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Reconfiguration of replenishment process of resuscitation unit of an public hospital in Morocco

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Abstract

In this paper, our objective is to present the results of a reconfiguration of the medication distribution process in favor of a resuscitation service in a public hospital in Morocco. We begin by modeling the distribution of drugs in its current state; we then highlight the anomalies posed by this process and this through a performance indicator "the rate of advances". We end by proposing a reconfiguration of the process in such a way to eradicate the anomalies noted while clarifying the specifications of its implementation.

Keywords
Supply chain, Medicines, process, replenishment, hospital, reconfiguration

1. Introduction

In hospital area, drug is a critical element considering all the constraints that surround its management. It is an essential and vital product for any act of care, the availability of medicines in the units of care in sufficient quantity and at the desired time is imperative for the accomplishment of this act. The prices of medicines in Morocco are expensive, their acquisition by hospitals is subject to an operating budget allocated by the Ministry of Health, pharmacists in hospitals are forced to optimize their use while covering the full annual requirements in medicine. Replenishment of care units is the stage preceding medicines administration to the patient. This replenishment lead to the constitution of a stock of medicines in the care units. The process of replenishment, of which the supplier is the pharmacy and the client is the unit of care, is qualifies as performing when it allows the immediate satisfaction of any demand for medicine while avoiding their stockpiling.

In this article, we aim to improve the performance of a process of replenishing a resuscitation service within a public hospital in Morocco. To do it, we have adopted a three-step approach. A first is devoted to the study of the existent, it consists in modeling the process, highlighting the actors, the activities, the data and the documents conveyed. A second step is to assess performance through two indicators, advances rate and the sold-out rate. The analysis of the

results obtained through these two indicators serves to clarify the points of inadequacy in the process. The final step is to propose a target process

We begin by presenting the context of the study and the presentation of the approach adopted. The second part of the article and dedicated to the deployment of the process, from the modeling of the process to the final result, we end by discussing the conditions of implementation of the reconfiguration approach.

2. Contexte and study steps

The study takes place within the pharmacy of a public hospital in Casablanca intended to treat a population of 520 000 inhabitants. The pharmacy's mission is to provide the 11 units of care that make up the hospital for pharmaceuticals, including medicines. The pharmacy manages 220 items of medicines, among the units of care, we have service of resuscitation. This unit supports patients with critical health, whose life is directly threatened and which requires special treatment. It is a unit of extreme importance and is called upon to treat pathologies of all kinds. As a result, it has a high degree of diversity in drug use, which is about 47%, this shows the importance of the flow from the pharmacy to this unit.
Medicines are distributed by many was, but the monthly global distribution is the most practiced (90%). It consists on replenishment once month of all drugs required by care unit, under a request from medical staff.
Our steps to resolve the question is described in figure 1

