



ANALYSIS OF PREVALENT PATHOLOGIES, PHARMACOLOGICAL TREATMENTS AND THEIR POTENTIAL PROBLEMS IN ELDERLY PATIENTS IN A HOSPITAL OF MENDOZA, ARGENTINA

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ABSTRACT

The goal was to conduct a preliminary assessment of drug use in elderly patients at a Mendoza hospital. An observational, descriptive, transversal of indication-prescription study was carried out during four months. Data were collected of 52 elderly patients from different hospital services. Drugs, diseases and interactions were classified according to Anatomic Therapeutic Chemical Classification, International Diseases Classification and Horn's algorithm, respectively. Polypharmacy existence was considered when four or more drugs were prescribed simultaneously. Results (%): Gender: M (59), F (37). Age range: 61-93 years. Services: Medical Clinic (72), Traumatology (15), Surgery (3), Gynecology (2). Diagnosis: fracture (12), chronic obstructive pulmonary disease (8), heart failure (8).

Drugs/prescription: 3 or less (52), more of 3 (48). Drugs (506): Ranitidine (13), heparin (7), enalapril (6), diclofenac (4). Interactions: enalapril-antacids (19), aspirin-antacids (8), dexamethasone antacids, aspirin-enalapril, diclofenac-antihypertensive drug, digoxin-furosemide and digoxin-spirolactone (5). Recipes number/patient: 1 (40), 2 (26), 3 (15), 4 (10), 5 (5), 6 and 7 (2). Interactions: 39 in 126 recipes. The male sex was predominant. The antacids, antimicrobials, antithrombotics and NSAIDs are the most commonly used drugs. The most frequent disorders were musculoskeletal, respiratory, and metabolic. The detected polypharmacy was high, on average more than 4 drugs by prescription and over 10 drugs by

patient. This polypharmacy favored the interactions. Moreover, inappropriate drug uses were detected. These situations can endanger the health or life of the patient. These results are considered satisfactory and are an encouragement to continue them in a larger number of patients and promote prudent use of medicines.

KEYWORDS: Elderly patients, polypharmacy, interactions, adverse drug reactions.

INTRODUCTION

The correct use of medicines includes their selecting on the basis of a careful assessment of the efficacy and safety of the drug and an appropriate adjustment of the dosage regimen, which allows obtaining the maximum benefit with minimum risk to the patient.

In a changing field as that the Medicine, in which a continuous emergence of new therapies and technological progress occurs, the approach of selection process of drugs is not without difficulty, for this reason, it is necessary that the amount, quality and objectivity of information are available.

Moreover, the situation in elderly patients is even more difficult because the confluence of several factors adds complexity at the time of establishing a drug treatment.^[1]

People who are 65 years of age or older are considered elderly patients. This age group is increasing mainly due to the decline in the death rate by improving the quality and life expectancy in many countries.

Aging is defined as all morphological, physiological, biochemical and psychological changes that occur as a result of the action of time on living things.^[2]

The concept of physiological aging is used when biological parameters accepted for each age group are met, and functional capacity and mental and social relationship are maintained with the medium.^[3]

The main features presented by this group are:

- Decreasing of following functions: renal, heart and mental.
- Increased susceptibility to tissue damage.
- Decreased lean mass that affects the functionality of the individual.
- Decreased ability of homeostasis and adaptation to external changes by the

ineffectiveness of control mechanisms regulated by hormones and the autonomic nervous system.

- Heterogeneity in aging from one organ to another and from one individual to another.
- Decreased vitality, understood by the individual capacity to cope with the biological requirements of daily life.
- Limitations the tissue response to aggression, replicative capacity of cells, repair capacity of DNA and protein synthesis.
- All these changes lead to increased vulnerability.

Likewise, there are circumstances that cause a particular demand for health and social care, complicating adherence. Among others may be mentioned a greater tendency to chronicity, which makes drugs are continuously prescribed; prescription by various specialists, who generally do not consider the rest of the drugs taken by the patient, increasing the risk of adverse reactions, drug interactions, and the complexity of the treatments; making it more difficult to medication management.

The correct prescription of drugs in this age group is very important because they are often polymedicated and the occurrence of adverse drug reactions is high. This dangerous condition worries the medical authorities in the international arena and is of interest not only at a scientific level, but also at a family and social level.^[4]

In England, elderly patients consume the twice drugs compared to the general population and about 10% of hospital admissions to geriatric units are motivated by ADRs. The 25%-50% of elderly patients make mistakes in administering medication, being greater when the number of prescribed drugs increases.

