered around 6:30 pm.
- In case of prescription modification to be applied before 6:30 pm:
  - Nurses go to the AC
- AC displays the prescription.

Automated Cabinets

- Medication access after identification of:
  - Nurse (Bio-ID)
  - Patient
  - Product
- Secured opening
- Real time connexion to the pharmacy WMS
5. Going into practice

Knowledge that is not put into practice is like food that is not digested.

Sathya Sai Baba
Change management challenges

- Confusion: No coherence and vision
- Chaos: No leadership and control
- Resistance: No commitment
- Fear: No skills
- Frustration: No facilities
- Uselessness: No added value

Desired outcome: Change and development

Barriers in implementation of strategic Projects

- Only 10% of the companies really execute their strategy

Barriers for strategy-implementation

1. Barriers of Vision
   - Only 8% of the workforce understands the business strategy
2. Barriers of People
   - Only 28% of people receive instructions towards the strategy
3. Barriers of Managers
   - 80% of top managers struggle to define and implement strategy
4. Barriers of Resources
   - 80% of organizations don’t have a strategy process for the budget process
Implementing and sustaining change

8-Steps Process for Chang(ing)

1. Create a sense of urgency
2. Create a guiding coalition
3. Create a vision for change
4. Communicate the vision
5. Remove obstacles
6. Create short-term wins
7. Consolidate improvements
8. Anchor the changes

Organise your change stakeholder management

- Board / Management
- Medical staff
- Pharmacists / Technicians
- Nurses
- Direct
- Roles
- Patient care
- Security
- Medication safety
- Support therapy
- Strategy hospital
- Finance
- Patient care
- Security

- Keep satisfied
- Manage closely
- Monitor
- Keep informed
Project management errors

Momentum
Strong team
Sufficient support board and doctors?
Sufficient priority IT department
No project plan, no phasing ... No celebrations of successes!
Considerations
How to get the most out of my project?

Project scope
1. Changing insights
2. User biased influence of professionals (quality creep)
3. Dynamics in the context of project
4. Insufficient project support
5. Blind spots of project planning
6. Parkinson's law
7. Delay decision-making
8. Price inflation by suppliers

Lessons learned in project management
"I understand! The question is how much money can I save?"

Post project evaluation
Have we captured the value of the BC?
6. Results & Case Studies

Roll out

- July 2008: WMS and carrousels
- September 2008: AMDC
- January 2009: first unit doses
- May 2011: Electronic record and CPOE
- January 2017
  - 637 beds under automated dispensing system
    - 581 daily unit dose delivery
    - 56 weekly unit dose delivery
    - 23 AMDC stand alone (ICU)
Unit doses dispensed
Order lines checked by the pharmacists

Systems involved in dose dispensing

- Carousels: 17.7%
- Cold chambers: 11.9%
- Pillpack system: 5.4%
- Pyxis system: 0.2%
- Shelvings: 66.2%
- Narcotics safes: 1.6%
Medication error rates

- DG: 12.0%
- DDN: 5.2%
- 53% *

* p<0.001

Medication error types

1: Omission
2: Wrong dose
3: Wrong medication
4: Wrong time

- DG: 28.2%
- DDN: 80.4%
Look at the wider picture

A white fence is better than a yellow line

- Cerner / Copilote interface build
- Pharmacist phial-box refill check
Be efficient? The Chinese way

The occidental way

Results
A total of 615 opportunities of errors (OEs) were observed among 148 patients treated during the WSS period, and 783 OEs were observed among 166 patients treated during the UDDS period. ME rates were calculated and compared between the two periods. Secondary measures included type of errors, seriousness of errors and risk reduction for the patients. The implementation of an automated drug dispensing system resulted in a 53% reduction in MAEs. All error types were reduced in the UDDS period compared with the WSS period (P < 0.001). Wrong dose and wrong drug errors were reduced by 79.1% (2.4% versus 0.5%, P = 0.005) and 93.7% (1.9% versus 0.01%, P = 0.009), respectively.

Conclusion
An automated UDDS combining a unit dose dispensing robot and AMDCs could reduce discrepancies between ordered and administered drugs, thus improving medication safety among the elderly.

Case studies

PS-022

COMPLEX AUTOMATED MEDICATION SYSTEMS REDUCE MEDICATION ADMINISTRATION ERROR RATES IN AN ACUTE MEDICAL WARD

B Risør, M Lisby, J Sørensen

Results
A total of 269 doses with one or more errors were identified out of 3216 doses administered. The complex automated medication system effectively reduced the overall risk of administration errors in the intervention ward (OR 0.53, 95% CI 0.27–0.90), and the procedural error rate was also significantly reduced (OR 0.44, 95% CI 0.126–0.94). The non-patient specific automated medication system effectively reduced the clinical error rate in the intervention ward (OR 0.38; 95% CI 0.15–0.96).

Conclusion
The implemented automated medication systems reduced the error rate in the medication administration process and thus improved quality and patient safety.
Future challenges in which automation will play a role.
From wearables to … insideables
Gaming becoming serious

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8. Take home messages

1. Always keep the end in mind!
2. Not just focus on automating the process
3. Do mind your stakeholders
   - What do you give them?
   - What do you need?
4. The value of automation
   - ... to create an agile organisation that can adept itself to changes ...

“Alice: This is impossible. The mad Hatter: Only if you believe it is.”
Lewis Carroll, Alice in Wonderland
We would like to recommend

- Risk management and Medication safety
- Barcode Scanning:
- Management
- Leadership
- Innovation
  - TEDxMaastricht - Wouter Bos - "Is technology the answer to the rising costs of healthcare?" http://youtu.be/yk6Ulr9TCsc
- … Just for fun …
  - Jonasson, Jonas (2011) The 100-Year-Old Man Who Climbed Out the Window and Disappeared