

## **SYSTEM OF AUTOMATIC MEDICATION DISTRIBUTION WITH THE ADJUSTMENT OF HOSPITAL COMPUTER SYSTEM**

The planned investment includes:

- 1) Supply, installation and initiation of fully automatic system of packaging, storing and distributing unit doses
- 2) Adjustment of hospital computer system within initiating the automatic medication distribution in the unit dose technology
- 3) Necessary project and construction works adjusting the facilities of the University Clinic Hospital in Białystok to the purchased system, with the inclusion of the Pharmacy of the University Clinic Hospital in Białystok into the system of pneumatic mail.

### **Centralized, fully automatic system of packaging, storing and distributing unit doses**

Unit dose system is to be automatic system of medication management that facilitates isolating single medication units (pills, capsules, phials, ampoules and syringes), packaging them into single packs and distributing these unit doses strictly according to individual therapy of a patient or ordering them from hospital ward.

The system should execute the following functions of medication distribution:

- Packaging,
- Storage,
- Distribution,
- Inventory,
- Returns.

### Packaging

- The system is to isolate and package single medication units from: blister packs of different shapes, carton packs, ordinary packs etc. into single packs. The system must ensure the packaging of an adequate medication with the use of electronic control at every stage of the unit dose preparation process.
- The system is to be capable of packaging unit doses of different sizes by automatic adjustment of the package size to the size of the medication.
- Packaging medicines into standard packs is to be accompanied with proper labeling. Each and every unit dose pack is to contain at least the following information:
  - Trade name of the medication
  - International name of the medication
  - Form
  - Dose (mg, ml, ml/ml,...)
  - Quantity
  - Series (batch) number
  - Expiry date
  - Free space of ca. 30 signs (e.g. information on manner of drug application)
- Additionally, every packaging is to contain a bar code for clear identification of every unit dose with the use of barcode scanner. The bar code must include a unique identification number for tracking every unit dose throughout the whole logistic

process until it is given to the patient (together with the series number and expiry date). The unit dose package must not contain the information of the patient as it would disable the return of the medicine to the pharmacy.

- The implementation of the new products/ medications into the hospital formulary is to be carried out by the pharmacy personnel and must not require additional duties on the side of the system supplier. External differentiation of medication packs shall not be accepted.
- Every unit dose package produced by the system is to be automatically delivered for storage.

### Storage

- The system is to be capable of storing at least 40,000 unit doses.
- The system is to automatically manage all unit doses within the machine. System management software is to guarantee ensuring the adequate storing conditions for every medication. The software is to possess and provide the information of series number and expiry date.
- Minimum/maximum stock of every medication is to be calculated based on statistical consumption of the distributed medications or in line with formerly defined stock.
- The system is to inform the operator on the minimum stock in the case of any medicine.
- The system is to store medications of the same series number and expiry date in the same localization.
- The system is also to inform the operator on the localization of every medication in the stock (including series number and quantity). The system is to inform the operator in cases of approaching expiry date of any medications not distributed for a given, defined time.

### Distribution

- The system is to automatically complete all unit dose packs, composing an individual medication set for every patient, and collect them into a package in a manner disabling accidental unpacking. The number of unit dose packages depends on individually prescribed treatment for a given patient.
- The system is to supplement every package with a label with patient data (e.g. patient's surname, name/code of ward, number of hospital room, age). This label should also include a list of medications composing a daily medication set of a patient and the time of applying the medication.
- The system is to be capable of distributing medications to the wards in order to supplement the ward stock.
- The system is to automatically reject medications from the withdrawn deliveries and unload the medications post-expiry date from the automatic unit dose stock.
- The unit dose stock management software is also to manage the medications not stored in the stock (e.g. drugs, medications in the refrigerators, medications of considerable volume etc.). For every order from the ward, the software is to enable the preparation of the medication withdrawal list that is to be carried out by the personnel in a manual mode.
- The system is to enable the simultaneous loading and unloading orders.

- If the stock of any medication amounts to “zero”, the system is to send this information directly to the operator before the beginning of production and distribution process.
- The system is to distribute medications chronologically in line with expiry dates: medicines of shortest expiry date must be distributed in the first place.
- Expiry date and batch number are to be checked automatically before the distribution of medications to the patient/ward.
- As a result of distribution process, medications for every patient are to be compiled in a chronological order responding to the adequate prescription/intake hour. All doses withdrawn by the system from the stock are to be automatically checked by barcode scanning in order to confirm the appropriateness of distributing every of them (within the system of medication stocking and withdrawing). Manual unit dose checks by the pharmacist should not be necessary following on the implementation of the system.
- Management system is to be capable of tracking every unit dose together with its history (medication code, stock localization, series number, expiry date) with the use of a bar code. In cases of returns, the stock management system, with the use of a bar code, is to identify the ward and the patient who did not receive the unit dose (complete identification).
- The system is also enable the service and tracking of medications that are not in the form of unit doses.

#### Inventory

- The system is to cooperate with the software processing prescriptions (recommendations) and the pharmacy system and other hospital systems. The communication with the software processing prescriptions is to enable the management system to receive orders from the wards, calculate the total amount of medication of a given type and check which medications are stored in the stock or which of them do not require repackaging. The operator, on checking by the pharmacist, is just to call for the order list on the monitor, choose the proper-to – the-situation operation and confirm the initializing of proper actions. The system automatically prepares individualized medication sets in line for every ward.
- The system is to support pharmacists even in most cumbersome inventory procedures. At any moment the system must ensure checking the stocks in the automatic stock and printing out reports.
- Every conducted operation is to be recorded and archived in the system.
- Information on conducted operations is to be recalled on entering the search parameters: time frame, ward, patient, cost, etc.