Pharmacovigilance studies in hospitals have established a linear relationship between age and frequency of ADRs, reaching 25% in hospitalized elderly patients older of 80 years. ADRs are the most common form of iatrogenic disease in elderly patients.

Factors associated with aging that determine the response to drugs are pharmacological and non-pharmacological type. The pharmacological factors refer to pharmacokinetic and pharmacodynamics changes associated with aging. Among the non-pharmacological are the coexistence of multiple diseases that interact in complex ways and make difficult the diagnosis; problems in adherence to treatment by visual, hearing o cognitive difficulties;

cultural and economic changes; use of several medications by prescription or self-medication; and modifying doses of drugs according to their symptoms.

Despite represent about 20% of the population, elderly patients are the main consumers of drugs, being they responsible for about 80% of drug expenditures.^[5,6]

Given the importance of the issues raised, and the lack of studies about the drug consume in elderly patients of the studied hospital, the purpose of this preliminary study was to analyze the socio-demographic characteristics, prevalent diseases, the pharmacological therapies, and potential risks of polypharmacy in order to determine the feasibility of continuing in a larger number of patients.

MATERIAL AND METHODS

A study of type pharmacoepidemiological, observational, descriptive, transversal, and of indication-prescription was performed.

Data collection. Data from prescriptions and records of Pharmacy Service of a Mendoza (Argentina) Hospital were collected during 4 months (September – December, 2014). They correspond to the inpatients and outpatients of the following Services: Medical Clinic, Orthopedics and Traumatology, Gynecology and Surgery.

The collection form included the following data: diagnosis, prescribed medications (generic and brand name, dose, route of administration, duration of treatment, dosage form, and concentration), patient data (age, sex), other medical conditions, such as possible adverse events and interactions. Subsequently were loaded into a database.

Classification of consumed drugs. Prescription medications were classified according to the Anatomic-therapeutic-chemical classification (ATC). This classification is recommended by the Nordic Council of Medicines, the Drug Utilization Research Group (DURG) and the World Health Organization.^[7]

Classification of health problems and analysis of their distribution in the population studied. The classification of the diagnostics was made according to the International Classification of Diseases.^[8] In addition the prevalence of different health problems and their distribution taking into account the age and sex of the patients were determined and analyzed.

Quantitative and qualitative analysis of the use of drugs. The use of drugs was quantitatively and qualitatively analyzed. The indicator for the quantitative analysis was the frequency of drugs consumption by age and sex of patients. The used indicators for qualitative analysis were the intrinsic potential value of medicines,^[9] the degree of adequacy to national and international guidelines and protocols^[10-11] and its inclusion in the National Drug Formulary of the Medical Confederation of Argentina.^[12]

The drugs were classified according to the value therapeutic intrinsic potential in elevate, relative, questionable or null, and unacceptable.

Statistical analysis. Diseases and prescribed drugs percentage distribution was calculated. The relationships between qualitative variables were calculated. Statistical method used was the χ^2 (Chi square). Significant difference was considered for $p < 0.05$.

Classification of ADRs and interactions. The interactions were classified based on the algorithm Horn or Probability Scale Drug Interactions.^[13]

The ADRs, interactions and drugs that could cause them were identified and assessed. They were classified according to the affected organ systems and depending on the severity.

Number of drugs consumed. The prescribed drugs number/patient simultaneously was determined to establish the existence of polypharmacy. Polypharmacy existence was considered when the patient was prescribed more than four drugs.^[14]

Ethical safeguards. Approval of Ethics and Teaching and Research Committees of the Hospital of Mendoza was requested for conducting this study. The data confidentiality of involved patients, health professionals, and the institution, was remained at all times.

RESULTS AND DISCUSSION

A hundred and twenty-two Pharmacy Service records of hospital, corresponding to 52 patients of selected services were analyzed. The 88.5% of drug consumption corresponded elderly patients, while the remaining 11.5% was of adults between 61 to 65 years old.

A. Socio-demographic data

The distribution of the studied population by sex is shown in the Fig. 1. The number of patients of male sex was 77; while of the female sex was 45. There is no significant difference can be observed between both sexes.

