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Analysis of drug dispensing by risk management method at three teaching hospitals in Abidjan, Cote d'Ivoire

D.P. Abrogoua[1, 2 *], A.Y. Sangaré[1], E. Doffou[3]

[1] *(Clinical Pharmacy and Therapeutics Laboratory, Faculty of Pharmaceutical and Biological Sciences - Félix Houphouët-Boigny University (Abidjan, Cote d'Ivoire)*
2(Clinical Pharmacology Department, Teaching Hospital of Cocody (Abidjan, Cote d'Ivoire)
3(Pharmacy Department, Teaching Hospital of Yopougon (Abidjan, Cote d'Ivoire)

Abstract
Introduction: *In hospitals, an optimum drug dispensing (DD) is involved in the quality of health services and the prevention of medication errors. This study aims to describe the features of hospital DD in Cote d'Ivoire in order to suggest improvements.*
Methodology*: The site visit (risk management method) was conducted at hospital pharmacies (HP) of the three teaching hospitals in Abidjan. A self-administered questionnaire was submitted to pharmacists, pharmacy assistants and pharmacy technicians. Another form served as support for observation during DD.*
Results*: The delivery of drugs was the most current act performed during DD among both pharmacists (38.04%) and other actors (58.89%). The prescription review was confirmed by 30.44% of pharmacists. Pharmacists spent more time in activities of "supply, orders, inventory, receiving, storage"(15.38%) than in prescription review (13.68%) and information about drugs (11.97%). The main medication orders collected were carbon multi-sheet medication orders of teaching hospitals (71.37%). 5.24% of prescription supports were analyzed by pharmacists.2.62% of medication orders included the 6 safety criteria of prescription per line.*
Conclusion: *DD at the visited teaching hospitals should be optimized for greater safety of patients. Clinical pharmacy activities could help improve its quality.*
Keywords: *drug dispensing, features, risk method, hospital, Cote d'Ivoire.*

I. Introduction

WHO reports that half of all pharmaceuticals worldwide are inappropriately prescribed or dispensed [1].Health facilities have the task of ensuring quality of care benefits. Practical means should be implemented to improve the various stages of medication system. The International Pharmaceutical Federation through Good Pharmaceutical Practices, described four major roles of hospital pharmacists, including that of ensuring the availability of pharmaceuticals and security in their use, especially during drug dispensing (DD) [2].DD is a complex process [3] and is the middle step between prescription and administration of medication. It triggers the transfer of drugs to patients. Among the tasks related to pharmacy practice in hospitals, DD is the essential pharmaceutical act. It is under the direct responsibility of the pharmacist. This is a key activity in the therapeutic management of patients and must participate in the rational use of drugs. Every year, a large number of drugs is delivered by pharmacists in many countries in the world. About 900 million drugs would be dispensed each year by the hospital and community pharmacists in England and the country of Wales [4]. In hospitals, an optimum DD is involved in the quality of health services and the prevention of medication errors. In the United States until the 20th century, adverse drug events were the fifth cause of death [5].In France, the EMIR study carried out in 2007 by 31 pharmacovigilance centers showed that 3.6% of hospital admissions are due to adverse drug effects [6].One time out of two, the effect was considered as preventable or potentially preventable [6]. Many adverse effects, hospitalizations and deaths are due to drug-drug interactions that could have been avoided [7-12]. This iatrogenic feature affects every step of medication system including that of DD. According to some authors, dispensing errors account for about 4% to 22% of medication errors encountered in a medical system [12-15]. According to the MEAH survey, the part of DD in the occurrence of preventable adverse drug events is 15% [16].DD is an important step in medication system to ensure the safe use of pharmaceuticals. Thus, the pharmacist must ensure the dispensing of the right drug at the right dose to the right patient at the right time and in the right conditions. The aim of our study was to describe the general features of hospital drug dispensing (HDD) at three teaching hospitals in Cote d'Ivoire) in order to make an inventory and to suggest improvements.

