Evaluation of Pharmaceutical Interventions on Antibiotic Prescriptions at the University Hospital Fattouma Bourguiba of Monastir

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Abstract

Prerequisite: The absence of a clear and validated strategy in terms of pharmaceutical validation of antibiotics prescription is a major reason for the emergence of antibiotics resistance and the increase of hospital costs. The implementation of such a strategy requires close cooperation between the prescriber and the hospital pharmacist.

Objective: Evaluate the acceptance of prescribers for the validation role of the hospital pharmacist, and thus describe pharmaceutical interventions performed for the clinical departments at the University Hospital Fattouma Bourguiba of Monastir.

Methods: The study was conducted over a period of six months during which an assessment of pharmaceutical interventions was established, a result of the validation of antibiotics hospital prescriptions.

Results: 110 pharmacotherapeutic problem were identified, corresponding to 110 performed pharmaceutical interventions. The two most frequent interventions concerned proposals for dosage adjustments that were the primary cause of interventions (39.1%), followed by proposals for substitutions of antibiotic treatments (35.45%). 64.5% of all the interventions (71 pharmaceutical interventions) were accepted by the prescribers.

Conclusion: This strategy of pharmaceutical validation has contributed to the prevention of some inappropriate treatments. Therefore, it allows avoiding as much as possible the therapeutic inefficacy or the possible toxicity of administered medications, the reduction of resistance and the treatment failure, in addition to a significant financial gain. The good acceptance rate reflects the satisfactory collaboration between the prescribers and the pharmacists in our Hospital. However, it can be improved by the continued presence of the pharmacist in the clinical departments and his permanent exchange with the prescribers.

Keywords: Pharmacotherapeutic problem, Pharmaceutical intervention, Anti-infectives, Hospital pharmacist.

Introduction

Since their introduction in therapeutic, antibiotics have brought significant benefits for the health of the populations by the disappearance of many forms of serious bacterial diseases and the decrease of complications and mortality of common infectious diseases. However, their massive and repeated use has led to the emergence of resistant bacteria to these drugs [1]. Punctual at the start, these resistances have become the cause of various situations of therapeutic impasses. In this regard, the World Health Organization (WHO) said in its latest report published on March 20, 2014 that antibiotic resistance worldwide is no longer a forecast but a reality in all regions of the world; and poses a serious threat to public health. WHO also notes in its report that the broad-spectrum antibiotics are consumed unduly and are subject to abusive prescriptions [2]. Taking massive regulation measures at national and international level on the supply, the prescription, the consumption and the distribution of antibiotics appears therefore essential [3].

In Tunisia, anti-infectives are considered among the most prescribed therapeutic drugs classes; and are a topic of great concern for health managers [4]. Indeed, they constitute 25% of the consumed drugs in 2010 and have a preponderant part of drugs spending with significant increase in costs (up 25 million dinars between 2008 and 2009) [5].

Therefore, all health care providers should contribute to the rationalization of this drug class’s use, including the pharmacist. Indeed, as medication expert, the hospital pharmacist can play...
a significant role in ensuring the effectiveness and the safety of drug use clinically and economically [6], with particular attention to anti-infective considering the risk of development resistance and its consequences. This can be effectively achieved by pharmaceutical analysis and validation of medical prescriptions from clinical departments. This analysis takes into account firstly the individual patient profile (medication history, pathophysiology field, clinical and biological data...), and secondly, the drug strategy adopted from recent therapeutic repositories. Indeed, the good practice guidelines should form the basis of the Pharmaceutical opinions regarding the therapeutic strategy [7].

Each pharmacotherapeutic problem (PTP) identified during the pharmaceutical analysis should require a pharmaceutical intervention (PI), defined as: “Any proposed of amendment to the drug therapy initiated by the pharmacist” [8].

In the pharmacy department of the Tunisian University Hospital Fattouma Bourguiba (FB), the pharmaceutical validation of antibiotics hospital prescriptions, and the monitoring of antimicrobial consumption are a routine task that constitute pharmacist prerogatives. Thus, this last is led in some cases to make PI for the prescribers to palliate the potential PTP.