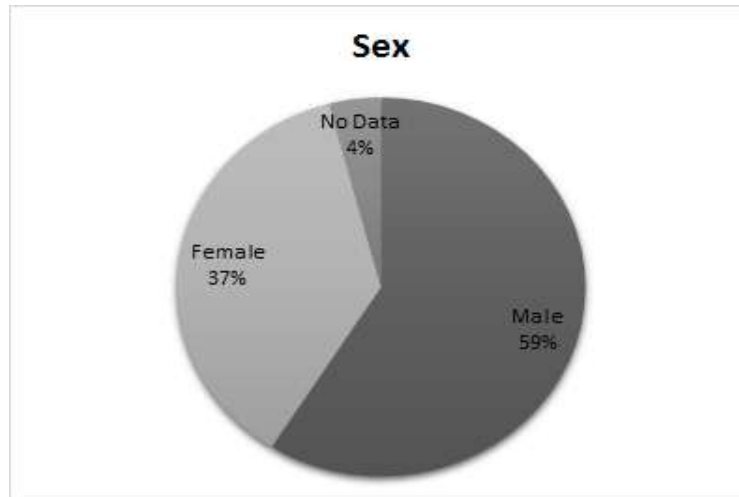


Figure 1. Patient's distribution by sex. The distribution of patients according sex showed a no significant difference (χ^2 : Female vs. Male n.s.; n = 122).

The patients studied belonged to four Hospital Services, being the distribution of such patients by Service was as follows: Medical Clinic (n=88), Surgery (n=4), Gynecology (n=2) and Traumatology and Orthopedics (n=18). The percentage distribution is shown in Fig. 2.

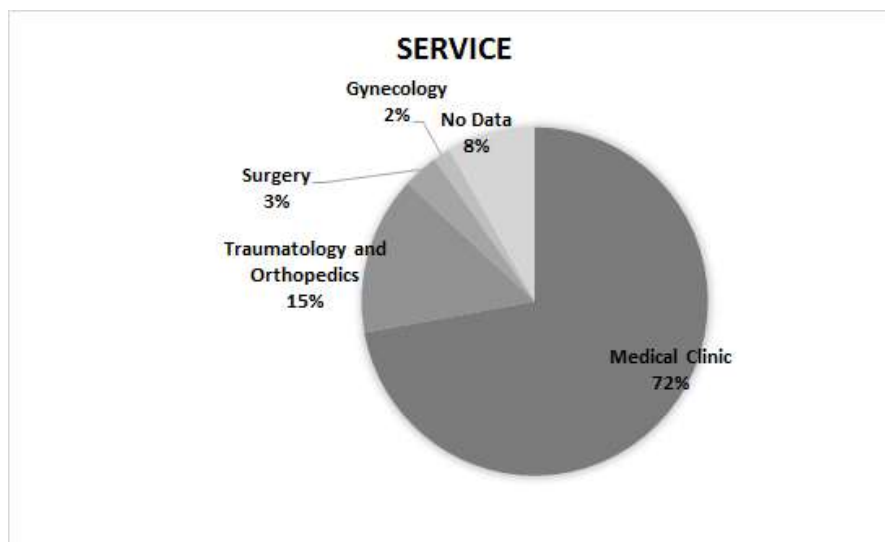


Figure 2. Patients distribution by Service. The distribution of patients according Hospital Service showed a significant difference (χ^2 : 0.001; n = 122).

B. Diagnostics

The various pathologies presenting patients studied are shown in the Table 1, expressed in absolute and percentage values, as well as their corresponding ICD-10 classifications.

Table 1. Diagnostics.

<i>Diagnostics</i>	<i>ICD-10</i>	<i>Absolute Value</i>	<i>Percentage</i>
Fractures	T142	15	12,3
Cronic obstructive pulmonary disease	J44	10	8,2
Heart Failure	I50	10	8,2
Comunity acquired pneumonia	J18	8	6,5
Diabetic Foot	E145	6	4,2
Deep Vein Thrombosis	I802	5	4,1
Diabetes	E14	4	3,3
Acute Myocardial Infarction	I21	3	2,5
Diabetes-Comunity Acquired Pneumonia-Arterial Hypertension	E14-J18-I10	3	2,5
Hemorragia Digestiva Alta	K922	3	2,5
Accidente Cerebro Vascular	I64	2	1,7
Axial Tumor	C574	2	1,7
Congestive Heart Failure	I500	2	1,7
Encephalopathies	G934	2	1,7
Type II Diabetes	E10	2	1,7
Tuberculosis	A15	2	1,7
Sepsis	A419	2	1,7
Pulmonary Fibrosis	J841	2	1,7
Not Readable	Not Rreadable	4	3,3
Various	Various	23	18,9
No Data	No Data	12	9,9
Total	Total	122	100

Diagnostics and ICD-10 classifications (International Classification of Diseases)^[8] expressed in number and percentage. Significant differences were found (χ^2 : 0.0056; $n = 122$).

