

## Nominative Drug-Dispensing System in Hospital: Literature Review and Sharing of Experience

Zineb Lachhab<sup>1,2\*</sup>, Sanaa Makram<sup>2</sup>, Mina Ait El Cadi<sup>2</sup>, Bouchra Meddah<sup>1,2</sup>

<sup>1</sup>Pharmacy department, National Institute of Oncology, Rabat, Morocco

<sup>2</sup>Laboratory of Pharmacology-Toxicology, Faculty of Medicine and Pharmacy, University Mohamed V, Rabat, Morocco

**\*Corresponding author**

Zineb Lachhab

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**Abstract:** Once prescribed, within a hospital structure, the drug will follow a complex circuit, involving many intermediates, human and technical, and leading to the drug administration and its monitoring. From the point of view of pharmaceutical practice, the circuit is of course made of an important logistic part but also of a clinical part often underestimated but nevertheless essential to the safety of the patients during their stay in the hospital. In order to be able to combine the logistic and clinical aspect of the pharmaceutical activity in a hospital environment, it is essential to adopt an appropriate dispensing mode that allows to better secure the patient's medication management. The purpose of this article is to describe the practice of the nominative dispensing in hospital and to share the experience of introduction of this practice at the pharmacy of the Moroccan Institute of Oncology.

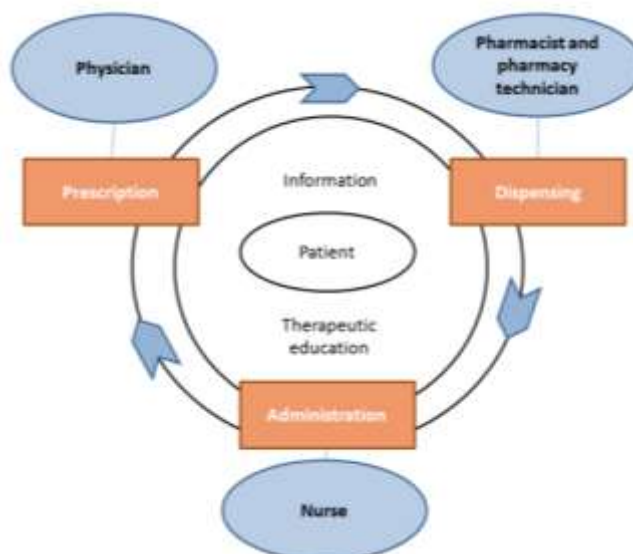
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**INTRODUCTION**

The hospital medication circuit is a complex and heterogeneous macro-process that involves many health professionals and is based on a chain of competences in which communication between the different actors and the coordination of the interventions of each is essential factors [1] (Figure 1).

The hospital pharmacy is responsible for meeting the pharmaceutical needs of the establishment where it is established, including the management,

supply, preparation, control, detention and dispensing of medicines and medical devices.



**Fig-1: overall scheme of the drug circuit at the hospital [2]**

Drugs are one of the main tools of medical therapy and are a significant part of hospital budgets.

Implementing safe, organized, and efficient drug-dispensing systems is essential for controlling costs and

assuring that the medical prescription is safely followed according standards. An appropriate dispensing system is an important ally for the prevention or reduction of medication errors by helping to minimize dispensing errors in a hospital pharmacy [3].

The pharmacist must ensure the drug dispensing, associating with the drugs delivery: the pharmaceutical analysis of the medical prescription, the eventual preparation of doses to administer and the provision of information and advice necessary for the proper use of the drug [4].

The pharmaceutical analysis of the medical prescription must be carried out for any prescription of drugs before their delivery and their administration to the patient. It includes on the one hand the regulatory analysis of the prescription which is a control of the conformity of the prescription with the regulation in force, and on the other hand the pharmacological analysis which is carried out by a pharmacist and consists in checking: the dosage, the method of administration and possible incompatibilities, drug interactions, prescription redundancies and potential adverse effects.

The preparation of the doses to be administered consists in the galenic preparation of doses when this is necessary. This operation includes the magistral preparations, the hospital preparations, the possible division of the multidose presentations and their reconditioning in unitary forms, as well as the labeling.

Deliverance is the set of distributive activities performed in accordance with regulations by a pharmacy professional and comprising: the collection, distribution, control and delivery of the medication to the care units or to the patient.

The provision of informations and advices necessary for the proper use of the drug are a very important part of the dispensing act. These informations are distributed by the hospital pharmacy and under the responsibility of the pharmacist; they may be intended for prescribers, nurses or patients and may concern the methods of administration of drugs, the conditions and durations of conservation, the stabilities of the drugs in time according to their galenic forms or their dilutions, the precautions of use, etc.

