Impact on Safety Prescriptions: The Study of Health Care Groups Performing Pharmaceutical Interventions in Hospitalized Patients

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SUMMARY. **The clinical pharmacist interventions (CPI) are activities developed by the clinical pharmacist to take decisions in the pharmacotherapy of patients. The aim of this study is to analyze and describe the CPI made during clinical rounds, before giving the daily dose, and to evaluate its clinical significance through the study of therapeutic groups and the impact on patient's safety. This is a descriptive, prospective study. CPI were classified as oriented to the medicine, to the medicine administration or to the physician's prescription. A total of 450 CPIs were performed for six months with a general acceptance of 96%. The most prevalent groups of the therapeutics categories (the Anatomical Therapeutic Chemical Classification System) were group "A" (59%), followed by groups "B" (11%), "J" (11%), "C" (7%) and "N" (7%). The most frequently prescribed drugs were ranitidine, omeprazole and pantoprazole. Seventy-two percent of the CPI were made suggesting the change of route of administration of the drug according to the concept of sequential therapy. This activity encourages active participation of pharmacists in interdisciplinary clinical activities.**

RESUMEN. Las intervenciones del farmacéutico clínico (CPI) son actividades desarrolladas por el farmacéutico clínico para tomar decisiones en el tratamiento farmacológico de los pacientes. El objetivo de este estudio es analizar y describir las CPI hechas durante las rondas clínicas, antes de dar la dosis diaria, y evaluar su importancia clínica a través del estudio de los grupos terapéuticos y el impacto en la seguridad del paciente. Se trata de un estudio prospectivo descriptivo. Las CPI fueron clasificadas como orientadas a la medicina, a la administración de medicamentos o para la prescripción del médico. Se realizaron un total de 450 CPI durante seis meses con una aceptación general de 96%. Los grupos más frecuentes de las categorías terapéuticas (el Sistema de Clasificación Química Anatómico Terapéutico) fueron (la) Grupo "A" (59%), seguido por los grupos "B" (11%), "J" (11%), "C" (7%) y N "(7%). Los fármacos prescritos con mayor frecuencia fueron ranitidina, omeprazol y pantoprazol. Setenta y dos por ciento de las CPI se hicieron sugiriendo el cambio de vía de administración de la droga de acuerdo con el concepto de la terapia secuencial. Esta actividad fomenta la participación activa de los farmacéuticos en las actividades clínicas interdisciplinarias.

INTRODUCTION

The dispensation of drugs in daily doses allows the clinical pharmacist intervention, even with limitations, if the unit dose system is not available [1]. The clinical pharmacist interventions (CPI) are activities developed by the clinical pharmacist to make decisions in the pharmacotherapy of patients and to assess the results, besides monitoring the pharmacotherapy plan proposed by the physician [2]. It is a set of clinical pharmacist activities that produce indicators that allow, for example through their acceptance

and impact on the health of the patient, to measure whether directly or indirectly if the pharmaceutical process was carried out in terms of quality. If the pharmacist validation is performed before the decision of the prescription through the presence of the pharmacist in the rounds, a rational use of medicines in the hospital is promoted, which ensures availability of the resource for the patient and improves safety in the use of them [3].

The aim of this study was to analyze and de-

scribe the pharmacist interventions performed during clinical rounds, before daily dose, and to evaluate its clinical significance through the study of therapeutic groups and the impact on patient safety.

METHODS

This was a descriptive, prospective study, of CPI, with the inclusion criteria for all prescriptions drugs to inpatients at the hospital. Clinical activities started with a daily analysis of the prescriptions before a six-month long dispensation.

CPIs were classified as oriented to the medicine, to the medicine administration or to the physician's prescription. We decided to design a methodology that could be applied to our reality (Argentine Association of Hospital Pharmacists and Spanish Society of Hospital Pharmacists). We applied Anatomical, Therapeutic & Chemical classification system (ATC) in two levels: drug therapeutic group and subgroup; 4th and 5th level were considered when the frequency of clinical pharmacist intervention (CPI) was significant [4]. The acceptance variable was "yes/no" and patient safety was assessed in groups with more significant frequency of intervention as described in literature.

Statistical analysis was used for qualitative variables frequencies and percentages. For quantitative analysis mean, median, minimum and maximum were calculated.

RESULTS

A total of 450 clinical pharmacist interventions (CPI) for 6 months were performed with a general acceptance of 96%. From the total of pharmaceutical groups intervened ordered following Anatomical, Therapeutic and Chemical classification system (ATC), the most frequent interventions were in group "A": alimentary tract and metabolism drugs (59%), followed by groups "B": blood and blood forming organs drugs and "J": anti-infective agents (both 11%), and groups "C": cardiovascular system and "N"; nervous system drugs (both 7 %).

Analysis of group "A": the sub group A02B Drugs, drugs or peptic ulcer and gastro-oesophageal reflux; the most frequent drugs were ranitidine (A02BA02), followed by proton pump inhibitors, omeprazole and pantoprazole (N = 43 and 33, respectively) A02BC. All together account for 88.5% of group A intervened. 97.7% of this group is completed with metoclopramide as a drug for functional gastrointestinal diseases (sub-level 4 A03FA). 72% of the CPI were made suggesting the change of route of administration of the drug according to the concept of sequential therapy.

Analysis of group "B": Blood and blood forming organs, 69.4% of CPIs were focused on antithrombotic agents, all in the heparin group (B01AB). The frequency of each group involved is found in Fig. 1. The most frequent CPI was to conduct a therapeutic exchange for an existing drug in the pharmaceutical guide.

