

Optimization of the treatment of orthogeriatric patients through a consensual prescription review program between hospital pharmacy and geriatrics services

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SUMMARY:

Abstract: Potentially inappropriate prescriptions (PPIs) are very common among the elderly population.

Background: Potentially inappropriate prescriptions (PIP) are very prevalent among the elderly population. This leads to a major ratio of adverse reactions to medication.

Aims: To know the prevalence of PIP in elderly patients, classify them and make interventions to reduce the amount of PIP in patient's prescriptions

Methods: Ambispective multidisciplinary interventionist study (February- 2019 - February 2020) on patients over or equal 70 admitted to the Trauma Unit of a general university hospital. Patients with admissions of less than 48 hours or in a terminal state were excluded. All patients underwent a comprehensive geriatric assessment and complete revisions of their home and admission treatments. PIP were identified by applying a checklist tool based mostly on START/STOPP,

Less Chron and Beers criteria. After identifying PIP, we classified them and carried out different kinds of interventions. Six months after, we verified that they had been successful.

Results: 286 PIP were identified in 199 patients. The most prevalent interventions were deprescription (36.0%), dose adjustment (32.2%) and omission of a prescription (18.9%). Six months after we reviewed the home treatments of patients with interventions. The mean number of PIP in this group of patients decreased from 1.71 (SD:1.1) to 0.75 (SD:0.93), ($p<0.001$) and polypharmacy was reduced from 9.83 (SD:4.40) drugs per patient to 9.23 (SD:4.55), ($p<0.05$).

Conclusion: The collaboration between hospital pharmacist and geriatrician allows the detection of PIP and the proposal of personalized alternatives adapted to the individual conditions of each patient that lead to an enduring improvement in the quality and safety of the prescriptions.

Keywords: geriatrics, treatments, inappropriate prescription, elderly, adverse effects.

Optimización del tratamiento de los pacientes ortogeriátricos a través de un programa consensuado de revisión de recetas entre la farmacia de hospital y los servicios de geriatría

RESUMEN

Objetivos: Conocer la prevalencia de las PPI en los pacientes geriátricos ingresados en el servicio de traumatología, clasificarlas y realizar intervenciones para minimizar sus efectos.

Método: Estudio intervencionista multidisciplinar ambispectivo (febrero-2019-febrero2020) en pacientes de 70 años o mayores, ingresados en la Unidad de Traumatología de un hospital general universitario. Se excluyeron los pacientes con ingresos inferiores a 48 horas o en estado terminal. A to-

dos los pacientes se les realizó una valoración geriátrica integral y revisiones completas de sus tratamientos domiciliarios y hospitalarios. Las PPI se identificaron aplicando una lista de comprobación consensuada basada principalmente en los criterios START/STOPP, Less Chron y Beers. Tras identificar las PPI, las clasificamos y llevamos a cabo distintos tipos de intervenciones. Seis meses después, comprobamos si nuestra intervención permanece.

Resultados: Se identificaron 286 PPI en

199 pacientes. Las intervenciones más prevalentes fueron la deprescripción (36,0%) y el ajuste de dosis (32,2%). Seis meses después se revisaron los tratamientos domiciliarios de los pacientes con intervenciones al alta. El número medio de PPI por paciente pacientes disminuyó de 1,71 (DE:1,1) a 0,75 (DE:0,93), ($p<0,001$). La polifarmacia se redujo de 9,83 (DE:4,40) fármacos por paciente a 9,23 (DE:4,55), ($p<0,05$) después de nuestra actuación.

Conclusión: La colaboración entre farmacéutico de hospital y geriatra permite la detección de PPI y la propuesta de alternativas personalizadas adaptadas a las condiciones individuales de cada paciente que conducen a una mejora duradera en la calidad y seguridad de las prescripciones.

Palabras clave: geriátrico, deprescripción, polifarmacia, seguridad, traumatología, efecto adverso.