II. Methodology

II.1. Type of study

We carried out a descriptive cross-sectional study at three teaching hospitals in Abidjan (Cote d'Ivoire): CHUT (teaching hospital at Treichville), CHUC (teaching hospital at Cocody), CHUY (teaching hospital at Yopougon). In each institution, the study concerned the hospital pharmacy (HP). It took place from May to August 2013 and mainly involved pharmacists (including intern pharmacists). It was also extended to other actors in the HDD namely pharmacy assistants and pharmacy technicians.

II.2. Method of investigation

We selected as a methodological approach the site visit [17]. It is a method of risk management transposed to the health sector that we have chosen in the context of the assessment of drug dispensing. This method was also used to assess the safety of medication system in health facilities [18].

II.3. Referentials and assessment form

The site visit (risk management method) was to meet all actors involved to varying degrees in the process of HDD and to submit to them an assessment form. The assessment form was a specific self-questionnaire that was personally addressed to each actor, according to his availability, by the investigator. The items in this self-administered questionnaire were inspired from different referentials: Self-Assessment Tool of the Institute for Safe Medication Practices [19], the tool "checklist for a check-up" of the national center of hospital expertise (France) [20], good practices of DD and the referential of HP of the French society of clinical pharmacy [21]. The assessment criteria were selected to allow an assessment adapted to the health context of teaching hospitals of Cote d'Ivoire. The regulatory bases considered in this study consisted of the Decree No. 94-669 of December 21, 1994 on the conditions of drug registration and DD in Cote d'Ivoire [22] and the order of April 6, 2011 concerning the quality management of drug therapy and medicines in health facilities of France [23] to consider a more comprehensive definition of DD. Another form served as support for the comments made during the dispensing process involving all actors. Any prescription support for DD the days of our presence in the HP was analyzed.

II.4. Data analysis

Descriptive statistics were used to analyse the data collected. Data were analyse dusing IBM SPSS Version 20.0 (IBM Corp., Armonk, NY, USA).The significance level of the statistical tests was 5%. Multiple correspondence analysis (MCA) was used for further analysis to clarify the links between some items on prescription supports according to different teaching hospitals. The SPAD 5.5 software (Coheris, France) was used to perform analysis and graphics of factorial designs by MCA.

III. Results

III.1. General features of drug dispensing actors

The survey involved 41 pharmacists that is 83.67% of the number of pharmacists at the three teaching hospitals in Abidjan: CHUT (n = 16), CHUC (n = 11), CHUY (n = 14). Intern pharmacists constituted 34% of pharmacists. The other actors were represented by pharmacy assistants (n = 41) and pharmacy technicians (n = 14). Actors non pharmacists were more numerous than pharmacists (55 vs 41).The site visit concerned 43.9% of pharmacists in HP annexes located within care units in each teaching hospital. The sex ratio was2.15 males per female. An important part of pharmacists encountered had a job seniority between 1 and 10 years (68.3%). The other actors in HDD also had for the majority a job seniority that ranged between 1 and 10 years. The prescription supports analyzed were 1872 in number.

III.2. Drug delivery modes

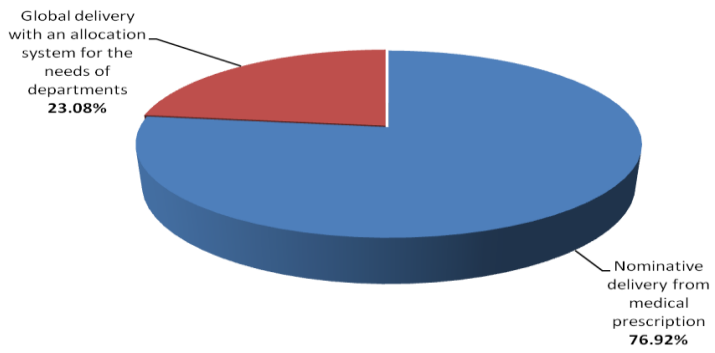


Figure 1. Drug delivery modes at all teaching hospitals

Two drug delivery modes are used at the three teaching hospitals: the nominative delivery, the largest (79.92%) and global delivery with an allocation system for the needs of departments. Globalized delivery from a set of prescriptions was not practiced (Fig. 1).