In this context, our work is carried out in the aims to evaluate the pharmaceutical activity in the managing and the consumption of anti-infectives at the University Hospital FB, and thus describe the PI made according to the different anti-infective classes and clinical departments concerned by the PTP, and finally estimate their acceptance by the medical setting and their impact within the Hospital.

Materials and methods

This is a prospective study taking place over a period of six months from January to June 2014 at the pharmacy department by a resident in pharmacology in collaboration with a group of internal pharmacy affected in different clinical departments. This study included all the hospitalized patients during this period. To perform a pharmacological analysis of prescriptions according to the clinical context, we asked an explanatory letter written by the physician and sent to the pharmacy for each request for introduction or modification of an anti-infective therapy. This letter must include the prescribed treatment and the all necessary clinical informations. The analysis tools were essentially the dictionary of pharmaceutical specialties Vidal [9], the practical guide of medicines Dorosz [10], and therapeutic recommendations and consensus of the French National Security Agency of Medicines and Health Products (ANSM) [11], the Infectious Diseases Society of French Language (SPIFL) [12], and the French Society of Anesthesia and Intensive Care (SFAR) [13], as well as the thesaurus, which is the French national repository interactions drug-2014, developed by the Working Group of drug Interactions (GTIAM) ANSM [14]. Therefore, the analysis of antibiotic prescription focuses on the verification of prescribed dosages and duration of treatment according to the antibiotic and/or treated infectious diseases, the detection of possible contraindication or a potentially serious drug interaction based on pathophysiologic field of the patient, as well as checking the choice of drugs in relation to the indication and the patient profile, and comparison of current therapy with the good practice guidelines (required associations, reservation of some antibiotics for codified indications ...). Moreover, the daily obtaining of hospital antibiograms from the microbiology laboratory allowed us to verify the agreement between the bacteriological results and the prescribed antibiotics. Each prescription of antibiotics is recorded in a register reserved for the traceability and the monitoring of antibiotics by mentioning the patient’s name, the prescribed medications and their dosages, the indication and the duration of treatment, and some clinical information of the patient. If there is a problem relating to the therapeutic treatment of the patient, a pharmaceutical opinion is formulated and notified to the prescriber either by direct contact in the clinical department or by telephone. The entire PI performed during the study period were recorded and studied and a report was then established.

Results

The analysis of antibiotics prescriptions yielded a total of 110 PTP corresponding to 110 PI conducted in clinical departments during the study period. The majority of these PTP concerned a parenteral therapy at a rate of 78%. Their distribution according to classes of antibiotics is illustrated in the Figure 1. The most concerned classes were primarily fluoroquinolones (24.5%), followed by aminoglycosides (16.4%) and penicillins (14.5%). The fusidic acid alone occupied 11% of all the interventions. The others antibiotics classes were carbapenems (8.2%), cephalosporins (6.4%) and glycopeptides (5.5%). The distribution of the PI is illustrated in the Table I. The departments that have benefited the most from our interventions are listed in the Table II.

Problems related to dosages requiring PI can be divided into three classes: under-dosing, overdosing or error of taken distribution as shown in the Figure 2. In addition, 11.6% of this type of PTP correspond to an inadequacy of dosage for patients with renal insufficiency. The PI concerning the treatment duration were devised in two types: A lengthening of the duration of treatment at the rate of 14.3% when the prescribed period was proved insufficient, or often a discontinuation if the intended or recommended period has been exceeded.

Interventions aimed to change the antibiotic therapy were of three types: either a therapeutic alternative proposal if there is an inappropriate antibiotic therapy compared with suspected or documented infection (56.4%); or a proposal to make an association of antibiotics (23.1%); or a removal of an antibiotic if it turned out not indicated or not justified (20.5%). Seventy-one PI presented to clinical departments were accepted, representing approximately 64.5% of all the interventions. The acceptance by the medical setting differed according to the clinical departments and the type of PI. Its estimate is illustrated in the Figures 3 and 4. The impact or the potential therapeutic and financial benefits of the PI translating the pharmaceutical performance within the Hospital are described in the Table III.