INTRODUCTION

Secular trends of population aging and disease chronification have facilitated a new profile of patient characterized by presenting pluripathology, which is inherently associated with the prescription of complex polytherapy. Poly medication entails a high risk of interactions and adverse reactions to drugs, as well as medication errors, therapeutic cascade and low adherence to treatment^{1, 2}.

A potentially inappropriate prescription (PIP) is one whose risk of producing adverse effects is greater than the expected clinical benefit of its use, especially when there is evidence of the existence of safer and/or more effective therapeutic alternatives. It also includes the omission of clinically indicated drugs, the use of drugs with a different frequency or duration than indicated and the presence of therapeutic interactions and duplicities.

Several studies showed a high prevalence of PIP among older adults which leads to a major ratio of adverse reactions to medication. All of these events result in an unnecessary increase in health care demand, taking into account that 5-20% of hospital admissions of older patients are caused by adverse events associated with medication, many of which preventable^{3, 4}. The application of different strategies for optimizing treatments in elderly patients has shown a reduction of polypharmacy, and consequently, of fragility, according to the literature^{5, 6}. Interventions must be adapted to the settings and patients' needs and the best results in improving important health outcomes, such as readmissions or emergency room visits, have been shown in multifaceted multidisciplinary interventions⁷.

On the other hand, it is important to remind that there is limited knowledge of the efficacy and safety of treatments in elderly patients, given that they are usually excluded from clinical trials⁸. In addition, clinical practice guidelines are focused on isolated pathologies and rarely include specific therapeutic recommendations for pluripathological patients, as most elderly patients are⁹. In this context, a systematic review of patient's individual needs and a comprehensive geriatric assessment is necessary, adapting the treatment to the evolution of the functional and cognitive situation.

Several studies have demonstrated the importance of the role of the hospital pharmacist collaborating with the physician responsible for the patient in the review of treatment during admission and discharge from hospital¹⁰ so that it is important their inclusion in the multidisciplinary team to promote a rational use of medication.

Due to the above, we started a pilot project of intervention in elderly patients admitted to the Traumatology Unit of the hospital for more than 48 hours, beginning a collaboration between pharmacy and geriatrics service. In order to facilitate the detection of PIP in old patients' prescriptions we designed a working tool that we called FARMAGER. In the present study, we aimed to measure the prevalence of PIP among old patients, classify them and make interventions to improve the quality and safety of their admission and home treatments.

METHODS

We carried out an ambispective multidisciplinary interventionist study (February 2019-February 2020) on patients over or equal 70 years old admitted to the Traumatology Unit of the University Hospital Foundation of Alcorcón. Patients younger than 70, with hospital admissions of less than 48 hours or in a terminal state were excluded. The study was performed in three phases.

Phase one

During the first two months, we created a work tool called FARMAGER with the objective of facilitating the systematized review of treatments and the detection of PIP. For its design, we selected some drugs and pharmacological groups in order to prioritize our intervention in them, proposing doses and therapeutic alternatives suitable for the elderly patients. We based the selections of these drugs and the recommendations given in different international explicit methods of identification and adequacy of PIP based on evidence and expert consensus as: the Beers criteria 2019¹¹, the Screening Tool of Older Person's Prescriptions/ Screening Tool to Alert doctors to Right Treatment (STOPPP/ START criteria)¹² and the List of Evidence-Based Deprescribing for Chronic Patients (Less-Chron criteria)¹³.

We also used the Pharmacogeriatric Guide of the Autonomous Community of Madrid (PGACM)¹⁴ and the alerts and information notes of the Spanish Agency of Medicines and Healthcare Products (AEMPS) that could specially affect older patients^{15, 16, 17, 18, 19, 20, 21}.

Furthermore, during this phase, we updated a specific template in the electronic admission medical record adapted to the orthogeriatric patient that contains analgesics, heparin, laxatives and psychotropic drugs, with its adjusted doses and posology.