C. Prescriptions

Polypharmacy existence was considered when four or more drugs were simultaneous administered. The number of patients with polypharmacy ($n = 59$) was no significant higher than those without polypharmacy ($n = 63$). In the Fig. 3 is represented the percentage of polymedicated and non-polymedicated patients.

Prescriptions numbers by patient are represented in Fig. 3.

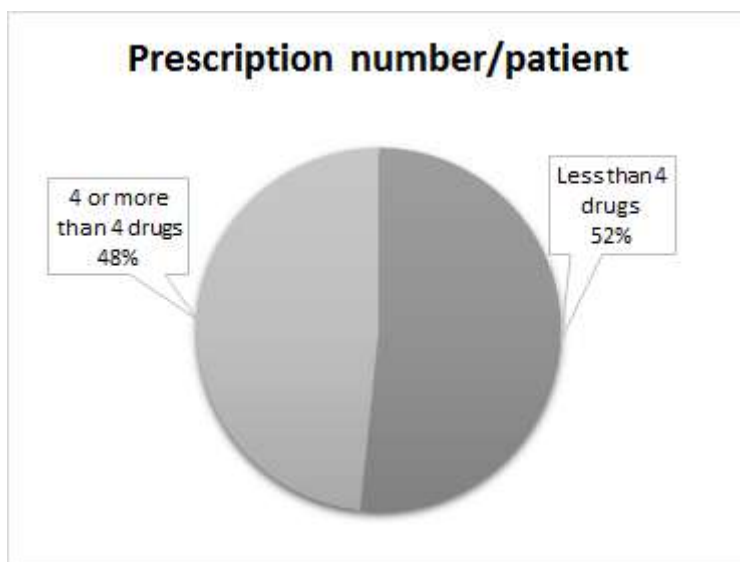


Figure 3. Number of prescriptions by patient expressed as percentage. There is polypharmacy when 4 or more drugs are simultaneously prescribed. There are significant differences between patients with and without polypharmacy (χ^2 : n.s. n=122).

Polymedicated patient's distribution, expressed in percentage, according to prescribed drugs number is showed in Fig. 4.

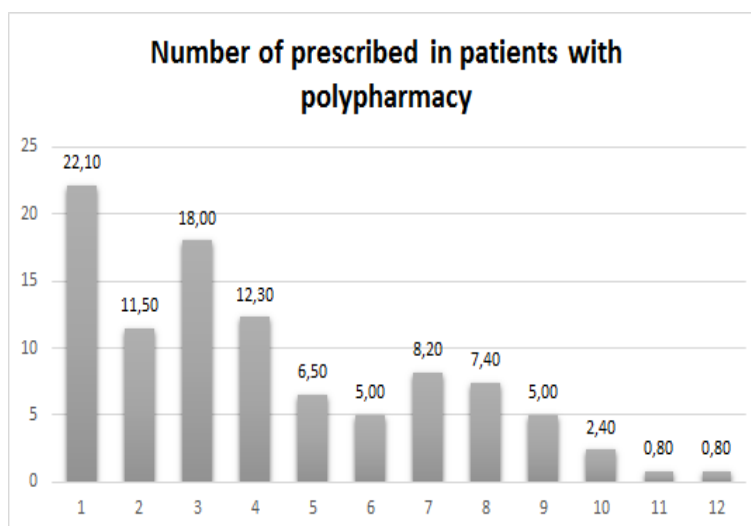


Figure 4. Prescribed drugs distribution in patients with polypharmacy expressed in percentage.

The number of recipes by patient was represented as absolute number and percentage (Fig. 5). Despite the majority of patients received one or two recipes, an important proportion received more two recipes during their hospitalization.