In the "N" group, nervous system drugs, the prevalence of CPIs were 47 % for opioids (N02), 22% for benzodiazepines (N05) and 16% for anticonvulsants (N03). The most common CPI was to remove a prescribed treatment. In the "C" Cardiovascular system drugs: 66% of the CPIs were to change the route of administration or to
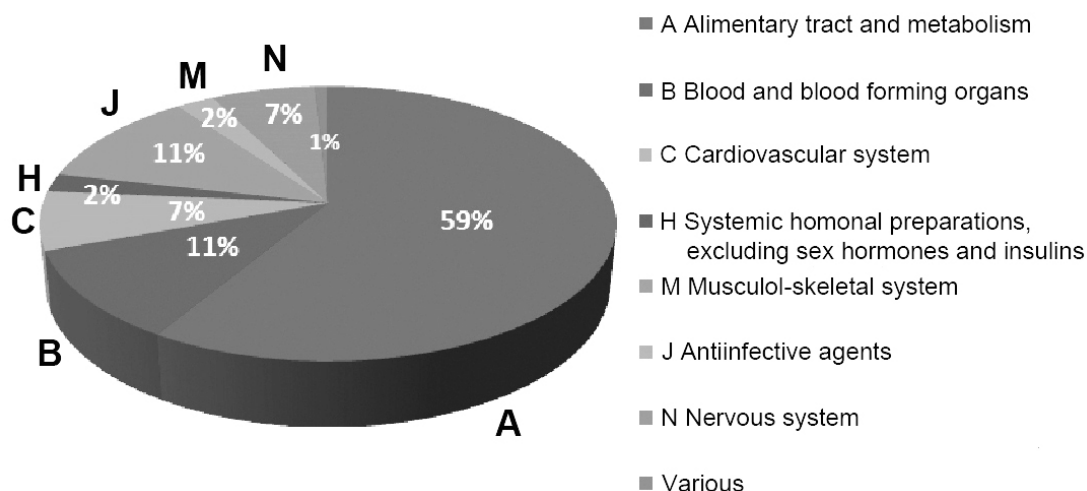

Figure 1. Frequency of clinical pharmacist interventions (CPI) based on the therapeutic groups operated according to ATC classification.

ATC	A	B	J	C	N
1A. Add medication to regimen	5	3	-	1	3
1B. Discontinue therapy	21	13	11	-	12
1C. Recomendation of alternative therapy	1	1	3	-	3
2A. Dosing recomendation	7	7	2	5	3
2B. Frequency /time/dose change	5	-	2	2	2
3. Intravenous to oral conversion	158	-	21	16	1
4. Change to include in Formulary	76	16	-	-	2
5. Nurse education	2	1	9	-	-
6A. Medication reconciliation	1	-	-	3	2
6B. Order clarification	3	7	6	3	3
6C. Drug information	-	3	-	3	1

Table 1. Most frequently intervened therapeutic groups and classification of CPIs.

reduce the dose of furosemide 39% (C03), and digoxin 27% (C01A). The list of the most frequently intervened therapeutic groups and the classification of CPIs are described in Table 1.

Analysis related to security

Analysis of security in relation to CPI shows that dosis adjustment was performed on 30 drugs of which 10 are considered dangerous as digoxin, sodium heparin, low molecular weight heparins, potassium, midazolam, morphine hydrochloride, promethazine and chlorpromazine.

Therapeutic conciliation, CPI oriented to prescription and to the doctor, was conducted in 14 prescriptions which included 10 drugs which should not be discontinued abruptly; in our case they were: propranolol, phenytoin, levodopa + benserazide and levothyroxine.

When the amendment prescription was performed nine drugs were intervened, three of which, i.e., digoxin, enoxaparin, and morphine, are considered dangerous.

DISCUSSION

Acceptance of the CPI is in the range presented by other authors (Gorgas Torner et al.[5] 91%), and was superior to that of other authors such as Martí Gil et al.[6], and Carmona García et al.[7] (49 and 62,4%, respectively). We agree with this group that most CPI were directed to the doctor though we chose another classification.

The highest percentage of CPI was performed on group "A" drugs ("A") unlike other authors where the prevalence was in the C group of ATC classification, although this group (C) in our case is within the five mostly intervened groups. However, it should be noted that drugs of this group had the most impact in relation to patient safety. Overall, our groups coincide with those presented by other authors that individualize them according the treatment they were assigned to -chronic or acute-, we have not considered this discrimination in our work [6-8].

Low molecular weight heparins and proton pump inhibitors were CPI related to drugs not included in the Pharmacotherapy Guide. There are contributions from the literature to perform a pharmacokinetic and dynamic analysis in each case in order to propose drug substitution in both cases [8,9].

From the analysis of drugs with pharmaceutical interventions and their relationship with reports of medication errors, real errors were not recorded in any case in the period of study because we were working double validation (clinical pharmacist intervention before dispensing drugs) so in all cases we presented them as potential errors. Digoxin is a drug responsible for serious medication errors. It is a glycoside used to treat congestive heart failure and atrial fibrillation. Its prescription is controversial; yet, its use is suggested to reduce morbidity and mortality in patients whose prescriptions are within therapeutic ranges. However, digoxin toxicity in acute and chronic exposure can be fatal. None of these requirements was related to children where bibliographic records of errors are the most frequent [10-12].

Conciliation-related CPI errors generally occurr during medication transcription from one day to the other, and not when the patient is admitted or discharged. We can relate these errors with distractions that affect not only the prescription process but also the validation and preparation of individualized doses for patients [13].

CONCLUSIONS

Because most CPI in this work were accepted, we infer that the pharmacist contribution helped to improve the patient's condition through the results expected from the therapy prescribed by the doctor. These CPI are considered safe and effective [14]. This activity encourages the active participation of pharmacists in interdisciplinary clinical activities optimizing in this way patients' therapy having direct knowledge of his present clinical status.

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