Finally, we prepared information sheets to inform patients upon discharge about the indications, correct use and risk involved with benzodiazepines to complement the oral information given by the doctor at this point.

Phase two

In the second phase (April-June 2019) we implemented a structured review of the treatments.

During the first 24-48 hours after the admission, a geriatrician performed a detailed comprehensive geriatric assessment including cognitive function, frailty and functional dependence. After the interview, the geriatrician initiates the adaptation of the pharmacological treatment. Meanwhile, a pharmacist validated the pharmacological treatment using the patient's electronic medical records, analytical parameters and both electronic home prescription and electronic hospitalization prescription. The pharmacist verified that chronic treatment was well scheduled and adjusted to the patient's acute situation. We also verified that there were no pharmacological duplicities or interactions, that prescriptions were optimal in the elderly patient and that doses were correctly adjusted to the current renal and hepatic function. To detect PIP and propose alternatives we applied FARMAGER.

At the end of the morning, a brief meeting between pharmacist and geriatrician was conducted where we discussed the possible interventions. The intervention strategies were different depending on where we found

the PIP and the type of PIP detected. The possibilities were the following:

If the intervention was made on electronic admission prescription:

- A. Direct modification of the prescription
- B. Recommendation to the traumatologist in charge.

If the intervention was made on electronic home prescription:

- A. Direct modification of the prescription.
- B. Communication with the primary care doctor in charge.
- C. Recommendations in the discharge report.

If possible, modifications in chronic treatment were carried out gradually and started during the admission to control any possible adverse effect. When patients leaved the hospital, any change in their treatments was explained and discussed with them.

For the evaluation of the program, we collected the following variables: age, sex, diagnosis on admission, comorbidities, number of drugs as usual home treatment, number of drugs during admission (the day the first evaluation was performed), number of PIP in home treatment, number of PIP during admission, number of interventions performed, type of intervention and therapeutic group concerned.

The interventions were coded as: deprescription, dose adjustment, detection of therapeutic duplicity, adjustment of treatment duration, adjustment of treatment frequency, omission of a prescription and change of administration route. It was specified whether the intervention was carried out on chronic treatment or on hospital prescription. Polifarmacy was defined as number of chronic drugs prescribed equal or major 5.

Phase three

In the last part of the project (February 2020) a backward review was carried out to determine the real impact of the program. Using the electronic home prescription we checked if the interventions performed on the chronic treatment had succeeded six months after. We also recorded the number of drugs prescribed at this moment.

Ethical considerations

This study was approved by the hospital Ethics Committee for Research with medicinal products. The interventions were considered by the committee to be a part of the routine clinical practice and therefore no written consent was requested.

Statistical analysis

Absolute and relative frequencies were used to describe the distribution of the qualitative variables and mean and standard deviation (SD) or median and interquartile range (IQR: p25-p75) were used to describe the distribution of the quantitative variables, depending on the distribution of the data.

For the comparison of PIP and polypharmacy six months after the intervention, first we performed a normality test (Kolmogorov-Smirnov) and after we applied Student's t-test. All tests were considered bilateral and those p-values lower than 0.05 were considered statistically significant. For data analysis we used the statistical program Stata MP, 16.0 version.

RESULTS

FARMAGER contains 26 drugs and 11 pharmacological groups and includes 48 recommendations; 14 of them are general recommendations for pharmacological groups and 34 are specific recommendations for specific drugs.

Of these 48 recommendations, 17 were taken from Beers criteria, 15 from STOPP/START criteria, 11 from Less-Chron criteria, 7 are alerts and notes from the AEMPS and 2 are based on the PGACM (4 of them are based in two criteria that overlap). The 11 pharmacological groups comprised are anticholinergics, anticholinesterase drugs, antihypertensive drugs, bisphosphonates, hypnotics, thiazide diuretics, non-steroidal analgesics (NSAID), opioids, proton pump inhibitors, statins and tricyclic antidepressants. We can see the full table as Table 1.