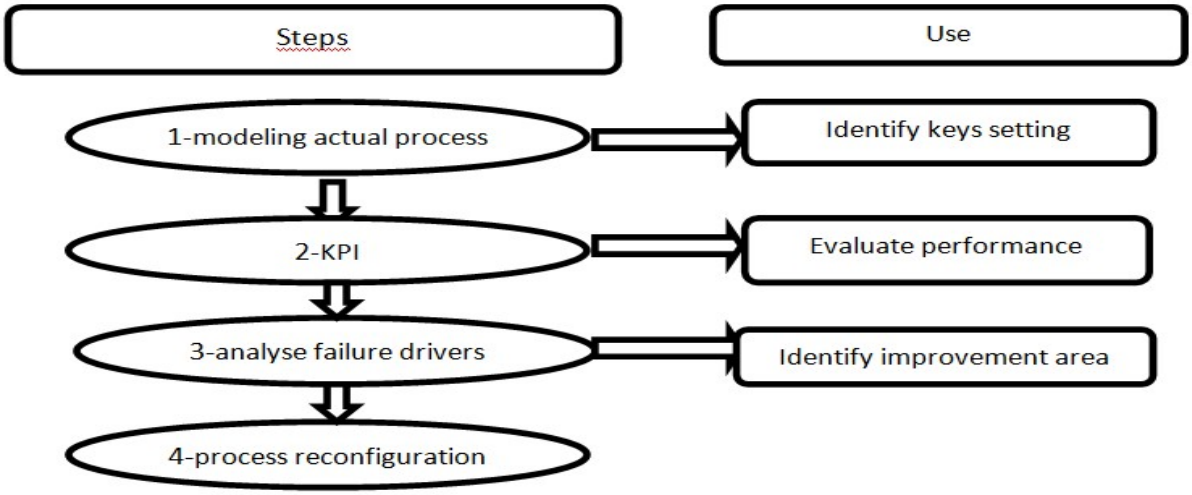

Figure 1: steps to process reconfiguration

3. Approach deployement

The first step is process modeling, two processes are modeled, global distribution and especial distribution, the second one is calculate of KPI[1].

3.1 Modelling process

Process actors are: pharmacist, drug preparer, head nurse of care unit and chief medical. Figure 2 shows the process chain of global distribution .
the global distribution of medicines is triggered by a request made by the monthly frequency care unit, this request is based on an estimate of the monthly need for medicines made by the head nurse and the chief medical officer. thereafter to the approval of the pharmacist who, with the help of the preparer, validates the need, according to the available stock, the average consumption of each drug. Order is then given for drug distribution. In cases where the

[1] Key performance indicators

quantity of medicines distributed at the beginning of the month is not sufficient, the resuscitation department is authorized to request medication advances on month M + 1. This mode involves the same actors and follows the same steps as the initial mode. However, excessive advances may mean a dysfunction in the initial mode, which is why, in a second step, we evaluate the indicator of the rate of advances and that of the rate of rupture of the resuscitation service.

3.2 Calculating KPI

The performance of the drug delivery process is measured by two key indicators, the rate of breakdown and the rate of advances. These two indicators are derived from the TDB OPRI design methodology (IBN EL FAROUK, 2014). They are calculated according to the following formulas:

- Out-of-stock rate = number of orders for drugs not met / total number of orders
- Rate of advances = sum of quantity of drugs distributed in advance in M / sum quantity distributed in M + 1