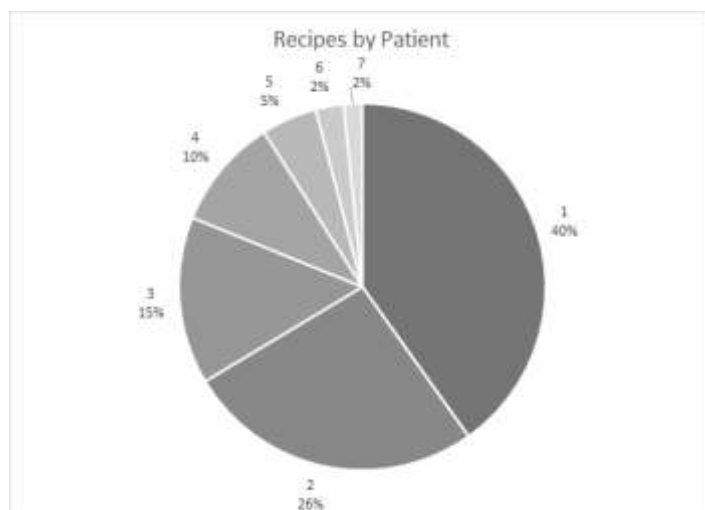


Figure 5. Recipes by patient. Numbers and percentages of recipes by patient during their hospitalization.

The total number of prescribed drugs in a way individual or together was 506. The classification of prescribed drugs according to the ATC classification and their expressed distribution as absolute number and percentage are represented in the Table 2.

Table 2. Drugs consumption.

<i>Drugs Consumption</i>	<i>ATC</i>	<i>Absolute Value</i>	<i>Percentage</i>
Ranitidine	A02BA02	66	13
Heparin	B01AB01	35	6,9
Enalapril	C09AA02	29	5,7
Diclofenac	M01AB05	20	4
Metoclopramide	A03FA01	17	3,4
Ampicillin+Sulbactam	J01CR01	17	3,4
Furosemide	C03CA01	16	3,1
Atorvastatine	C010AA05	15	3
Salbutamol	R03AC02	15	3
Omeprazole	A02BC01	13	2,5
Espironolactone	C03DA01	13	2,5
Dipyrrone	N02BB02	13	2,5
Ipratropium	R01AX03	13	2,5
Acetylsalicylic Acid	NO2BA01	11	2,2
Clonazepam	N03AE01	11	2,2
Amlodipine	C08CA01	10	2
Carvedilol	C07AG02	9	1,7
Digoxin	C01BD05	8	1,6
Amoxicillin+Clavulanic Acid	J01CR02	8	1,6
Clarithromycin	J01FA09	8	1,6
Ciprofloxacin	J01MA02	8	1,6
Dexamethasone	H02AD02	7	1,4
Clindamycin	J01FF01	7	1,4
Ketorolac	M01AB15	7	1,4
Haloperidol	N05AD01	7	1,4
Not Readable	Not Readable	11	2,2
No Data	No Data	18	3,6
Various	Various	94	18,6
Total	Total	506	100

ATC: Anatomical Therapeutic Chemical Classification.^[7]

The recipes were 122 and the patient's number was 52, which resulted in an average of 2 prescriptions per patient. On the other hand, prescription drugs was 506, reaching more than four prescription drugs and almost ten per patient.

Further, the prescriptions percentage distribution by ATC group is showed in the Table 3.

Table 3. Distribution of prescriptions by ATC group.

<i>ATC trend group</i>		<i>Absolute Value</i>	<i>Percentage</i>
A02	DRUGS FOR ACID RELATED DISORDERS	80	15,8
J01	ANTIBACTERIALS FOR SYSTEMIC USE	64	12,7
B01	ANTITHROMBOTIC AGENTS	45	8,9
N02	ANALGESICS	34	6,7
C01	CARDIAC THERAPY	32	6,3
M01	ANTIINFLAMATORY AND ANTIRHEUMATIC PRODUCTS	30	5,9
C03	DIURETICS	29	5,7
C09	AGENTS ACTING ON THE RENIN-ANGIOTENSIN SYSTEM	29	5,7
R03	DRUGS FOR OBSTRUCTIVE AIRWAY DISEASES	20	3,9
A03	DRUGS FOR FUNCIONAL GASTROINTESTINAL DISORDERS	17	3,4
N03	ANTIEPILEPTICS	14	2,8
R01	NASAL PREPARATIONS	13	2,6
H02	CORTICOSTEROIDS FOR SYSTEMIC USE	12	2,4
C08	CALCIUM CHANNEL BLOCKERS	11	2,2
C07	BETA-BLOCKING AGENTS	10	1,9
N05	PSYCHOLEPTICS	10	1,9
R05	COUGH AND COLD PREPARATIONS	6	1,2
Various	Various	24	4,8
Not Redeable	Not Redeable	11	2,2
No Data	No Data	15	3
Total	Total	506	100

ATC: Anatomical Therapeutic Chemical Classification.^[7] Differences significant was found (χ^2 : $p < 0.006$).