Of the total number of patients admitted to the Traumatology Unit during the study period, 199 were included, 91.2% of the total amount who met the inclusion criteria. The baseline characteristics of the patients included in the study are shown in Table 2.

Table 2. Demographic and clinical characteristics of the patients

Characteristics	Population (nr = 199)
Sex (female) nr (%)	136 (68.34%)
Age (years), median (IQR)	77.55 (74.08 – 82.81)
Principal diagnosis,nr (%)	
knee joint replacement	73 (28.14%)
hip joint replacement	33 (16.50%)
fracture of the femur and others	54 (27.13%)
Nº comorbidities: median (IQR)	5 (4-7)
Nº patients with chronic pathologies, nr (%)	
arterial hypertension	126 (63.31%)
dyslipemia	100 (50.25%)
diabetes	42 (21.10%)
chronic renal disease	32 (16.08%)
malnutrition	16 (8.04%)
heart failure	4 (2.01%)

Polypharmacy in chronic domiciliary treatment was detected in 73.1% of patients (CI95%: 66.5%-78.8%), with a median of 8 drugs (IQR: 5-10) per patient. During hospitalization 97.0% (CI95%: 93.6%-98.6%) of the patients took more than 5 drugs, with a median of 10 drugs (IQR: 8-12) prescribed.

We identified 286 PIP in the sum of domiciliary and hospital treatments of the 199 patients included in the study, with a median of 1 PIP (0-2) per patient. Of all patients, 46 had PIP in their home treatment, 71 had PIP in their hospital treatment, 17 had PIP in both home and hospital treatments and 65 had no PIP.

We made one intervention in 30.2% of patients, two interventions in 15.1% and three or more interventions in 13.6%.

Up to 39.9% of the adjustments were to the usual chronic treatment that patients took at home and 60.1% to the treatment prescribed during admission.

TABLE 1. FARMAGER: drug evaluation for treatment adequacy in the geriatric patient

PHARMACOLOGICAL GROUP	PATIENT TYPE	ALTERNATIVE and special considerations
ANTICHOLINERGICS ANTIMUSCARINICS	Avoid in patients with dementia (LC, B)	
Anticholinesterases and Memantine	Adequacy/deprescribing if GDS >6 (LC)	Keep only one Watch if withdrawal
Anticholinergics	Avoid in geriatric patients at risk of falls, urinary retention, glaucoma, hypotension, QT increase. (SS, B).	Withdraw anticholinergics for incontinence if it does not improve or if severe dementia (LC)
ANTIHISTAMINES		
Hydroxyzine	Avoid in geriatric patients (SS)	Loratadine 10mg Cetirizine 10mg
ANTIAGGREGANTS		
AAS 300MG	Avoid doses > 160mg/day for chronic treatment (B)	
Ticlopidine	Equal benefit and higher risk. Use an alternative (PGMAC)	AAS 100 mg or Clopidogrel 75 mg
Clopidogrel+AAS	Withdraw one after one year of dual therapy following acute coronary syndrome (unless indicated by Cardiology). (LC)	
AINES	Contraindicate if RI, Cardiopathy, Gastrointestinal bleeding, HBP (SS)	
Diclofenac	Limit treatment to one week (B)	
Ibuprofen	Cardiovascular risk with doses > 2400 mg/day (N-AEMPS) Limit treatment to one week (B)	
Dexketoprofen	Limit treatment to 2 days (B)	Max dose: 50mg/day
ANTIDEPRESSANTS		
Tricyclic antidepressant	Avoid in geriatric patients, dementia, glaucoma, arrhythmias, HBP, acute urinary retention, hypotension, sedation, falls. (B)	Use Sertraline/Venlafaxine For neuropathic pain: Gabapentin/Pregabalin
Citalopram	Max dose 20mg/day (A-AEMPS)	
Escitalopram	Max dose 10mg/day (A-AEMPS)	
Fluoxetine	Avoid in geriatric patients (PGMAC)	Sertraline 25-100mg/day
ANTIPSICÓTICOS		
Ziprasidone	Avoid in geriatric patients	If Parkinson's disease or Lewy Body dementia use Quetiapine
ANTIPARKINSONIANS	Avoid biperiden in geriatric patients (B)	L-DOPA/Carbidopa
HYPNOTICS	Avoid long half-life BZD as clobazam, clorazepate, diazepam, flurazepam (B)	Insomnia: Lorazepam 0.5-1 Anxiety: Sertraline or Lorazepam 0.5/8h (2 nd option)
Lorazepam Lormetazepam	Avoid high doses in geriatric patients (SS) Use no more than 4 weeks	Gradual withdrawal
Zolpidem	Max dose in geriatric patient: 5mg/day (A-AEMPS)	
THIAZIDE DIURETICS		
Thiazides	Avoid if at risk of ionic alterations, hypercalcemia and gout. (SS)	
Spironolactone	Avoid the association with amiloride, triamterene, eplerenone, dosipirenone. Higher risk of hyperkalemia if associated with: ACE inhibitor, Angiotensin II receptor blockers, beta-blockers, heparin, NSAIDs, NaCl (A-AEMPS)	Recommended doses: -Heart failure: 25-50 mg/day -Hydropic decompensation: 100-200 mg/day -RI moderate: 25 mg/48h
DIGOXIN	Use lower doses if geriatric patient or RI (SS)	Max dose: 125 µg/day (SS, B)

