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BD Carefusion – White Paper

Nurses' satisfaction with the use of automated dispensing cabinets in a paediatric intensive care unit.

Direction des
Opérations

Pharmacie

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1. Geneva University Hospitals

Geneva University Hospitals (HUG) is a 1800-bed consortium of public teaching hospitals in the Canton of Geneva and affiliated with the University of Geneva. All medical specialties and levels of care are represented. In 2014, the HUG handled 650'000 hospitalisation days, 25'000 surgical procedures, 85'000 emergency visits and 960'000 outpatient consultations.

The pharmacy is responsible for drug procurement for all the facilities making up the HUG, and its missions are to:

- Supply drugs to the entire consortium (purchasing, stock management, distribution);
- Ensure full drug traceability from purchase to administration to the patient;
- Ensure the production of personalised medicines when these are not available on the market;
- Contribute to the safe and rational use of drugs.

As an integral part of the HUG, the pharmacy's academic duties also involve education and research activities in collaboration with the University of Geneva's School of Pharmaceutical Sciences.



Illustration:
picture of HUG hospital

2. Organisation of the medication process

The medication process is organised around a global distribution system that involves the presence of drug stocks in each of over 100 wards spread about the HUG's many sites all around the Canton of Geneva. Some wards are very close to the central pharmacy, whereas others are more than 10 kilometres away.

In comparison with an individual (or nominative) distribution system in which the pharmacy directly prepares treatments for patients based on their prescription, the presence of drug stocks on wards is an efficient way to deal with modifications to those prescriptions. In the HUG, the majority of acute care patients require rapid changes in prescriptions, and there are large distances between some wards and the pharmacy. It was therefore decided that the drug distribution should use an institution-wide process, with sufficient ward stocks to allow drugs to be dispensed in real-time from close to patients.

The pharmacy is responsible for defining the rules on the organisation of drug stocks. Nurses are responsible for dispensing drugs based on the most up-to-date electronic prescription. On wards equipped with traditional, non-electronically monitored drugs stocks, they are also responsible for applying stock management rules and replenishing stocks by re-ordering the required products from the pharmacy every day.



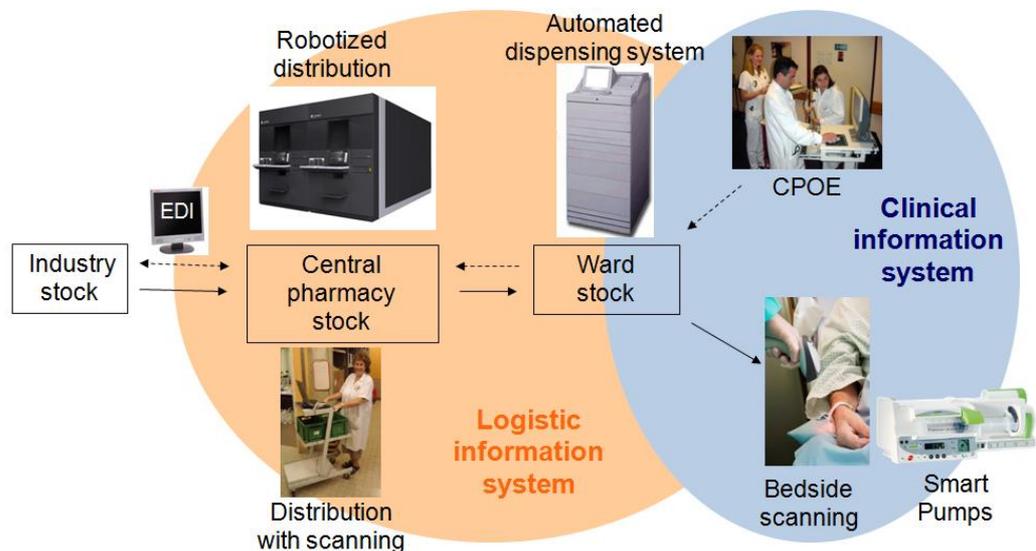
Illustration:
picture of traditional ward stock

3. IT in the medication process

As in any hospital, managing the medication process is a challenge. Efforts to improve the safety, efficiency and traceability of drug use never cease – from the moment drugs arrive at the hospital until they are administered to patients. The HUG's strategy involves actions covering the 3 Ps: Processes, Persons (i.e. clinical pharmacy) and Products (i.e. appropriate design by manufacturers). Processes can be progressively optimised by very simple actions, but disruptive improvements require major re-engineering involving computerisation, automation and/or robotisation.

The HUG is a leader in medical informatics, and a large part of its clinical information system was developed in-house. A vision of its ideal medication process of the future has been prepared (see illustration) and the different technologies required to make it a reality are being progressively integrated throughout the institution. In 2016, a full electronic patient record, including a Computerized Provider Order Entry (CPOE) system, was deployed throughout the institution. Furthermore, a Rowa Vmax robot was installed in the central pharmacy, with products stored outside the robot scanned at distribution. Finally cytotoxics are scanned at the bedside before administration.