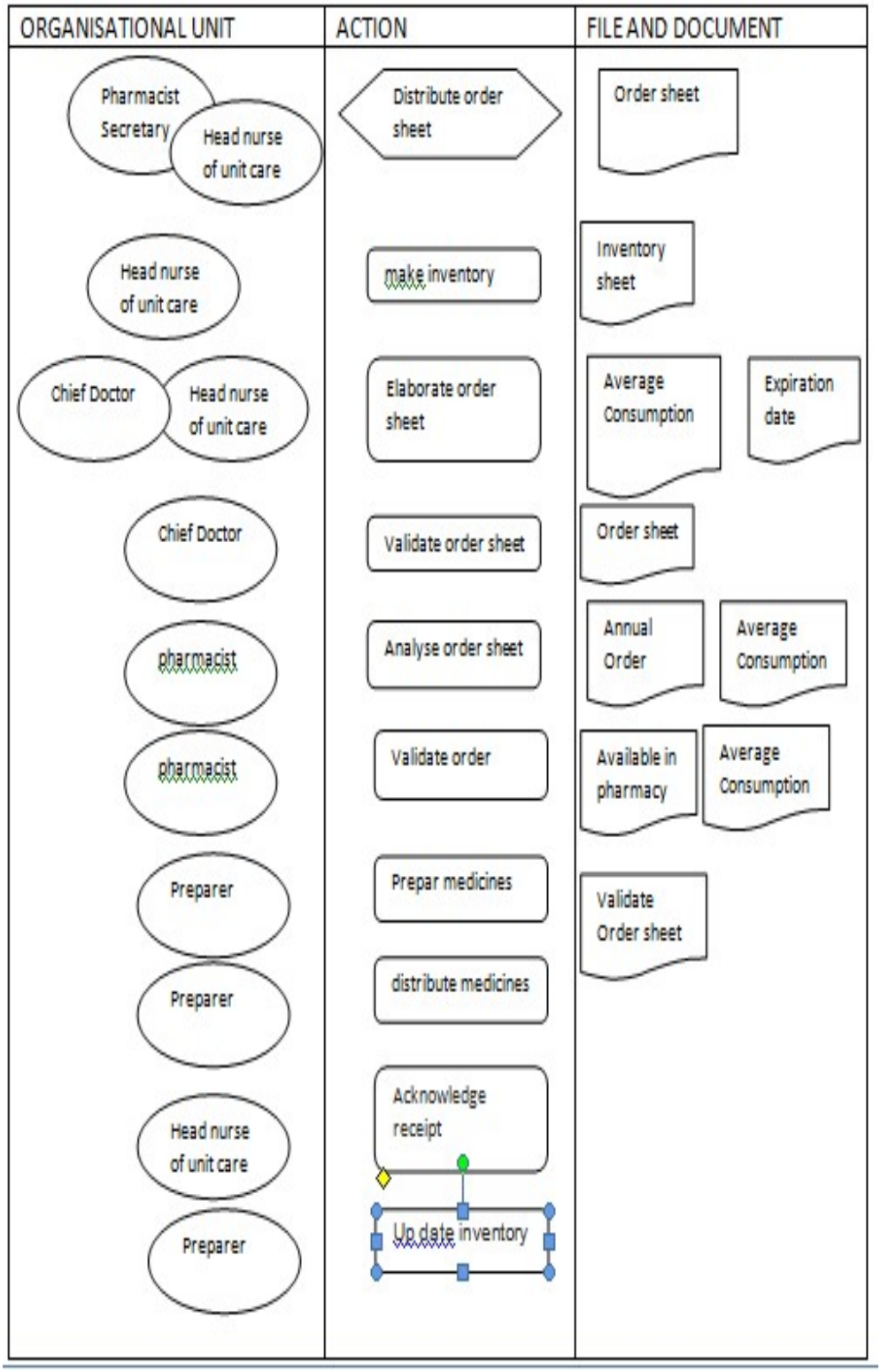

Figure 2: process chain of global distribution

In the first quadrimester of 2012, the sold-out rate for the intensive care unit was 61%, while the advances varied between 20% and 50% (Figure 3).

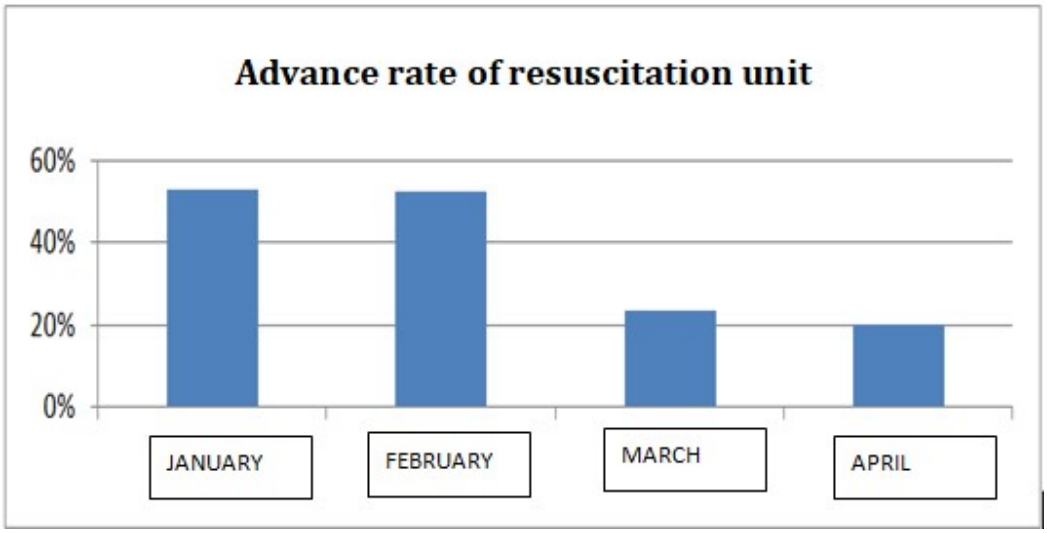

Figure 3: advance rate

A structure analysis of advance rate let us discover a number of dysfunctions as:

- Lack in storage facilities: the care unit don't have an area allocated to the pharmacy. The situation is much more critical when it concerns medicines with large packaging. To face this situation, nurse tend to call for a minimum quantity on the monthly order and proceeds by requests for advances during the month. This is the case of SODIUM CHLORIDE 0.9% INJECTABLE POCKET OF 500 ML. For example, monthly consumption is equivalent to 150 packages.
- Irregular consumption for some medicines
- Tendance to reduce inventory level in care unit: the nurses and doctors in care units always tend to lower the levels of stocks and especially for the expensive items. The items concerned by advances are mostly the most expensive.

Synthesis: We conclude that advanced order is a practice which tends to replace push flow replenishement by a lean flow in order to reduce stocks and guarantee greater flexibility in drugs supply . This leads us to think about introducing a much more flexible system of dispensing medicines and ensuring greater availability of medicines without causing congestion in the resuscitation service.

4. Result of replenishement process reconfiguration

To resolve the following question, we proposed a replenishment personalization. The actual mode is called "requisition" (BLOUIN & all, 2000).according to authors, this mode have some disadvantage, essentially, inventory accumulating and also shortage.

In literature, several options are available for replenishment unit care, according to the report of the MEAH about organization of the drug circuit in hospitals (LABORIES & WOYNAR, 2006) and the work of (BLOUIN & all, 2000) there are three principals modes: requisition system, level approach and trolley system. The description of these three modes of replenishment shows that each mode presents advantages and limitations and is adapted to a particular flow and can coexist with the other modes.

Through this literature review, we have opted for a combination of the bimonthly staffing system (BSS) and the stock replenishment (RS) system. The process of choosing the appropriate distribution mode for each article follows a certain mathematical logic in addition to a personal assessment by the chief pharmacist who knows the specificities of each items. Thus, according to this logic, the RS system is reserved for:

- Items whose daily consumption exceeds one packaging unit, it is easier to feed by complete packaging than to have to extract units in a package.
- Any items whose daily consumption is the equivalent of half a package and which falls under critical therapeutic classes namely: Pneumology;¬ Gastrology; Infectiology; Anesthesia; Analgesic; Cardiology.

- Any items considered as expensive.¬ These are the items whose prices fall in class A or the first half of class B. The purpose of this filtering is to minimize the value of the stock at the level of the care unit and all that it generates as losses, degradations and waste.

Result: 18 items in RS and 30 in BSS

For RS, parameters are

- **Interval of a tour:** every 2 days,
- **Staffing**: 3 days of rounded packaging,¬
- **Actor:** the pharmacy preparer,¬
- **Working document:** Listing containing the 20 items to be endowed. It specifies the staffing of each items, the processor records the existing stock at the position. It also provides for the listing of the pharmacy stock and the quantity dispensed (table 1).
- **Conduct of the operation:** the synoptic (Figure 4) shows the progress of the activity of which the main players are the preparer and the pharmacist.

Tableau 1: file of RS items

DATE	12/01/2015					
NAME OU PREPARER	YASSER					
DCI	CODE	LEVEL/ KEPPING UNIT	INVENTORY	GAP	PHARMACY INVENTORY	REPLENISHEMENT QUANTITY
FUROSEMIDE 20MG INJECTABLE	770020501	21				
CEFTRIAXONE 1G INJECTABLE	DMP32	18				
BENZYLPENICILLINE 1MUI INJECTABLE	410290505	12				
SALBUTAMOL 0,5MG/ML INJECTABLE	1630031001	7				
SODIUM CHLORURE 0,9% INJECTABLE POCHE DE 500 ML	2220100407	6				
LIDOCAINE 2% INJECTABLE	210030607	5				
POLYVIDONE IODEE 10% SOLUTION DERMIQUE	1840041207	4				
INSULINE HUMAINE A ACTION INTERMEDIAIRE MIXTE 70:30 100UI/ML INJECTABLE	920040601H	3				
HYDROCORTISONE 100MG INJECTABLE	910010508	3				
METRONIDAZOLE 500MG INJECTABLE	DMP60	3				
SOLUTION DE REMPLISSAGE VASCULAIRE A BASE DE GELATINE OU DEXTRAN OU HYDROXYETHYLAMIDON INJECTABLE	DMP121	2				
GLUCOSE 5% INJECTABLE POCHE DE 500 ML	2220010407	2				
DOBUTAMINE 250 MG INJICTABLE	100130201	2				
HEPARINE A BAS POIDS MOLECULAIRE 3500 A 4500UI ANTI-Xa INJECTABLE	DMP87	1				
VASELINE BLANCHE	1890051202	0				
NORADRENALINE 8MG INJECTABLE	100080201	0				
HUILE DE PARAFFINE	650010107	0				
EOSINE DISODIQUE 2% SOLUTION DERMIQUE	1840061207	0				