TABLE 1. FARMAGER: drug evaluation for treatment adequacy in the geriatric patient

DOMPERIDONE	Avoid if asociated with another drug that prolongs QT or hepatic insufficiency. Use only if nausea or vomiting (A-AEMPS)	Max dose: 10mg/ 3 times per day
IBP	Limit its use to authorized indications (B)	
Omeprazole	20 mg/day indicated as gastroduodenal ulcer prophylaxis if: ³ 1 gastrolesive drug (NSAID, antiplatelet, anticoagulant, corticosteroid, selective serotonin reuptake inhibitor) Discontinue Omeprazole if no indication (SS)	20 mg/12h indicated for the treatment of gastroduodenal ulcer or perforation, gastro-oesophageal reflux disease, high digestive hemorrhage, Zollinger-Edison Syndrome
OPIOIDS	Consider reducing dosage or deprescription if: chronic non-oncologic pain, treatment >6 months (SS), RI, low effectiveness, stable patients with low level of pain, other CNS depressants associated (SS) (B), dementia, risk of falls (B) -Decrease 50% if CKD, hepatic failure and elderly. (B)	Decrease-withdrawal regimen: -Long treatments: reduce 10-25% of daily dose every month. End in 3-9 months -Short treatments: Reduce 10-25% of the daily dose every week. Associate laxative and/or antiemetic (SS).
Tramadol		
ANTI-DIABETICS Insulins	If capillary blood glucose > 180 mg, assess rapid insulin regimen or basal bolus	
Metformin	Consider deprescription if: -Low body mass index (LC) -GFR < 30 ml/min (SS)	iDPP-4 Linagliptin does not require adjustment for RI
Glimepiride Glibenclamide	Withdraw in geriatric patient, RI, HI, cardiovascular risk, polypharmacy (B)	iDPP-4 Glicazide (sulfonylurea with <risk of hypoglycemia)
STATINS	Consider deprescription if: -Low life expectancy (SS) -Low cardiovascular risk -Suspected adverse effects -First prevention in > 80 (LC) -Prevention 2nd Pfeiffer > 8 (monitor LDLH/HDL) (LC)	Maintain if high cardio-vascular risk or repeated events, good functional status or life expectancy > 5 years (SS)
BISPHOSPHONATES	Consider deprescription if: -Treatment duration> 5 years and DMO Tscore> 2,5 (LC) -Immoblised patients (lower risk of falls) (LC) -Avoid oral bisphosphonates if upper gastrointestinal disease (N-AEMPS)	Surveillance for risk of osteonecrosis of the jaw (N-AEMPS)
ANTIGOTOSES		
Allopurinol	Deprescription if secondary prevention and > 5 years without gout (LC)	
HYPOTENSORS	Evaluate the use of a single antihypertensive drug in >80 years of age with Blood Pressure < 160 (withdraw the one that is not 1st line). (SS, LC)	Avoid doxazosine (B)

