IT to improve the safety of the medication process at the hospital

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Agenda

13h45 Theoretical introduction
14h30 Discussion
14h45 Break
15h00 Visit in 2 groups
   - Pharmacy
   - Central warehouse
16h30 Discussion
17h00 End
Geneva university hospitals (HUG)

Consortium of public hospitals in the Geneva county

One of the 5 swiss university hospitals

1900 beds

≈ 50’000 hospitalisations/year

≈ 800’000 outpatients consultations/year

www.hug-ge.ch
Pharmacy: Missions

• Supply drugs to the whole hospital (purchase, stock management, distribution)
• Implement a full traceability of drugs until the administration to the patient
• Ensure a production and a personnalised preparation of drugs, when they are not available on the market
• Contribute to a safe and rational use of drugs

Services - Education - Research

Organisation
Drug medication process

- Support the teaching of drug pharmacotherapy to the physicians
- Limit the risk of errors by reducing the number of different drugs available
- Favour an optimal stock management
- Negotiate attractive purchase conditions

Drug selection
Interests of a restricted list
Process organisations

• **Global distribution**
  The pharmacy delivers boxes of drugs and nurses dispense individual treatments from the ward stock

• **Nominal or individual distribution**
  Drug dispensing is performed at the pharmacy, for each patient, based on the prescription
Individual distribution

- Prescription
- Administration to patient
- Delivery of doses
- Pharmaceutical validation
- Drug dispensing

Global or individual?

- **Individual distribution is more convenient in some conditions**
  - Few prescription modifications (chronic care)
  - Pharmacy close to the wards

- **This doesn’t fit to HUG situation**
  - Acute care in majority
  - Long distance between the pharmacy and some wards (multi-sites hospital)
The medication process

Industry stock

Pharmacy stock

Ward stock

Dispensation

Production

Prescription

Cytos

TPN

MP

Production stock

End-product analysis

Production

Raw-materials analysis

Administration to patients

Safety problems?
Human reliability

« On the 6th day, God created man … »

... but God was tired, and his creation was not perfect ...

The addition of two errors

Commission error AND Control failure

- Selection
- Calculation
- Counting

- Check
- Double-check
- Check-list
- Electronic
**Distribution errors**
(real life)

- Error rate = 1%

<table>
<thead>
<tr>
<th>Counting</th>
<th>Omission</th>
<th>Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>56%</td>
<td>24%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Gschwind L, Carrez L, François O. HUG, 2006-11

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**Dispensing errors**
(experimental)

- Error rate = 3%

<table>
<thead>
<tr>
<th>Selection error</th>
<th>Repartition error</th>
<th>Counting error</th>
</tr>
</thead>
<tbody>
<tr>
<td>74%</td>
<td>6%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Administration errors

• Error rate = 19%

<table>
<thead>
<tr>
<th>Error Category</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omission</td>
<td>443 (3)</td>
</tr>
<tr>
<td>Wrong dose</td>
<td>103 (5)</td>
</tr>
<tr>
<td>Unauthorized drug</td>
<td>22 (1)</td>
</tr>
<tr>
<td>Wrong form</td>
<td>20 (1)</td>
</tr>
<tr>
<td>Extra dose</td>
<td>10 (1)</td>
</tr>
<tr>
<td>Wrong route</td>
<td>6 (1)</td>
</tr>
<tr>
<td>Wrong technique</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Wrong time</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Total errors</td>
<td>445 (19)</td>
</tr>
<tr>
<td>No error</td>
<td>291 (61)</td>
</tr>
<tr>
<td>Total Dosage</td>
<td>532/100 (100)</td>
</tr>
</tbody>
</table>

Observation study in 36 institutions

Barker KN, Arch Intern Med 2002;162:1897

Limited performance of controls

• Introduction of errors during unit dose dispensing
• Detection ability during human-performed control:
  • Pharmacists: 87.7%
  • Nurses: 82.1%

Facchinetti NJ, Med Care 1999;37:39-43

Efficiency ≈ 85%
(known value in the industry)

Do not be too confident with the double-checks
Implementation of IT in the medication process

Potential interests of IT

• To improve
  – The safety
    by reducing the rate of errors and improving the reliability of controls
  – The traceability
    by facilitating the registration of logs
  – The efficiency
    by increasing the working performance
  – The communication
    by connecting the different steps of the processes
Many questions before to start

• Positive impacts ?
• New risks ?
• Return on investment ?
• System selection ?
• Commercial or homemade ?
• Interoperability ?
• User’s training strategy ?
• Acceptability ?