III.3.Common procedures performed during drug dispensing

Table 1. Common procedures performed during drug dispensing at the hospital pharmacy

Common procedures during drug dispensing	Pharmacists N (%)	Other actors N (%)	p
Drug delivery	35 (38.04)	53 (58.89)	0.03*
Prescription review	28 (30.44)	18 (20)	
Preparation of unit doses	2 (2.17)	0 (0)	
Provision of necessary information and advice to the proper use of drugs	27 (29.35)	19 (21.11)	
Total	92 (100)	90 (100)	

**Chi-square test*

Among the common procedures performed during DD, the most important was the drug delivery among both pharmacists (38.04%) and the other actors (58.89%) (Table 1). A smaller proportion (30.44%) of pharmacists declared to carry out prescription review. The provision of information and advice necessary for the proper use of drugs (29.35%) and preparations of unit doses (2.17%) were the activities the least performed by pharmacists. The Pharmacy Technicians and pharmacy assistants declared that they essentially practiced drug delivery (58.89%) during DD. None of them performed the preparation of unit doses. A significant difference existed between the common procedures performed during DD by both groups of actors (p = 0.03).

III.4. Sectors dedicated to the professional activity

Table 2. Sectors dedicated to the professional activity

	Pharmacists [N(%)]	Other actors [N (%)]	p
Supply, orders, inventory, receiving, storage of drugs	18 (15.38)	55 (41.04)	<0.01*
Supervision of trainees	18 (15.38)	20 (14.92)	
Research activities at the hospital	17 (14.53)	0 (0)	
Prescription review	16 (13.68)	4 (2.99)	
Drug delivery	15 (12.82)	45 (33.58)	
Drug information	14 (11.97)	1 (0.75)	
Preparation and management of drugs allocations of departments	11 (9.4)	9 (6.72)	
Therapeutic follow-up of patients	7 (5.95)	0 (0)	
Pharmacotechny including production and control of preparations	1 (0.85)	0 (0)	
Total	117 (100)	134 (100)	

** Chi-squareTest.*

Pharmacists spent more time in activities of "supply, orders, inventory, receiving, storage" of drugs (15.38%) and supervision of trainees (15.38%). The prescription review and information on drugs accounted for 13.68% and 11.97% respectively of sectors dedicated to the professional activity of pharmacists. The other actors mainly performed activities of "supply, orders, inventory, receiving, storage" (41.04%) and delivery of drugs (33.58%). The sectors dedicated to the professional activity differed significantly depending on the actors (p <0.01) (Table 2).

III.5. Analysis of prescription supports

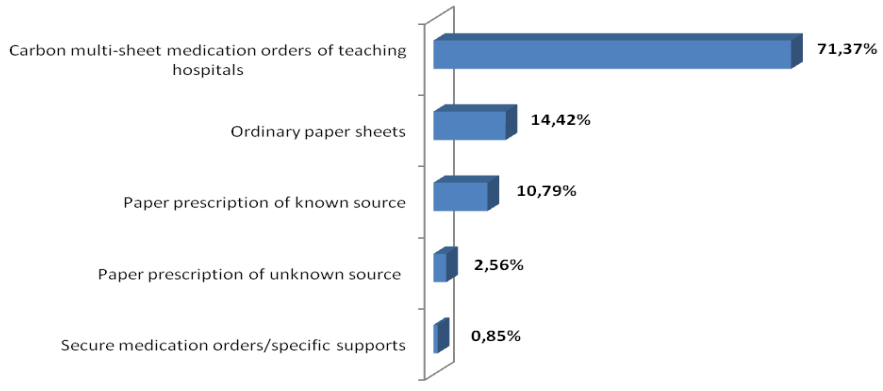


Figure 2: Types of prescription supports received at hospital pharmacies

The analyzed prescription supports were 1872 in number. The main supports were carbon multi-sheet medication orders of teaching hospitals (71.37%); paper prescriptions of unknown source and secure medication orders accounted for respectively 2.56% and 0.85% of supports. No support related to therapeutic protocols was received (Fig. 2). Pharmacists and other actors respectively received 5.24% and 94.76% of the supports for DD.

