The use of information technology to improve medication safety in hospitals

Pr Dr Pascal BONNABRY, Head of pharmacy, Geneva Hospital, Vice-President of Patient Safety Switzerland
June 14th, 2017
Welcome and thank you for attending!

• Welcome to our June 2017 webinar. Thank you to our guest speaker – Prof dr Pascal Bonnabry, Head of Pharmacy at the Geneva University Hospitals (HUG), Switzerland, Associate Professor at the School of Pharmaceutical Sciences, University of Geneva, University of Lausanne, and Vice-President of Patient Safety Switzerland

• Some housekeeping for today:
  - All attendees will be on mute
  - If you have questions during the presentation, please type them into the questions area and these will be monitored, then answered at the end of the call

• After the webinar:
  - Within a week, the recording will be posted to: http://www.gs1.org/healthcare/hpac_webinars
  - All previous webinars are also posted to this location, so please feel free to use this resource and share the link
The GS1 Healthcare Provider Advisory Council (HPAC)

Thought leaders and adopters of GS1 Healthcare Standards from the global clinical provider environment. Their final goal is to improve patient safety, cost efficiency and staff productivity through implementation of GS1 standards.

A forum for sharing and discussion

- About the practical realities of implementation of GS1 Standards in the care giving environment in regards to the impact on clinical care and patient interaction

Identification of projects and case studies

- That support the adoption of GS1 Standards in healthcare providers and retail pharmacies
- For publication, presentation and sharing

A source of expertise and advice

- To those involved in GS1 standards development, the wider Healthcare stakeholder community and senior executives/decision-makers to gain their buy-in and support for implementation of GS1 Standards
HPAC Activities

- Monthly webinars open to all stakeholders interested in learning about GS1 standards implementation in the care giving environment.
  - [http://www.gs1.org/healthcare/hpac_webinars](http://www.gs1.org/healthcare/hpac_webinars)

GS1 Healthcare also holds two global conferences per year. Next conference will be in Chicago from October 17-19 2017. There will be significant Healthcare Provider participation on the agenda.

- Twice per year
- Provider Best Case Study Award
- Provider Recognition Award
- The prize is travel / accommodation to attend the next GS1 Healthcare conference
  - [http://www.gs1.org/healthcare/hpac](http://www.gs1.org/healthcare/hpac)
Learning objectives

- How to define a global strategy to improve the medication process in a hospital
- How GS1 identifiers fit in to reach the overall strategy
- Impact of information technologies on the safety, the efficiency and the traceability
Medication: challenges

- **Safety**
  - Among the 3 main sources of avoidable adverse events

- **Efficiency**
  - Difficult to perform highly without appropriate tools for stock management

- **Economics**
  - Value of decentralized stocks

- **Traceability**
  - Increasing requirements by authorities
An obsolete organisation?

Avoidable adverse drug events: 6.5% of admissions

Industry stock → Central pharmacy stock → Ward stock

Prescription

Interception: 48%

Interception: 11%

Interception: 38%

Interception: 39%

Administration

Bates DW, JAMA 1995;274:29
How errors occur?

The addition of 2 errors
Commission error AND Control failure

Selection
Dilution
Calculation
...

Check
Double-check
...

\[ P_{err} = P_{sel} \times P_{chk} \]
Dispensing errors (simulation study)

- Error rate = 3%

- Selection error: 74%
- Repartition error: 6%
- Counting error: 20%

Limited performance of controls (simulation study)

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

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

Efficacy \approx 85\% (known value in the industry)

Do not be too confident with the double-checks!
Human reliability

« On the 6th day, God created man … »

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

In hospitals, many high-risk activities are based on human reliability, which is limited
How to improve the safety?