Abbreviations: B (Beers criteria), SS (STOPP/START criteria), LS (Less-Chron criteria), A-AEMPS (Alert of the Spanish Agency of Medicines and Healthcare Products) N-AEMPS (informative note of the Spanish Agency of Medicines and Healthcare Products), PGACM (Pharmacogeriatric Guide of the Autonomic Community of Madrid). RI (Renal Insufficiency), GB (gastrointestinal bleeding), HBP (high blood presion), BZD (benzodiazepines), ACE-inhibitors (Angiotensin-converting-enzyme inhibitors), CNS (Central nervous system) CKD (chronic kidney disease), HI (hepatic insufficiency).

The pharmacological groups in which we detected more PIP were antihypertensive drugs (19.2%), hypnotic drugs (16.5%) and opioids (13.8%). The frequency of interventions by pharmacological group can be seen in Table 3. The majority of the interventions performed were deprescription (36.0%) followed by dose adjustment (30.8%). The type of interventions made is shown in Table 4.

The percentage of deprescription interventions on medication prescribed during admission was 23.8% and on home treatment was 54.4%. On the other hand, the frequency of dose adjustment interventions accounted for 32.6% of the hospital medication interventions while it was a 28.1% of the interventions on home treatment. New drugs were prescribed in 26.2% of the patients during admission because of our intervention (intervention coded as omission of a drug prescription), and in 7.9% at discharge.

Six months after the intervention the number of PIP on patients' home treatment reduced significantly. Considering only the home treatments where we detected PIP, the number of PIP reduced from a mean of 1.71 (SD: 1.10) to 0.75 (SD: 0.93), ($p < 0.001$) and from a median of 1 (1-2) to a median of 0.5 (0-1), respectively. The Table 5 details the variation in the number of PIP between both periods classified by type of intervention.

Table 3. Frequency of PIP by pharmacological group

Pharmacological group	PIP, no (%)
antihypertensive drugs	50 (19.2)
hypnotics	43 (17.5)
opioids	36 (13.8)
non-steroidal analgesics	26 (10.0)
antidepressants	17 (6.5)
antidiabetics	15 (5.7)
antipsychotics	13 (5.0)
diuretics	8 (3.1)
anticoagulants	8 (3.1)
other	70 (16)

PIP: potentially inappropriate prescription

Table 4. Frequency of type of intervention respect to the total PIP

Type of PIP	PIP, no (%)
deprescription	103 (36.0)
dose adjustment	92 (32.2)
omission of a prescription	54 (18.9)
adjustment of treatment frequency of administration	19 (6.6)
change of administration route	8 (2.8)
therapeutic duplicity	7 (2.4)
adjustment of treatment duration	3 (1.0)

Table 5: number of PIP in home treatment before and after the intervention

PIP in home treatment	Pre-intervention	6 months later	
Total	114	49	
Deprescription	63	29	
Dose adjustment	35	13	P < 0,001
Omission of a drug prescription	9	4	
Frequency of administration adjustment	5	3	
Therapeutic duplicity	2	0	

PIP: potentially inappropriate prescription

The mean number of drugs as chronic home treatment for patients who were intervened on dropped from 9.83 (SD: 4.40) before the program to 9.23 (SD: 4.55) at six months ($p < 0.05$).