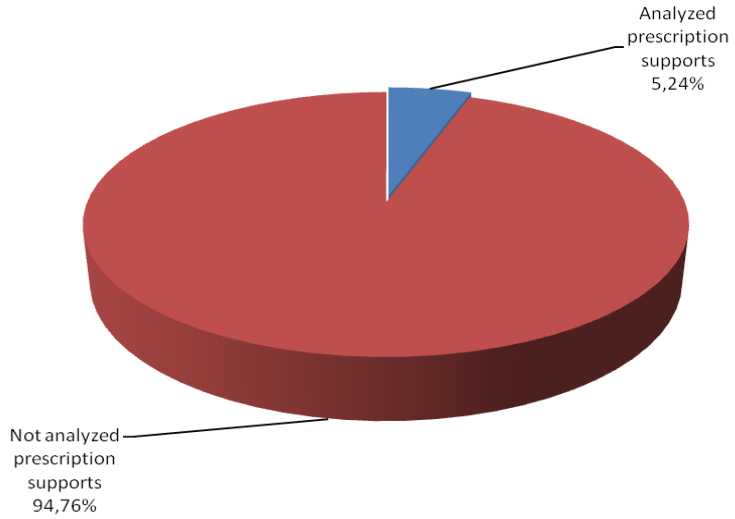


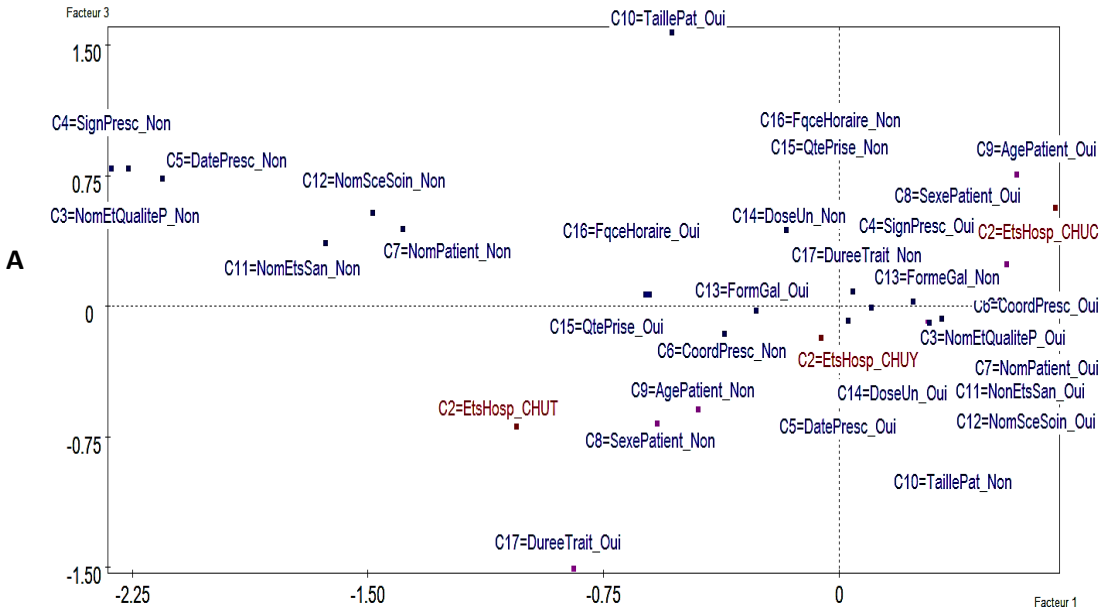
Figure 3: Proportion of prescription supports analyzed by pharmacists