#### Managing returns

- Returns of unused unit doses is to involve complete automatic checking of expiry date and series number. The system must update the stock and send information to the hospital/pharmacy computer system. By scanning unit dose barcode, the system is to recognize which ward and patient did not receive the medication.

#### Managing errors and safety system

- The system is to be equipped with safety system that disables manual access during processing. In case of a trial of manual access the machine should come to a halt immediately. Here, the device shall enable triggering the alarm signal and recording event logs in the database recording the device’s operation.

- In cases of any disturbances within the production process, all data is to be retained in the system management software. The system must ensure the possibility to resume the production process after dealing with all technical problems. In the case of any alarm, the system must notify the operator on the error together with detailed information of it and information concerning the manner of problem resolution.
- In case of technical problems during medication distribution, the software must ensure the possibility to switch the process onto other devices of this kind. If the system contains only one such device, all modules critical to the distribution process should be doubled inside this device. The system is to ensure, in particular, the capability to distribute medications by two, fully independent, robots within the same device.

#### System control software

- The system should include IT devices, software and central management system and crucial interfaces (for hospital computer systems, electronic prescription system and central pharmacy system). The system is to be supported with a alarm procedure in cases of technical problems.
- The software should have a graphically- and user-friendly interface in Polish language. The user and technical documentation should be in Polish as well (it also applies to the external carrier CD-ROM).

#### Transportation

Medication transportation to the hospital wards shall be conducted with the use of transport carts locked in the Pharmacy and unlocked in the Clinic. The cart should be ensured against unauthorized unlocking in an effective manner (e.g. digital or electronic lock, key).

#### Types of managed medications

Packaging system should facilitate packaging medications of different sizes by automatic adjustments of bag sizes to the medication sizes.

#### *Loose medications (loose oral medications)*

This medication type constitutes 20% of all repackaged and distributed medications from the device.

During repackaging process in the machine, the risk of cross-contamination should be avoided. The same carriers, paths or transport channels must not be reused. The system description must indicate a detailed manner in which the device prevents the risk of contamination.

#### *Medications in blister packs*

This type of medication constitutes 50% of all packaged and distributed medications from the device.

There are four types of blister packs:

- Unit dose blister pack (initially trimmed) prepared by the medication deliverer
- Single-row blister pack
- Double-row blister pack of parallel arrangement
- Other blister packs

The device is to process the machine-trimmed blister packs. Multiple-row blister packs (single-row and double-row blister packs) are to be automatically cut by the device. For safety reasons, the cutting device should be installed inside the machine. External-to-the-machine cutting devices are strictly prohibited (except for manual cutting of nonstandard blister packs).

### *Ampoules, phials, sachets, suppositories and syringes*

This type of medication constitutes 30% of all packaged and distributed medications from the device.

The device must be capable of repackaging:

- Ampoules
- Phials
- Sachets
- Suppositories
- Syringes.

### **Adjusting the hospital computer system within initializing automatic medication system within unit dose technology**

Hospital computer system shall be adjusted to the automatic medication distribution system (unit dose) within implementing barcode technologies in order to manage the processes of patient, medication, medical material flow and their usage in the elements of the existing finance-accounts system.

The execution of the planned investment calls for:

- Adjustment of hospital computer system (ISS) in a way that allows one-time data entering into the system and sharing it among all users,
- All organization units used common dictionaries of basic data (e.g. medication lists, patient lists),
- With its range, the ISS included all operational units of the hospital and all sites generating costs,
- The ISS was integrated with the software of separate diagnostic devices (analyzers and imaging diagnosis devices) in such a way that storing data was automated,
- In the patient service process the identification was enabled with a code placed on a band that the patient received at the moment of registration and had it at all times,
- The documents were provided with unique codes responding to the separate patient in the ISS,
- All medications cleared for every patient were delivered to the wards in barcoded packages,
- The application of medication to the patient was preceded with scanning the patient code, medical material code and the person in-charge-of-the-medication code and was possible at the bed site of the patient with the use of medical terminals,
- The identified medications and medical materials used and utilized by the patient were recorded in the database in the record identified by their code,
- In cases of inability to barscan, the registration of the application was conducted by typing the name of medication or choosing from the list on the monitor,
- The ISS ensured the conformity to the international standards of the identification of medical procedures, medications and materials, and electronic communication,
- Implementation of the system for electronic circulation of documentation inside the hospital,
- Integration of elements of finance-accounts system (Fixed assets, Stock) with barcoding,
- The ISS was applicable to PDA mobile devices and TABLET with in-built barcode scanners. Additionally, the system is to include barcode printers ensuring the printouts of codes on bands and labels in different formats,
- Ensuring the expansion of local computer network for the Hospital with the use of active and passive devices (computers, servers, routers, LAN switches, emergency power

suppliers, WiFi spots with controllers and necessary LAN cabling and powering network) that shall facilitate the proper operations of the ISS on all Hospital premises. The equipment and the software must cooperate with the existing devices and meet the safety standards for the ISS (it applies in particular to authorized access to the ISS resources, wireless transmission coding, possibility of remote management from one place).