On other hand, the found interactions are showed in the Table 4. The drugs with more potential interactions were antacids, enalapril, acetylsalicylic acid and digoxin.

Table 4. Drug Interactions.

<i>Interactions</i>	<i>Absolute Value</i>	<i>Percentage</i>
Enalapril-Antacids	24	18,9
Acetylsalicylic Acid-Antiacids	10	7,9
Enalapril-Espironolactone	8	6,3
Dexamethasone-Antacids	7	5,6
Acetylsalicylic Acid-Enalapril	6	4,7
Diclofenac-Antihypertensive	6	4,7
Digoxin-Espironolactone	6	4,7
Digoxin-Furosemide	6	4,7
Acetylsalicylic Acid-NSAIDs	5	3,9
Acetylsalicylic Acid-Furosemide	3	2,4
Ampicilin-Clindamycin	3	2,4
Atorvastatin-Digoxin	3	2,4
Ciprofloxacin-NSAIDs	3	2,4
Digoxin-Antibiotic	3	2,4
Digoxin-Carvedilol	3	2,4
Heparin-Ketorolac	3	2,4
Ceftriaxone-NSAIDs	2	1,5
Dexamethasone-NSAIDs	2	1,5
Heparin-Anticoagulantes	2	1,5
Ketorolac-Enalapril	2	1,5
Omeprazol-Clopidogrel	2	1,5
Paracetamol-Ranitidine	2	1,5
Various	16	12,8
Total	127	100

Detected interactions between prescribed simultaneously drugs. Differences significant was found (χ^2 : $p < 0.022$).

In 78.68% of the recipes the co-administration of two or more drugs was observed, showing in 39 recipes possible drug interactions, giving a total of 127 cases.

The possible interactions generated between drugs administered concomitantly can decreasing or increasing the action of one of the drugs involved and in consequence, increase or decrease of the toxic or therapeutic actions of the another drug.

Some behaviors as polypharmacy drew attention, because they lead to a significant number of drug interactions. The most frequent was the interaction between antacids and Enalapril, resulting in a possible decrease in serum angiotensin converter enzyme inhibitors, and consequently, to a decreasing of its antihypertensive effect. In similar way occur with the interaction between enalapril with acetylsalicylic acid, which can produce a decrease of the antihypertensive effect. Other interactions produce similar result, such as Dexamethasone with Antacids, which decreases the bioavailability of corticosteroids, Enalapril with Diclofenac, that decreases the antihypertensive effect was detected. In some cases, the

interactions which increase the concentration of Digoxin they were visualized, although not many cases, it is a significant interaction due to the narrow therapeutic range with digitalis.

CONCLUSIONS

- In this study, the population was constituted mainly by older male.
- The hospital services more utilized was mainly Medical Clinic and Traumatology.
- The drugs most consumed in descending order, were: ranitidine, heparin, enalapril, diclofenac, furosemide, atorvastatin, dipyron and spironolactone, among others. Considering by ATC groups, antacids, followed by antibiotics for systemic use, antithrombotic agents and non-steroidal anti-inflammatories drugs were the most used.
- Although the number of patients studied was low, the number of prescriptions and prescription medications was high. This indicates the existence of a elevated polypharmacy, whose negative connotations are good known, especially in elderly patients.
- Pathologies prevalence in decreasing order was the following: fractures, heart failure, chronic obstructive pulmonary disease, the Community Acquired Pneumonia and Diabetic Foot.
- There is an elevated polypharmacy, favoring the interactions, being some of these of clinic relevance. Situations that can endanger the health or life of the patient.
- Most patients had one prescription, although there are cases with more than one, either because they were more of one day in the hospital, or because reentry into it.
- Taking in account have been carried out few drug utilization studies in hospitalized elderly patients in Mendoza, the obtained results would allow to detected and modified inappropriate drug use in benefit of extremely vulnerable population.
- In this preliminary study were analyzed the different aspect related with the drug use elderly hospitalized patients in order to determine the feasibility of continuing in a larger number of patients.
- The obtained results are satisfactory and are considered an encouragement to continue them in a larger number of patients and promote prudent use of medicines.

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