Discussion

The activity of the pharmaceutical team has generated 110 PI over a period of six months. This number is acceptable compared to other similar studies in French Hospitals. Indeed, in the study of Bonnin et al, the number of PI accomplished on 28 tested antibiotics during a period of 3 months in the intercommunal Hospital Creteil in France in 2013 reached 48 [15]. In another study performed by Viprey et al in the Hospital of Lyon, the interventions number of the anti-infectives has reached 291.
in 2012 [16].

The distribution of the results of this study revealed that the dosage problems are the main cause of interventions in our study, followed by proposals for therapeutic substitutions. These results are consistent with those of the study of Bonin et al [15]. In the study of Viprey et al, proposals for dosages adjustments were also the most important, while the PI of treatments substitutions occupy the third place after the proposals for modifying or discontinuing the treatment [16].

The medical acceptance rate seems quite satisfactory (64.5%). This result is similar to that indicated by the study of Viprey et al where the acceptance rate was 61% [16], but lower than the rate reported by the study of Bonin et al which was 98% [15]. The PI of dosage changes have been in the majority of cases appreciated and taken into account by prescribers (70% of cases). The discontinuation or the modulation of treatments duration was often successful, especially if a treatment duration was extended abusively. The others PI have been fully accepted: there are a management of two drug interactions type “not recommended” between valproic acid (anticonvulsant) and imipenem [14], and relay proposals (substitution of a missing antibiotic by another). This reflects the high cooperation between the medical and the pharmaceutical teams in our Hospital. However, the PI concerning therapeutic substitutions were rejected in more than half of the cases (51%).

The causes of rejections are sometimes linked to anterior prescriptions or to medical opinions given by doctors other than those contacted including the infectiologists who are consulted in priority in our Hospital and considered the decision-makers in terms of antibiotic therapy. This was due, among others, to the difficulty which the physicians may have to call in question or modify the prescriptions of their colleagues. This phenomenon was also found in the literature [17,18]. The others causes of refusal declared by prescribers were the improvement of the patient status with its current therapeutic. The causes of non acceptance remain in others cases unknown. Then, it seems that a greater collaboration could improve the existing cooperation between the two parties in order to ensure a better therapeutic management of the hospitalized patients. Furthermore, it has been shown in the literature that the presence of the pharmacist in the clinical department increases the rate of medical acceptance [19]. Indeed, it is a major factor fostering an easier and a more efficient exchange with prescribers for the pharmacist.

Thus, the pharmaceutical performance could be better developed through the establishment of a clinical pharmacy system allowing the pharmacist to exercise with prescribers and to integrate into the healthcare team of clinical department. This is can ensure more fluid transmission of the information and a closer monitoring of ongoing treatments. Moreover, his presence in close to the patient allows a better understanding of the pathophysiological profile and an evaluation of its adherence to treatment, resulting in a more intense pharmaceutical activity.

Our study shows that this strategy of pharmaceutical validation has potentially contributed to the prevention of some non properly conducted treatments, which minimizes the risk of the therapeutic inefficacity (52.7%) and/or the potential toxicity (13.7%). In this context, it should be noted that the selection and the diffusion of resistant bacterial strains within the Hospital can be a frightening consequence of irrational antibiotics use, affecting therefore the validity of the therapeutic arsenal and increasing ominously the morbidity, the mortality and the risk of inefficacity and treatment failures.

This validation strategy of antibiotics prescriptions has also a financial interest (25%) by dint of our PI which allow stopping abusive deliveries of medicines and avoiding overruns of treatments fixed duration In fact, this exaggerated or unfounded anti-infectives use was described in an old study executed in our Hospital in 1990, estimating the additional cost of irrational antibiotics therapy to 28% compared to spending on antibiotics [20]. Besides, a study conducted in 215 to evaluate the antibiotics consumption in another Tunisian Hospital (University Hospital Habib Bourguiba in Sfax), found 38% of unjustified antibiotic prescriptions over a period of 24 hours [21]. Thus, this abuse of anti-infectives use in our Tunisian Hospitals proves to be largely preventable by the pharmaceutical strategy of validation and monitoring clinically regarding the optimization of the cares quality provided to the patients, as well as economically by enabling the rationalization of hospital expenditures.