Electronic systems to catch errors
Electronic systems to avoid errors

Industry stock
EDI
Pharmacy stock
Ward stock
Dispensation
Production stock
End-product analysis
Production
Raw-materials analysis
Prescription
CPOE / CDSS
Cytos TPN
Production
EPR
Administration to patients

Robotisation of drug distribution
Safety

1 %
\( n = 5805 \)

Selection
Convoy
Manual finalisation

0 %
0%
0.44%
0.04%

Phase I
Phase II

0.5 %
\( n = 4365 \)
0.2 %
\( n = 1497 \)

François O et al, HUG, 2012
Robotisation of drug distribution

Efficiency

• Hypothesis
  – decrease of workload estimated to 2 FTE

• Results
  – Reality seems to confirm this estimation
  – Real workload decrease is actually measured...

• Return on investment (ROI)
  – 2 FTE suppressed
  – 3.1 year, without the operating costs
  – 5.4 year, with the operating costs
    (amortization, maintenance contract)

Automation of drug dispensing

Safety

• Experimental

Du Pasquier C, Riberdy L, HUG, 2003
Automation of drug dispensing

Efficiency

- Real life (digestive surgery ward)

Francois O et al, HUG, 2011

Administration to patients

Bedside scanning

- Cytostatics
Administration to patients

Safety

- **Benefit of bedside scanning**
  - Wrong drug - 75%
  - Wrong dose - 62%
  - Wrong patient - 93%
  - Wrong administration time - 87%

Globally - 80%

*Johnson, J Healthcare Inf Manag 2002;16:1*

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The medication process

Final perspective

- **Robotized distribution**
- **Automated dispensing system**
- **EDI**
- **Pharmacy stock**
- **Ward stock**
- **Manufacturer stock**
- **Logistic information system**
- **Bedside scanning**
- **CPOE**
- **Clinical information system**

*EDI*

*Manufacturer stock*

*Pharmacy stock*

*Ward stock*

*Robotized distribution*

*Automated dispensing system*

*Logistic information system*

*Bedside scanning*

*CPOE*
Computer-assisted production management

• Objectives
  – To support any type of preparation by IT
    • Batches
    • Cytostatics
    • TPN
    • Other individualized prescriptions
  – To implement in-process electronic controls during the most critical steps
  – To link individualized preparation to their prescription and their administration

Production management

Automation

Nutrition (Baxa)
Cytostatics (CytoCare)
CIVAS (Smartfiller)

PharmaHelp (Medical Dispensing Systems), Riva, …
Production management

Gravimetry

• Cytostatics
  (Cato, Cypro )

• Batch production

Efficiency

• Production – Parenteral nutrition (10/day)

Manual
  2 x 3h = 6 h

Automated (BAXA)
  1 x 2.5h = 2.5 h

- 60%
Prerequisite to successful IT implementation

- Electronic management of processes (CPOE, stocks, ...)
- Technical infrastructure (hard-, soft-)
- Actors identification (caregivers, patients, drugs)
- Acceptability (patients, caregivers)
- Adaptation to processes
- Project leadership
- Financing

Actors identification

The patient

The caregiver

The drug
Drug identification

• Hierarchy

- Unit dose
- Secondary package
- Hospital package
- Box
- Pallet

= international standard
GS1 codification of pharmaceuticals at HUG

- Product ID (cytostatics)

01 07613167000009 7003 1103161400 21 cyt-11198499

- Product ID (batch production)

01 17613167001249 17 120831 10 PDS-11289663
Adaptation to processes

• **Reasons for workaround**
  – **Process**
    • Training requirements
    • Process flow (administration of drug before scanning, shortage of time)
  – **Technology**
    • Hardware (performance of scanners)
    • Software (delays in response)
    • Barcode (difficulties in reading)
  – **Resistance**
    • Communication
    • Changing role
    • Negative perception of IT

How to progress?

• Determine an institutional strategy and an implementation schedule, taking into account
  – the local organisation
  – the local culture
  – the expected return on investment
• Involve the different partners
• Re-think the process organisation (re-engineering)
• Manage each projet independently, without loosing the global vision
Conclusion

• The medication process at the hospital is complex and involves many different professionals
• A clever organisation contributes to improve the safety, the efficiency, the communication and the traceability
• IT takes more and more importance in the process improvement approaches: their implementation is necessary but is a challenge
• Each hospital must determine a strategy, based on the local context