Implement strategies to:

- Reduce the frequency of errors
- Increase the reliability of controls
- Automatic calculation, selection,...
- Scanning, Gravimetry, ...
Hierarchy of risk reduction strategies

**High**
- Technology
- Constraints
- Forcing functions

**Medium**
- Standardisation
- Redundancies
- Check-lists

**Low**
- Procedures
- Education
- Vigilance
A strategic roadmap
HUG situation 2017

Robotized distribution
Done (pilots)

Central pharmacy stock

Ward stock

Automated dispensing cabinets
Done, 35 implemented

CPOE
Done

Clinical information system

Distribution with scanning
Done
done

Logistic information system

Bedside scanning
Done (cytos)
Cytotoxics: a special process

Automated preparations (2015)

Electronic prescription + Dose-banding (2018)

Preparation with gravimetric control

Bedside scanning
Safety and efficiency improvements
Robotized distribution
Impact on the safety

François O et al, HUG, 2015
Robotized distribution
Impact on the efficiency

Keywords: Robotized distribution, Manual distribution, Scanning, Robot WITH filling, Robot WITHOUT filling

François O et al, HUG, 2015
Automated dispensing cabinets
Impact on the safety (simulation)

<table>
<thead>
<tr>
<th>Total Omission Selection Counting Repartition</th>
<th>Error rate [%] without</th>
<th>with</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
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<td></td>
<td>2.5</td>
<td>2.5</td>
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<tr>
<td></td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Du Pasquier C, Riberdy L, HUG, 2003
Automated dispensing cabinets
Impact on the efficiency

Lines asked in emergency mode

<table>
<thead>
<tr>
<th></th>
<th>Before (manual)</th>
<th>Pilot with ADS</th>
<th>After (manual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>15</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>

Surgical ward, 28 beds

François O et al, HUG, 2013
Automated dispensing cabinets
Nurses opinion on improvements

<table>
<thead>
<tr>
<th>...improves the safety of care?</th>
<th>...improves the stock management?</th>
</tr>
</thead>
<tbody>
<tr>
<td>strongly agree</td>
<td>strongly agree</td>
</tr>
<tr>
<td>agree</td>
<td>agree</td>
</tr>
<tr>
<td>disagree</td>
<td>disagree</td>
</tr>
<tr>
<td>strongly disagree</td>
<td>strongly disagree</td>
</tr>
<tr>
<td>no opinion</td>
<td>no opinion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>...improves medication traceability?</th>
</tr>
</thead>
<tbody>
<tr>
<td>strongly agree</td>
</tr>
<tr>
<td>agree</td>
</tr>
<tr>
<td>disagree</td>
</tr>
<tr>
<td>strongly disagree</td>
</tr>
<tr>
<td>no opinion</td>
</tr>
</tbody>
</table>

François O et al, HUG, 2015
Bedside scanning

Objectives

- Increase patient safety
- Increase patient satisfaction (safety feeling)
- Increase efficiency (documentation, stock management, invoicing,…)
- Increase nurses satisfaction
- Reduce costs (especially related to errors)
Bedside scanning
Impact on the safety

- Wrong drug - 75%
- Wrong dose - 62%
- Wrong patient - 93%
- Wrong time - 87%

Global - 80%

Johnson, J Healthcare Inf Manag 2002;16:1
Facilitators and barriers for success
**Categories**

- **External**
  - Other institutions
  - Healthcare system

- **Institutional**
  - Past and future
  - Corporate culture
  - Stability
  - Ability to innovate

- **Managerial**
  - Leadership
  - Corporations
  - Project management (resources, organisation)
  - Communication

**Facilitators**

- **Organisational**
  - Workload evolution
  - Process reengineering
  - Training

- **Technical**
  - Availability of the technology
  - Infrastructure
  - Interoperability
  - Ergonomic
  - Maintenance

- **Financial**
  - Investment
  - ROI
Return on investment (ROI)

Costs
- Investment
  - Acquisition
  - Installation
- Operation (annual)
  - Maintenance
  - Amortization

Benefits
- Direct purchase (e.g. drugs)
- Direct staff costs
- Efficiency (organizational costs)
- Safety (less errors)
- ...