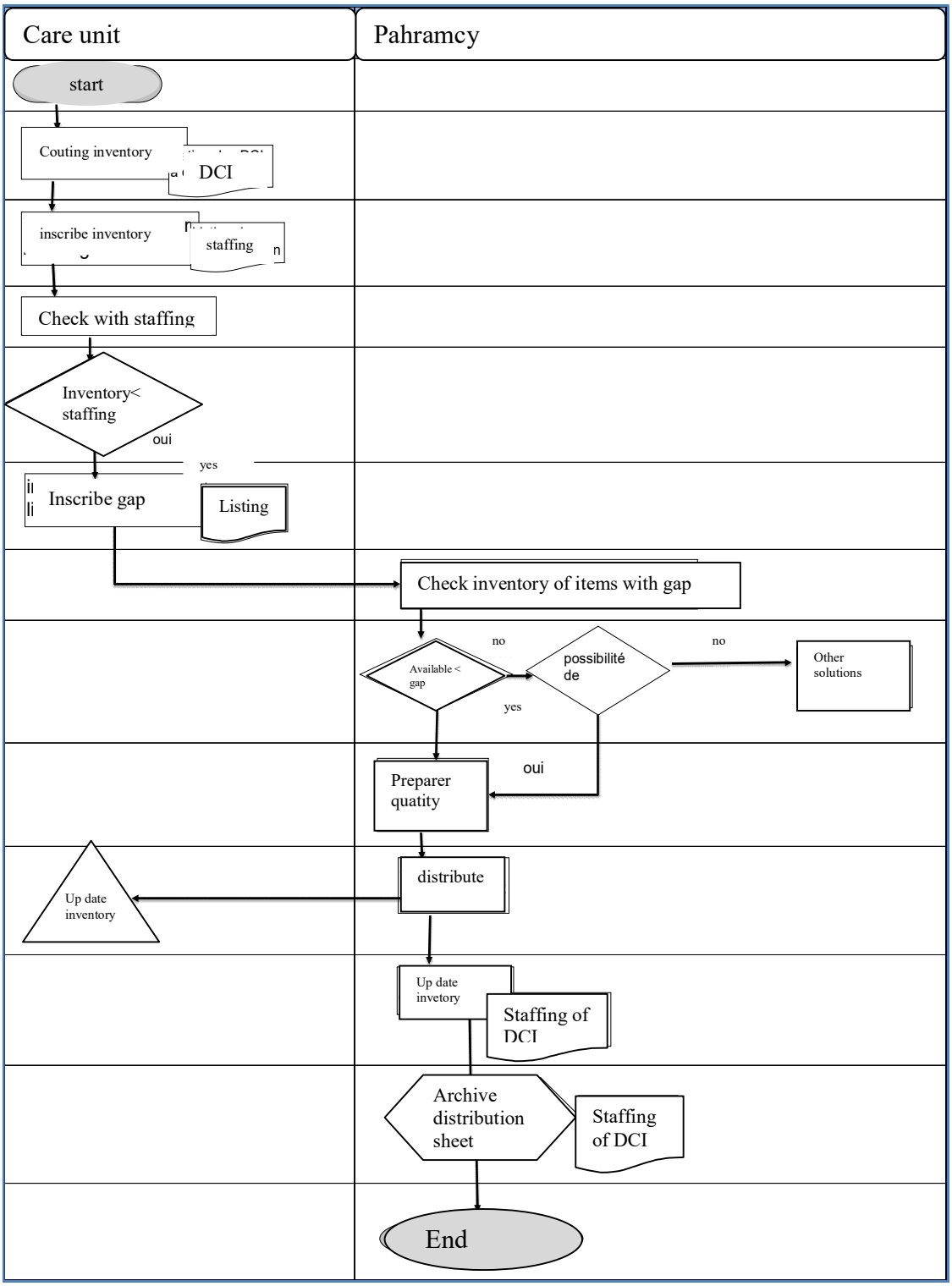

Figure 4: RS process synoptic

Demonstration

To illustrate the synoptic, we present in table 2, the result of a simulation of RS. we remark that on 18 articles distributed to the service resuscitation, only 11 was below the normal threshold. But the quatity to resupply does not correspond have exactly in the difference but in the available stock in the pharmacy.

Tableau 2: result of RS simulation

DATE	12/01/2015					
NAME OU PREPARER	YASSER					
DCI	CODE	LEVEL/ KEPPING UNIT	INVENTORY	GAP	PHARMACY INVENTORY	REPLENISHEMENT QUANTITY
FUROSEMIDE 20MG INJECTABLE	770020501	21	3	-18	16	16
BENZYLPENICILLINE 1MUI INJECTABLE	410290505	12	3	-9	10	10
CEFTRIAXONE 1G INJECTABLE	DMP32	18	12	-6	20	20
HYDROCORTISONE 100MG INJECTABLE	910010508	3	1	-2	7	7
SOLUTION DE REMPLISSAGE VASCULAIRE A BASE DE GELATINE OU DEXTRAN OU HYDROXYETHYLAMIDON INJECTABLE	DMP121	2	0	-2	8	8
INSULINE HUMAINE A ACTION INTERMEDIAIRE MIXTE 70:30 100UI/ML INJECTABLE	920040601H	3	2	-1	0	0
POLYVIDONE IODEE 10% SOLUTION DERMIQUE	1840041207	4	3	-1	0	0
GLUCOSE 5% INJECTABLE POCHE DE 500 ML	2220010407	2	1	-1	1	1
LIDOCAINE 2% INJECTABLE	210030607	5	4	-1	1	1
SALBUTAMOL 0,5MG/ML INJECTABLE	1630031001	7	6	-1	4	4
DOBUTAMINE 250 MG INJICTABLE	100130201	2	1	-1	3	3

Conclusion

The replenishment of units of care with drugs exactly according to their needs is the step that ensures the availability of medicines for each patient and which conditions a rigorous management of the stocks. Advances rate allowed us to analyze the reliability of distribution mode. We conclude that the mode applied is a pushed-flow, is too standard, and does not take into account the differences between drug categories and irregular drug consumption, or the storage space available at care units. Such functioning, which lacks flexibility, is detrimental to the supply chain of medicines, it favors breaks as well as overstocks.

The implementation of the personalization approach for medicines distribution requires certain conditions, mainly the training of human resources, ie preparers and nursing leaders, which must lead to the appropriation of the system by these actors, because without their involvement reconfiguration can not succeed. The adaptation of the storage rooms of medicines, the resizing of the storage drawers must be done according to the endowments of each drug, this dimensioning is to be reviewed periodically according to the evolution of the consumption.

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Biographies

Imane .IBN Farouk from MOROCCO, is currently serving as an Assistant Professor in National School of Management and Trade of EL JADIDA (ENCG), graduated with doctorate degree in hospital logistic from SIDI MOHAMED BEN ABDEALLAH UNIVERSITY in FES in 2014, and also a diploma of advanced studies in Engineering Logistics from Hassan II in Casablanca university, MOROCCO, in 2004. Ms. Imane was also a consultant in supplier logistics in the automotive sector and host of supplier performance since 2005.

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