Table 3. Presence of the 6 safety criteria of drug prescription on medication orders

Presence of the 6 safety criteria* of prescription	CHUT [N(%)]	CHUC [N(%)]	CHUY [N(%)]	Total (%)	p
Yes	46(8.78)	2(0.24)	1(0.19)	49(2.62)	<0.01**
No	478(91.22)	818(99.76)	527(99.81)	1823(97.38)	

**6 safety criteria: Drug Name, Form/route of administration, dosage, posology, moment and administration sequence, duration of treatment; ** Chi-square test.*

Only 05.24% of prescription supports were analyzed by pharmacists (Fig. 3).Overall 02.62% of supports included the 6 safety criteria of a prescription (Table 3).The presence of the 6 safety criteria of drug prescription on medication orders differs significantly depending on teaching hospitals (p <0.01) (Table 3).



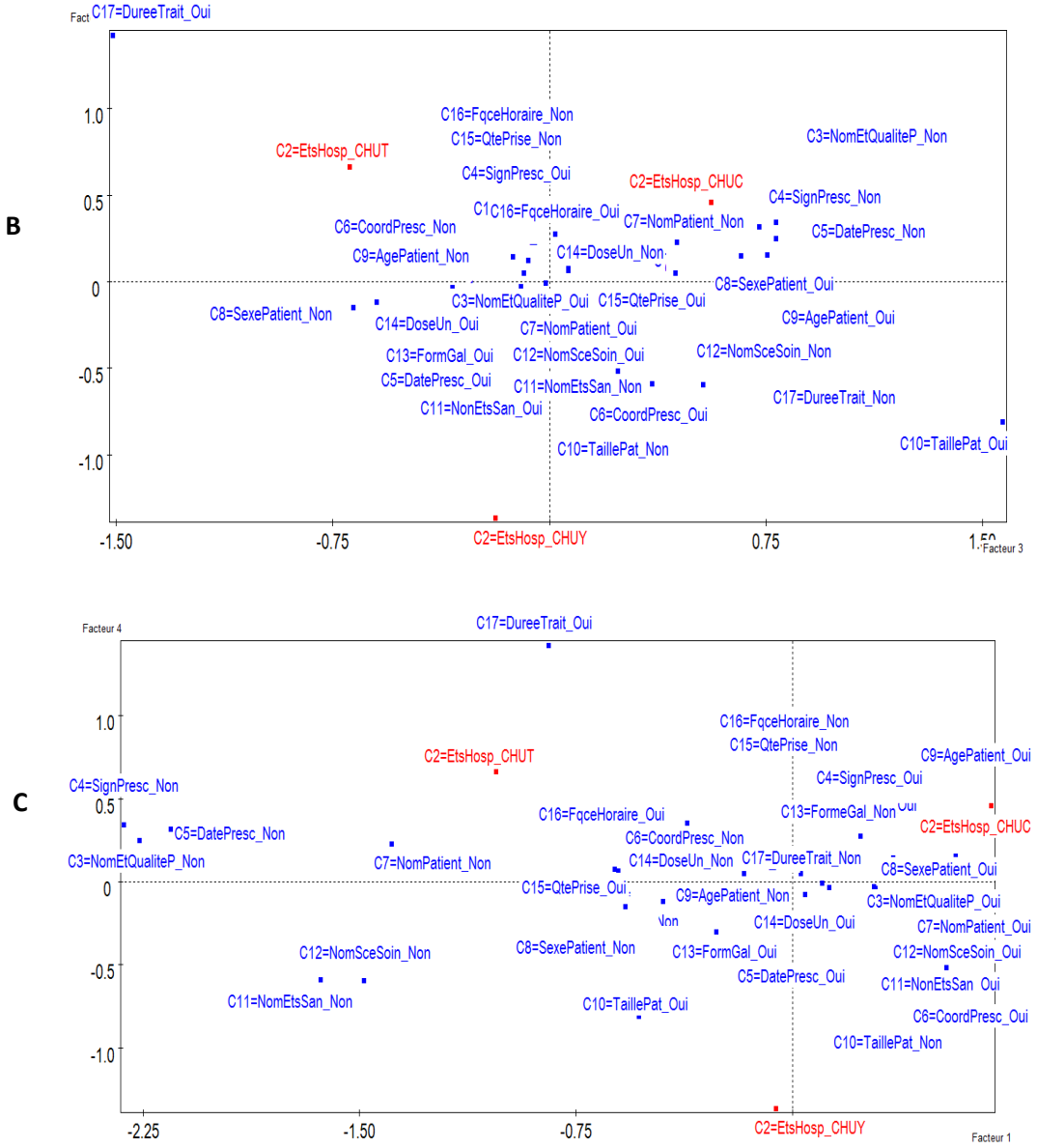


Figure 4: Main features of groups of prescription supports according to items appearing on them depending on teaching hospitals by MCA [factorial plans A: (1.3), B (1.4), C (3,4)].

The MCA of items appearing on prescription supports showed three groups depending on teaching hospitals (Fig. 4): *i) group 1*: These supports largely came from CHUC and partly from CHUT with as main elements mentioned: name and quality of the prescriber, signature of the prescriber, prescription date, name, gender, age and size of the patient, name of the health facility, name of the care department. The reference to the duration of treatment or prescriber's contact varies. The dosage is not mentioned. *ii) group 2:* these supports were largely from CHUT with the absence of the following elements (name and quality of the prescriber, signature of the prescriber, prescription date, contact of the prescriber, name, gender, age and size of the patient, name of the health facility, name of the care department). However, the duration of treatment and dosage are mentioned. *iii) group3*: these supports largely came from CHUY with the mention of the prescriber's contact, the variable reference to the duration of treatment and the absence of the specification of the patient's gender.

IV. Discussion

In our study, the dispensing system with nominative delivery was the most performed mode of delivery. This dispensing system must however be secured to the inpatient. It should be performed by health care professionals in sufficient numbers. For optimal DD, it is important to reduce the intervention of patients' representatives who are not healthcare professionals in the medication system especially during the dispensing process and the distribution of drugs. The presence of healthcare professionals at all stages of medication system

allows the pharmacist to have credible interlocutors for the transmission of information about the proper use of drugs. The computerization of medication system with shared medical records between clinical and pharmacy departments would allow the pharmacist to achieve better prescription review of both drugs dispensed at the HP and other drugs used by the inpatient. This computerization reduces errors of communication, transcription, and interpretation of handwritten prescriptions, which can represent 15.8% of medication errors according to Phillips et al. [24].