Illustration: Medication process: the HUG's institution-wide strategy



4. Installation of automated dispensing cabinets

In accordance with its institution-wide strategy to improve the safety, efficiency and traceability of the medication process, the HUG committed to installing automated dispensing cabinets. Owing to the significant investment costs and the project-related workload, it was decided to deploy the cabinets very progressively and to start with specific wards. Departments using high-risk, high-cost drugs for highly complex cases and processes, or using high levels of narcotics, were chosen as priorities. Consequently, installations started in 2014 with attention focussed on the paediatric intensive care unit, the adult intensive care unit and anaesthesiology.

The arrival of this new technology for ward stock management was an opportunity to re-engineer processes. Nurses no longer have to deal with replacing used stock – this is now the responsibility of pharmacy technicians, who visit wards every weekday to adjust stocks, based on an electronic inventory. Orders transcriptions have been suppressed and drugs are now dispensed in real time, just before their administration, to be as close as possible to the actual prescription and minimise queuing in front of dispensing cabinets

An evaluation of these first implementations showed very positive impacts on logistics efficiency. Stock levels now correspond to the real mean consumption of each drug, calculated using historical statistics and regularly updated. The number of emergency queries sent to the pharmacy – concerning real new medical needs or suboptimal stock

management – has been reduced by 50%–70%. This result is evidence that stock levels are now more appropriate, and there has been a major reduction in false emergencies related to difficulties in managing stock levels without effective tools. This improvement has provided real efficiency gains in the medication process, with positive impacts for the pharmacy, the logistics department and nurses.

People are at the centre of processes, even when these have been automated. It is therefore very important not only to look at performance improvements but also to obtain end-users' opinions. We therefore decided to measure nurses' satisfaction with this new way of organising drug storage and dispensing.



Illustration:
picture of automated dispensing cabinet in ward

5. Measuring nurses' satisfaction: methods

In March 2015, two automated dispensing cabinets (Medstation Pyxis ES) were installed in the HUG's 15-bed neonatal/paediatric intensive care unit. The larger system was installed in the pharmacy to cover the intensive care (10 beds), and the smaller system was installed in a room dedicated to intermediate care (5 beds). The two cabinets store almost all the unit's essential drugs (except infusion fluids, parenteral nutrition and care products, but including refrigerated products) and are designed to back-up each other for critical drugs.

The present survey's objective was to assess nurses' satisfaction with the use of automated dispensing cabinets and their collaboration with the pharmacy technicians in charge of restocking them. Six months after installation, a standardized questionnaire was distributed to 64 nurses who had used the system at least once (based on the connection logs). The questions addressed the following issues:

- Overall opinion on training, the interface, ergonomics, time management;
- Contribution to safety, traceability and improvements to stock management;
- Positive aspects and drawbacks;
- Evaluation of the pharmacy technicians' contribution;
- A final choice between several possible methods of organisation, with or without automated dispensing cabinets.



Illustration:
picture of nurses in the neonatal and paediatric intensive care unit

6. Measurement of nurses' satisfaction: results

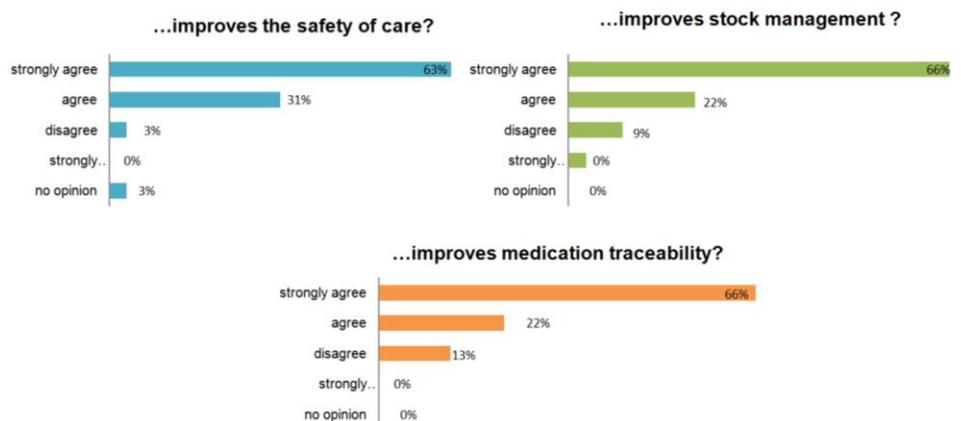
Thirty-two nurses (50% response rate) gave their opinions on this new way of organising of their ward stock.