Partially based on estimations

ROI (years) = initial investment / annual balance
Return on investment (ROI)

Exemple: automated dispensing cabinets

<table>
<thead>
<tr>
<th>Fictive numbers</th>
<th>Investment [CHF]</th>
<th>Operation (annual) [CHF]</th>
<th>Time for ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition costs</td>
<td>+ 45’000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td>+ 1’500</td>
<td></td>
</tr>
<tr>
<td>Amortization (8 years)</td>
<td></td>
<td>+ 6’250</td>
<td></td>
</tr>
<tr>
<td>Reduction stock value</td>
<td>- 5’000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction drug purchase (- 5%)</td>
<td></td>
<td>- 7’500</td>
<td></td>
</tr>
<tr>
<td>Staff costs (technicians vs nurses)</td>
<td></td>
<td>- 6’000</td>
<td></td>
</tr>
<tr>
<td>Safety (cost of errors)</td>
<td></td>
<td>- 3’500</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>+ 40’000</strong></td>
<td><strong>- 9’250</strong></td>
<td><strong>4.3 years</strong></td>
</tr>
</tbody>
</table>
Identification
Why GS1?

- Need to have a standardized system to identify objects, persons and locations
- GS1 is an international standard, recognized in the fields of logistic and health
- GS1 is the dominant standard for drug identification around the world
- Increasing interoperability needs in and between hospitals, important to abandon proprietary systems
Actors identification

Patient

Caregiver

Drug
YOUR IDENTITY IS YOUR SECURITY

Become an actor of your own security

Immediately after your admission, you will receive an ID bracelet with your name, surname, gender and date of birth. By keeping it at your wrist (or at your child’s wrist) throughout your stay, you will contribute to the safety of your health care. It helps controlling that you receive the treatment that you were prescribed. This procedure also applies to the children followed up in Pediatrics.

Fewer errors thanks to wearing the bracelet

With an ID bracelet for all patients, the HUG intend to improve your health care and reduce errors. That is why, during your stay, your identity (or that of your child) is verified several times. Your participation is essential.
Secondary package – for logistics

**Safety**
- ID product *(INSUFFICIENT)*

**Traceability**
- Batch number *(URGENT)*
- Expiry date

**Counterfeiting**
- Serial number *(idéal)*

![EAN-13](EAN-13.jpg)

![Datamatrix](Datamatrix.jpg)
Identification of single doses

Reconditioned by the pharmacy

Identified by the industry
Single dose
Europe

- Unit doses blisters, with each single dose containing the whole information
  - Trade name
  - Active substance
  - Dosage
  - Expiry date
  - Batch number
  - Barcode
    - Including product ID, expiry date and batch number
    - Use of a recognized international standard (i.e. GS1)
    - Datamatrix

EAHP, 2007
Single dose GS1

Position paper on the identification of the primary package level of drugs

References
GS1 Healthcare GTIN Allocation Rules:

Endorsed by:
Single dose – for clinical use

Panadol 500 mg paracétamol
n°lot 420607
Exp. 08.2009

Safety
ID product
(minimum)

Traceability
Batch number
Expiry date
(ideal)
Barcodes … how to progress?

Hospitals
- Implementation of IT (hardware, software)
  - Logistic
  - Clinical
- Costs / uncertainty in ROI
- Institution readiness (culture)

Industry
- Adaptation of production lines
- Costs
- Serialisation
- Heterogeneous requirements
  - Customers
    - between countries
    - in a same country
    - hospital vs community
  - Authorities

Availability of drugs with barcodes... (need to relabel)

Existence of customers scanning the barcodes... (producing for whom?)
GS1 codification of pharmaceuticals at HUG

- Product ID (batch production)

<table>
<thead>
<tr>
<th>GTIN</th>
<th>EXP date</th>
<th>Batch</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 17613167001249</td>
<td>17 120831</td>
<td>10 PDS-11289663</td>
</tr>
</tbody>
</table>
Lessons learned

- Automation and robotisation are important strategies to optimize drug management
  - Safety can be improved, as well as efficiency and traceability
  - A strategic vision should be elaborated by any hospital
  - The implementation is a challenge and it must be intelligently and interdisciplinary decided and planned
  - We need an identification strategy in the hospital, using international standards (GS1)
  - Primary and secondary packages of drugs must be appropriately identified by the industry
Pharmaceutical industries and hospitals have to work together

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HPAC Questions and contact details

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