DISCUSSION

The results obtained in our study indicate that more than a half of the patients equal or over 70 years old admitted to a Traumatology Unit have at least one PIP, based on the criteria of the FARMAGER program.

The percentage of patients with at least one PIP in our study was 58.9%. This result is higher than that obtained by other authors internationally, being 46% in a study in the elderly using the STOPP criteria²² and 41% in another study applying the STOPP/START criteria²³. On the contrary, different national studies detected results similar to ours or even superior²⁴.

In addition, the average number of medications prescribed in our study's patients is considered high. We have observed that polypharmacy is present in more than 70% of our patients with a median of 8 drugs prescribed for each individual. These results were higher in the case of hospitalized patients, with a prevalence of polypharmacy of 97%. We can see that PIP can occur at all points of patient care, having been detected in both home and hospital treatment. These results are in line with those of other studies carried out in similar populations²⁵, and are higher than the national average²⁶.

It should be noted that, in our study, the most frequent type of intervention at the level of chronic treatment was deprescription, and that this has been maintained for at least six months in half of the patients. In patients with polypharmacy, literature has described a general inertia to maintain the prescribed treatments²⁷. Therefore, the high level of acceptance of deprescription in our study was noteworthy. This is probably due to the careful communication of the hospital specialists with both the primary care physician and the patient himself, who is made a part in the decision. Several studies show how deprescribing should be a shared decision with the patient and caregivers, and the importance of following up the intervention to make it last in time²⁸.

The therapeutic groups most involved in our interventions were antihypertensives and hypnotics. These results are similar to those of a meta-analysis where benzodiazepines were positioned as the drugs most related to PIP³⁰. A national study carried out in a social health centre where they applied the STOPP/START criteria, placed benzodiazepines and diuretics as the pharmacological groups most associated with PIP²⁵. It

is worth noting how in our study a reduction in benzodiazepine prescriptions was achieved probably thanks to the educational work focused on both health professionals and patients. The informed delivery of the information sheets that reinforced the information given by the physician at the time of discharge may also contributed to maintaining these results over time.³¹ NSAIDs were also highly associated to PIP in our study agreeing with bibliography says³⁰.

In our study, 26.2% of the interventions on patients during admission were coded as omission of a drug, and therefore a new drug was proposed to be prescribed. In some cases, the omitted medication was part of the patient chronic home treatment that was not prescribed during admission by mistake, but in other cases, the collaboration between pharmacist and geriatrician allowed the detection of untreated pathologies.

FARMAGER is an easy and useful tool to detect PIP, and its implementation helps to improve the quality of the prescriptions. However, it is always necessary an individualized assessment of the prescription according to the clinic, the frailty and other circumstances of each patient. In the use of the comprehensive geriatric assessment to evaluate so, hence the necessary collaboration between pharmacist and geriatrician in this type of patient. One of the strengths of the work is therefore the multidisciplinary team, which allows to provide a global and targeted approach to the revision of the treatment of elderly patients.

On the other hand, it is as well intuited an improvement in the prescription of orthogeriatric patients during hospitalization. This may be due to our interventions during February and March 2019, which were approached from a didactic point of view. On the other hand, the implementation of prescription templates adapted to the orthogeriatric patient may have been reflected in an improvement of prescriptions. However, this trend has not been evaluated.

After completion of this study, the FARMAGER review program has being used not only in our hospital but also in the affiliated social health centers. The future would be the validation of the tool through a multicenter study and the programming of an electronic version incorporated to the clinical history as a support system for the clinical decision.

Among the limitations of the study are the limited number of experts to agree on the recommendations of FARMAGER tool and the absence of other professionals involved in the preparation of the table. Also the unicentric nature of the study is another limitation. However, the extensive experience of our hospital pharmacy service in the reconciliation, treatment review and knowledge of optimization strategies and the establishment of a multidisciplinary team which allows to provide a global and targeted approach to the revision of the treatments of elderly patients can be consider a strength of our study.

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