Their evaluation was mostly positive, and the main results were as follows:

- Overall opinion is summarised in the following Table:

	Poor	Satisfactory	Good	Very good
Training				
Time necessary for training	22%	41%	31%	6%
Interface				
Use of tactile screen	3%	38%	28%	31%
ID with fingerprint	16%	34%	25%	25%
Clarity of screen content	16%	28%	47%	9%
Overall satisfaction with software	6%	25%	59%	9%
Ergonomics				
Ergonomics of the workstation	3%	28%	53%	16%
Access to drawers	3%	25%	53%	19%
Drugs manipulation in cubies	9%	19%	56%	16%
Readability of medication/patient lists	16%	25%	47%	13%
Time management				
Time to log in	31%	22%	44%	3%
Time to withdraw a drug	19%	34%	38%	9%
Time waiting in front of the cabinet	25%	44%	31%	0%

- 85%–90% of nurses felt that the automated dispensing cabinets improved safety, traceability and stock management



- The most frequently cited positive aspects were the speed with which treatments could be accessed, dispensing safety, the time saved on logistics and the system's cleanliness/hygiene. The main drawbacks expressed were waiting times (only one person can use the system at a particular time) and the inability to easily visualise current stock levels.
- The nurses had very positive opinions of the pharmacy technicians' contributions. They particularly highlighted their expertise, efficacy and availability, the time that could be put back into patient care instead of managing logistics and stock levels that now better met their needs. Their only concern was about anticipating special requirements regarding specific drugs or quantities – technicians do not have a nurse's vision of the clinical activity on a ward and its logistical consequences, particularly before weekends. Verbal and written communication (using a transmission book) is the optimal method of dealing with this difficulty.
- 85% of nurses selected the automated dispensing cabinet as their preferred method of organisation. No nurses wanted to move back to the previous organisation and the remaining 15% would like to have their stock managed by pharmacy technicians, without the help of any specific technology.

In conclusion, this survey confirmed end-users' rapid adoption of the technology in the complex environment of neonatal/paediatric intensive care. The nurses had a very positive opinion of the new way of organising ward stocks. Although there was room for improvement – no system is perfect – the advantages significantly outweighed the drawbacks. A few nurses preferred a non-technological solution, but this may reflect that minority's general reluctance to accept IT solutions. It would appear important to identify these persons early on in the installation process and to accompany them specifically.

Illustration: table and figure presented in the text

7. Key factors for success

Implementing the use of automated dispensing cabinets was a real challenge, requiring clever project organization. Based on our successful experience, we recommend paying particular attention to the following key factors:

- Process organisation: the advent of these technologies provides a real opportunity to rethink the organisation of the entire medication process, and a process-oriented approach to this re-engineering is essential for successful implementation.
- Project organisation: implementation is a complex task, involving a huge amount of work and requiring strong collaboration between different stakeholders (i.e. pharmacists, nurses, technicians, purchasers, IT, and technical department). A motivated, available, open-minded, well-organised project manager who knows how to bring stakeholders together is essential to success.
- Nursing leadership: such a project should not be considered the pharmacy's *baby*; strong nursing leadership is crucial. The head nurse should be involved in every phase of the project and be its main information channel to the nursing team. Clinical nurses must buy into the project, seeing it as their own, facilitated by the pharmacy.
- On-site clinical pharmacist: to facilitate communication and rapidly solve project problems, large and small, having an on-site clinical pharmacist is very helpful. He/she acts as an interface between nurses, technicians, the project manager and other key stakeholders to identify possible improvements or workarounds requiring action by the project team.

8. Looking to the future

In the coming years, the HUG pharmacy will continue to follow its strategy of improving safety, efficiency and traceability in the medication process. The 3 Ps – Processes, Persons and Products – will continue to guide us.

With regard to information technologies, our top priorities will be the following:

- To continue installing Pyxis Medstation ES on wards. The HUG's management has decided to implement this technology in new buildings and in departments other than the high-risk wards described above. In 2017, automated dispensing cabinets will be implemented in a new facility with 14 medical and surgical wards.
- In parallel, the pharmacy expects to test a new device for narcotics –the Pyxis mini. The objective is to offer simple and efficient narcotics management to a large number of wards not yet equipped with a full Medstation ES system. This new product will be tested in paediatric medical and surgical wards.
- The hospital will continue to work hard to extend its bedside scanning system to drugs and devices other than cytotoxics. In the coming years, a new scanning module for our clinical information system should be developed to allow nurses to document their actions electronically and ensure Five Rights of Medication Administration (5 R') at the point of care. A concomitant effort is expected from the pharmaceutical industry enabling the identification of unit doses of drugs using a Datamatrix containing product identification (GTIN), batch number and expiry date.

Many challenges have been met to date, but over the coming years work to improve the organisation of the medication process must continue for the benefit of patients.

Illustration:



photo bedside scanning