In the majority of pharmacists interviewed, the act of drug delivery was more performed than the prescription review. The preparation of unit doses was the activity the least performed. The low performance of prescription review could be justified, on the one hand by the fact that the prescription supports do not always include the necessary data for an optimal review, and on the other hand by the low degree of importance that pharmacists gave to this measure.

In our study, pharmacists spent more time for drug management activities than those related to prescription review and information on drugs. These results are consistent with a literature review which showed that most of the pharmacist's time was devoted to preparation and distribution activities [25]. In the study of Machet et al., The conventional activities of purchasing, provision and stock management held more than 25% of the working time for 28.3% of pharmacists [26]. Additional activities of the drug delivery occupied more than a quarter of the working time for 33.9% of pharmacists [26]. The importance prescription review by pharmacists in France and Quebec is defined in a legal and normative framework [26]. Pharmacists should spend more time in professional activities that guarantee the safety of medication system and the rational use of drugs. They can delegate tasks with reduced pharmaceutical interventions to pharmacy technicians and pharmacy assistants during DD. These can devote their professional time to activities related to purchasing, provision and stock management under the supervision of the pharmacist. An optimal and safe DD should constitute the bulk of clinical pharmacy activities pending the deployment of other activities at health facilities in Cote d'Ivoire. Appropriate professional training must be available to pharmacists for the reinforcement of their experience and the acquisition of updated skills for hospital activities. Appropriate programs of professional training for pharmacists in Cote d'Ivoire must be developed and implemented according to the current requirements of HP. In our study, pharmacists devoted little time to information about drugs. This information should be given to the nursing staff and the patient. The study of Zamparruti et al. showed that the pharmacist is considered by the medical team as an important source of information [27]. In the study of Lamy et al. three-quarters of patients expressed expectations regarding the organization of their management, and particularly the access to personalized information [28]. The pharmacist must play his full role of referent and reliable source of information about drugs. To achieve this, he must engage in an increased continuous search for updated information on drugs [29].