Adoption of a proper drug dispensing system is a top priority for any hospital to ensure cost-effective

drug management process in that hospital [5]. There are many types of drug dispensing systems, including ward stock and unit dose systems that could be adopted to achieve this goal. We distinguish in order of increasing security: The Global dispensing (GD), Globalized dispensing and individual nominative dispensing (IND) (Figure 2):

The Global dispensing (Collective System) is described as traditional because it represented the mode of organization still predominant in many hospitals; it consists to deliver the drugs from a clinical service order without the prescriptions being communicated to the pharmacy [6]. The advantages of this system are that drugs are readily available at the units; there are fewer requests to the pharmacy, with a corresponding reduction in pharmacy expenses related to human resources and materials. These advantages become obstacles for improved pharmaceutical service to patients [7]. A negative consequence is a high rate of medication errors, the most common being giving twice the dosage, giving the wrong drug, inappropriate dose and administration routes, and giving non-prescribed drugs. A further disadvantage is inefficient stock control and increased expenses related to drugs [8,9].

In Globalized dispensing system, medical prescriptions are globalized by computer calculation after pharmaceutical analysis and possible preparation of the doses to be administered, for duration of one or more days. The drugs are distributed "in bulk" to the care units and the preparation of the doses to be administered is carried out by the nurses. This mode of operation corresponds to an intermediate position between the individual nominative dispensation and the Global distribution.

The Individual nominative dispensing (Individualized System) consists of individual dose deliverance in the name of a patient that takes place each day or week after pharmaceutical analysis of an individual prescription. Some authors speak of "Individual Daily Nominative Dispensing" "when the deliverance is made every day or "Individual Weekly Individual dispensing" when performed only once a week.

Specific terms of deliverance are organized for certain drugs: narcotics, blood-derived drugs, cytotoxic and other special-status drugs.



**Figuro-2: The different modalities of dispensing [10].**

Regulations and literature around the world have long recognized the many benefits to be expected from implementing a nominative dispensing in a health facility. The main benefits relate to the fight against iatrogenic, the reduction of hospital expenses and the improvement of quality.

Clinically, the IND is presented as an effective way to rationalize professional practices around the drug and improve patient management, through the pharmaceutical analysis of individual prescriptions, the checks carried out on preparations and the traceability of drugs. In this, it reduces the occurrence of iatrogenic medication incidents in the hospital [11]. Several studies have compared the rate of medication errors between the different modes of delivery, all of which have shown a significant reduction in the rate of Medication Error (ME) when the dispensing is nominal. Taxis et al demonstrate that the overall frequency of ME is significantly higher in a globalized system than in an individualized system: their study compares the ME rate of an English hospital where 70% of the drugs are stored in the wardrobes of services, a German hospital where drugs are delivered in IND and from another German hospital where drugs are delivered globally. The lowest rate of ME was found with the IND (2.4%), 5.1% of ME in total dispensing and 8% when the majority of drugs are stored in the services [12].

On the economic front, the IND has two effects; On the one hand, securing the drug circuit by the IND allows the hospital structure to limit expenditure directly induced by drug iatrogenesis, such as the prolongation of the length of stay or new treatments. On the other hand, the rationalization of the drug circuit by the IND leads to a decrease in consumption and better inventory management by reducing the quantity of drugs placed in endowment in the clinical services and the reduction of the immobilization of stock in clinical services as well as that of expiry of drugs [11].

The IND reinforces the quality in healthcare establishments, in terms of therapeutic management and quality of professional practices. The quality of the therapeutic management consists, for the patient, in

being able to receive the appropriate care to his state of health. In this sense, the IND is an organization that allows giving greater satisfaction to patients. It makes possible the pharmaceutical analysis of the prescriptions, a dose preparation assured under good conditions and controlled by a pharmacist, the optimization of the therapeutic choices, the management of the personal treatments of the patients since the pharmacy and the ascending and descending traceability of the drugs administered to patients. In addition, IND improves the quality of patient care through better information exchange; it promotes a dialogue between professionals, since the pharmacist becomes an interlocutor of the care units, giving information on the drugs that interest both the prescribers and the nurses responsible for administering the doses.