**Conclusion**

Our study highlights the role of the pharmacist in a Tunisian University Hospital in rationalizing the consumption of anti-infectives, with a satisfactory medical acceptance rate comparatively to studies carried out abroad.

On the other hand, the value added to the presence of the pharmacist in the clinical department was demonstrated by many studies in other countries where clinical pharmacy activities are implanted, and may provide a better pharmaceutical performance especially about the good management of anti-infectives.

| pharmaceutical intervention                  | Percentage relative to the total interventions |
|---------------------------------------------|-----------------------------------------------|
| Dosage modification                          | 39,1%                                         |
| Treatment modification                       | 35,45%                                        |
| Treatment duration                           | 12,8%                                         |
| Introduction of an antibiotic therapy        | 5,45%                                         |
| Relay proposal (Allergy / missing)           | 3,6%                                          |
| Drug interaction                             | 1,8%                                          |
| Contre-indication                            | 0,9%                                          |
| Redundancy                                   | 0,9%                                          |
Table 2: Distribution of pharmaceutical interventions based on clinical department

| Clinical departments       | Percentage of pharmaceutical interventions |
|---------------------------|---------------------------------------------|
| surgery departments       | 27.3%                                       |
| Orthopedics department    | 16.4%                                       |
| Cardiology departments    | 10%                                         |
| Nephrology department     | 8.2%                                        |
| Rheumatology department   | 8.2%                                        |
| Gastrology department     | 5.4%                                        |
| Pediatric department      | 4.5%                                        |
| Neurology department      | 4.5%                                        |
| Others                    | 15.5%                                       |
**Figure 3:** Estimate of the acceptance of pharmaceutical interventions based on interventions types

![Bar chart showing the acceptance rates of different types of pharmaceutical interventions.]

**Table 3:** Distribution of potential profit of pharmaceutical interventions

| Interventions to prevent the therapeutic inefficacy | Accepted Pharmaceutical Interventions | Refused Pharmaceutical Interventions |
|---------------------------------------------------|----------------------------------------|--------------------------------------|
| Correction of the under-dosing                    | 58.4%                                  | 30.7%                                |
| Correction of the treatment short duration         | 5.5%                                   | 94.5%                                |
| Modification of inadequate or insufficient treatment | 30.6%                                  | 69.4%                                |
| Management of the drug interactions                | 5.5%                                   | 94.5%                                |
| Interventions for financial gain for the Hospital  | 24.9%                                  | 75.1%                                |
| Discontinuation of a treatment exceeding the expected duration | 47%                                     | 53%                                  |
| Stopping abusive deliveries of medicines           | 53%                                    | 47%                                  |
| Interventions to prevent a possible toxicity       | 13.7%                                  | 86.3%                                |
| Correction of the overdosing                       | 55.4%                                  | 44.6%                                |
| Stopping an aminoglycoside after 5 days of treatment (outside of infective endocarditis) | 22.3%                                  | 77.7%                                |
| Association of 2 antibiotics from the same class  | 22.3%                                  | 77.7%                                |
| Others                                            | 8.7%                                   | 91.3%                                |

**Figure 4:** Estimate of the acceptance of pharmaceutical interventions based on clinical departments

![Bar chart showing the acceptance rates of different types of pharmaceutical interventions across various clinical departments.]

- Orthopedics: 55.50% Accepted, 44.50% Refused
- Cardiology: 86.60% Accepted, 13.40% Refused
- Cardiology: 72.70% Accepted, 27.30% Refused
- Rheumatology: 88.80% Accepted, 11.20% Refused
- Neurology: 88.80% Accepted, 11.20% Refused
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