The lack of supports related to treatment protocols in our study can be explained by a lack of written protocols in several departments at teaching hospitals. Abrogoua et al. in their study carried out in the intensive care unit at the teaching hospital of Yopougon (CHUY) had noticed that the written protocols were non-existent in this department [30].

The DD system established in teaching hospitals favored a rather prompt DD. The lowest proportions of prescription for which the dispensing was done the day after could relate to the surgical kits. Indeed these prescribed kits were often provided with delay by patients' representatives. The presence of the 6 safety criteria of drug prescription was effective only for 2.62% of prescription supports. The MCA showed real inadequacies in the drafting quality of drug prescription. The lack of the duration of treatment observed on some prescriptions can be explained by the fact that in hospitals, drug treatments are reviewed daily. But the absence of other important data such as the patient's age, dosage, posology, moment and drug administration sequence may not facilitate prescription review. Other studies have generally reported the incomplete nature of hospital prescriptions [31-35]. Bocquet et al. found that in a French hospital, 64% of prescription lines had at least an oversight or error in relation to prescription standards [33]. According to the study by Paul et al., several irregularities were observed in the drafting of drugs prescription at the end of hospitalization [33]. The dosage was specified only once in two (1/2), the dosage form (1/3), the administration mode (1/3) and the dosage (1/5) [34]. Sondo et al. reported that errors or omissions were common on the duration of treatment, dosage, posology and dosage form on prescription in Burkina Faso, West Africa [35]. However, according to a study carried out in the United States (US), out of nearly 8,000 prescriptions, it appears that less than 1% of prescriptions are not signed, that the dosage form or the dose to administer is not specified in less than 1% of prescriptions [36]. The results of this study can be explained by the fact that quality insurance and monitoring programs have been implemented in many US medical institutions [37]. Measures must be taken by the medical authorities of teaching hospitals in Cote d'Ivoire to improve the quality of drugs prescription sent to HP. Physicians must always consider the prescription as a means of communication between the physician, pharmacist and patient. It allows the first actor to formulate his prescription and the second to have the necessary elements for a good DD. The regulatory non-compliance of prescription supports in our study may explain that only 05.24% of the supports were analyzed by pharmacists. In the study conducted by a French regional health agency (ARS-PACA

Corse) in 2011, for two of the studied regions all received prescriptions were the subject of a prescription review by pharmacists. The analysis of all prescriptions was fully done in 71% and partially in 27% of HP of the region [38]. It is important that the prescriptions are consistent in regulatory terms to allow a prescription review. This level of review does not necessarily require the patient's clinical and biological data. Access to these data is necessary for prescription review of higher level. The prescription review with reference documents or with clinical monitoring is not practiced because clinical pharmacy activities are not yet implemented at teaching hospitals in Cote d'Ivoire.

V. Conclusion

Our study has helped us describe the general features of HDD at three teaching hospitals in Cote d'Ivoire, West Africa. The HDD must be improved for patients' greater safety. Its optimization is also essential for the overall safety of medication system with the requirement for quality drafting of prescriptions. The Ivorian hospital pharmacist must appropriate the act of DD and fully exercise it. He must not separate drug delivery from the prescription review and other regulatory measures related to DD. The initiation of clinical pharmacy activities in these facilities will help improve the quality of DD, reduce iatrogenic events and optimize the pharmacotherapeutic activity.

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Conflict of interest

The authors have no conflicts of interest to declare.

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