The nominative dispensing allows also the improvement of professional practices. Implementing it clarifies the functions of each, in accordance with the regulations. Each profession carries out its missions. The IND should thus prevent "slippage of tasks and inconsistencies that are detrimental to patient safety: unauthorized prescribers, dispensing without a prescription, collecting treatment by the nurse from the medicine cabinets, lack of validation"[13]. It is therefore a guarantee of good practice insofar as it ensures that each professional exercises the core of his or her profession, within the limits defined by law.

Automation is another step in modernizing and securing the drug circuit by reducing the importance of logistical tasks while ensuring the efficiency of the tasks performed, ensuring the traceability of operations and optimizing inventory management. Automated dispensing machines are currently widely used in many hospitals [14].

The main medical interest represented by the automation of the nominative dispensing lies in securing and optimizing the circuit of the drug in the hospital by reducing the risk of drug iatrogenic. Several studies have compared the delivery error rate before and after installation of a ND automaton: Weaver reported that the use of an automaton has reduced errors in the delivery from 2.9 to 0.6% in an adult hospital [15].

Kratz *et al.* estimated accuracy rate of the automaton (ATC212® from Baxter) at 99.98% while that of manual IND was estimated at 92.62% [16]. Borel *et al.* observed in their study 16.9% of ME before installation of the automaton and after automation, a reduction of this rate to 10.4% [17].

Automation also reduces human resources inasmuch as all the tasks that can be automated free up time for activities that are more oriented towards a "Job" skill.

Despite its multiple benefits, there are a number of constraints related to DN activity. These constraints affect both the work organization of the staff, the logistics organization which is more complex and has financial consequences. Not all clinical services are suitable for this type of organisation because of their internal organization; a clinical service with a low average length of stay and a high rate of modification of prescription will not be adapted to the IND, on the other hand, a long-stay clinical service with high prescription stability is eligible for the IND. Clinical services such as emergencies or intensive care units are automatically excluded from this dispensing modality. In the same way, not all drugs are suitable for IND, conditional prescription drugs such as paracetamol or laxatives and large volumes are not supported by the IDN, they remain distributed in GD.

**Experience of the Moroccan institute of oncology in the nominative dispensing of antibiotics**  
**Background**

Promoting good antibiotics use and improving the quality of care in hospitals by optimizing treatments is part of the Moroccan National Policy announced by the Ministry of Health to fight nosocomial infections. The nominative dispensing of antibiotics is one of the

tools used to achieve this goal. We report in this section the experience of nominative dispensing of antibiotics in a Moroccan oncology institute.

**Organization**

The nominative dispensing of antibiotics by the pharmacy of the Moroccan Institute of Oncology began in early 2016. The introduction of this practice was motivated by an awareness of the significant iatrogenic risk associated with globalized dispensing especially for sensitive pharmaceuticals such as antibiotics.

The system is based on the use of nominative prescriptions for antibiotics; each prescription has three parts (Figure 3):

- The first is reserved for the patient's socio-administrative information: name, age, sex, weight, diagnosis and type of medical coverage.
- The second part concerns the prescription: medical indication, type of antibiotic treatment (prophylactic, probabilistic or documented), the date of beginning and the duration of treatment.
- The third part concerns the prescribed treatment: the name of the antibiotic (International Nonproprietary Name), route of administration and dosage, these informations are reserved for physicians. The part reserved for the pharmacist concerns: the dispensed treatment, the dispensed quantity, the batch number and the expiry date.

Regarding the organization; the dispensation is not made on a daily basis, the duration of treatment provided depends on the type of antibiotic therapy. Usually three days for probabilistic treatment and four days for documented and prophylactic treatment.



**Fig-3: example of a nominative prescription of antibiotics in the Moroccan institute of oncology**

### Strong points

Logistically, the improvement of traceability of treatments is the main advantage of the nominative dispensing of antibiotics. Indeed; the nominative orders are classified and entered on the computer system.

Therapeutically, the adoption of this practice has allowed us to have a better visibility on antibiotic treatment protocols at our institute level and has also enabled the pharmacist's commitment to the therapeutic management of patients by carrying out certain interventions: mainly pharmaceutical adjustment of the prescription and reassessment of probabilistic antibiotherapy according to the results of the antibiogram.

The opinion of the referring physician is always required to justify an antibiotic treatment based on broad-spectrum antibiotics. This point made it possible to rationalize the use of antibiotics of last resort (for example: imipenem) which has an ecological impact by reduction of the pressure of selection of the mutants and a significant economic impact.

### Areas of improvement

The main point to improve in our practice is related to the computer system; it has limited functionalities, which does not allow the pharmacist to have access to the patient's file in order to perform the pharmaceutical interventions properly, taking into account the clinical and therapeutic information of the patient.

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