ORIGINAL ARTICLE

Study of non-appropriate medications among elderly patients in hospitals affiliated with IUMS using the STOPP screening tool in 2013

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ABSTRACT

Background: The use of inappropriate medications in the elderly is an important issue in the health care system. This issue can increase the side effects and the costs. This study aimed to investigate the prescribing of inappropriate medications in elderly patients.

Materials & Methods: In this cross-sectional study, 400 elderly people were selected by simple random sampling at four teaching and non-teaching in hospitals affiliated with IUMS during six months of the 2013 year. The data was collected from the profiles of hospitalization of patients and check lists of STOPP criteria and was analyzed using the chi-square test, Mann-Whitney, Spearman correlation coefficients and Kolmogorov-Smirnov.

Results: The mean age of the elderly was 73.4 year. The total number of prescribed drugs for studied patients was 4744 of which at least 124(31.1 Percent) inappropriate medication was prescribed for a patient. According to STOPP criteria, most inappropriate prescriptions were in the non-teaching hospitals related to drug classes Benzodiazepine (13.1 Percent) and Long-acting metabolites (6.2 Percent) and the teaching hospitals Benzodiazepine (9 Percent) and Anti-diabetic (2.7 Percent). Prescribed inappropriate drugs have had a significant relationship with the type of hospitalization section and the length of patients' residence in the teaching hospitals while the number of inappropriate drugs prescribed was increased as the number of diseases of the elderly in non-teaching hospitals was increased significantly.

Discussion: The rate of prescribing inappropriate medications among nursing was not considered in good standing. It seems that the introduction of screening tools can improve the accuracy of medication administration and physician partners and in addition to improving the quality of prescribing in the elderly it is required to design a comprehensive instruction for the country.

INTRODUCTION

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Nowadays in different societies, population aging has become one of the most important public health challenges of the present century[1] and caring the health and quality of life of elderly older than 65 year is considered as one the major problems of today and the future years.[2] Iran has included this demographics change and the increase of the aging population emerged in our country since 2040 which means in the year 2026 the population over 60 year was over than 10.5 million while people reached to more than 26 million per year 2050 and its ratio to the total population was about 23 percent.[3]

Elderly patients often suffer from several chronic diseases and continuously have to consume different drugs,[4] recent studies showed that 80 percent of the elderly suffer from at least one chronic disease that this group of the population develop the risk of disability and death more than others[5,6,7] while since many chronic diseases cannot be cured, then effective management of chronic diseases is important.[8] Therefore administration of a medication is an essential component of care for elderly patients.[9]

so that the optimization of drug therapy for elderly patients is challenging and sometimes harmful effects of drug therapy can be more dangerous than its benefits.[10]

On the other hand, during the past decades creating quality in medical care and medication has been very focused on, and prescription drug issues were not excluded from this general rule.[11] Medicine is an important stimulus for the use of resources in the health care.[12] So that a 20 to 40% of the health budget in many developing countries and 10 to 20 percent in developed countries is allocated to the drug.[13] Many drugs currently have the potential complications which are greater in older patients. Thus, this class of drugs potentially is considered inappropriate for the population.[14] Because a lot of evidences about the drug-related problems in the elderly over the past decades, many doctors and specialists in geriatric medicine had provided methods and tools in order to identify the problems in medication and prescribing patterns of high-risk medications and have used. Today, there is a collection of methods to assess

the drug, each with a unique process, its advantages and limitations.[15] Physicians and researchers require standard and reliable tools to assess the appropriateness of drug therapy in order to identify the negative effects of drugs.[16] Since decade 1990 number of methods, tools and standards have been provided to assist in assessing the quality of prescribing.[15] STOPP tool is one of the obvious criteria (quality assessment tools of drug prescribing in the elderly) that focuses mainly on prescription drugs and the problems associated with such prescriptions when an elderly person suffering from several diseases.[17] Given the importance of the growing elderly population in the country as well as the prevalence of inappropriate prescribing of drugs in this group of patients, this study examines the status of inappropriate medications in elderly patients 60 year old and older hospitalized in teaching and non-teaching hospitals Iran using STOPP screening tool in Year 2013.

MATERIALS AND METHODS

This cross- sectional study was conducted with 400 patients aged 60 year and older in the common hospitalization sections (CCU, ENT, General ICU, orthopedics, general surgery, internal) of teaching(127 patients of Firouzgar Hospital and 128 patients of Rasoul Agram Hospital) and non- teaching hospitals(55 patients of Shohadai 7Tir Hospital and 90 patients of Firoozabadi Hospital) affiliated with IUMS, while the sample size was divided in ratio based on the duration of hospitalization of elderly admitted in four hospitals within six months (From July to December).Profiles of the elderly patients were selected by simple random sampling; therefore the number of samples specified for each hospital was divided per 6 month to allow equal random evaluation for each month in the profiles of a hospitalized section. Finally, a number was assigned to each profile of hospitalized elderly patient using the table of random numbers; all the profiles with incomplete medical information were excluded.

Based on the standard documents in the profiles of any patient data such as age, sex, duration of residence, marital status, insurance status, history CCU, history of ICU, the current and previous history of diseases, consumed drugs, cause of hospitalization, medication orders and doses of drugs were extracted by three nurses. The inappropriate drugs prescribed in the hospitals were identified according to the STOPP criterion separately for each patient and all of the above stages were carried under the provision of clinical pharmacist. This tool has appropriate reliability and kappa coefficient has been calculated in order to measure the general consensus of the panel

on 100 data which has been reported equal to (K = 0.75) for Tools STOPP.[17] A little time is required to use this tool in the clinical activities. 65 was the standard STOPP of drug- related tools, Which includes 17 drugs related to the cardiovascular system, 13 drug-related Central nervous system and psychotropic drugs, 5 drug-related Gastro-intestinal system, 3 drug-related Respiratory system, 8 drug-related Musculoskeletal system, 6 drug-related Urogenital system, 4 drug-related Endocrine system, 5 drug-related Drugs that adversely affect those prone to falls (≤1 fall in past 3 months), 3 drug-related Analgesic drugs,1 drug-related Duplicate drug classes.[18] Finally, the data analysis was performed using the software SPSS (Version 18) and EXCEL 2013 and to determine the relationship between variables the chi- square, Mann- Whitney tests, Spearman correlation coefficients and Kolmogorov-Smirnov test were used.

RESULTS

255 patients (63.8 Percent) was selected from teaching hospitals and the number of patients selected from non- teaching was 145 (36.3 Percent). The mean age of the studied elderly was 73.4 year. Most of the studied elderly with ages less than 70 years (44.8 Percent) were male (51.3 Percent). The residence duration of most of elderly people in hospital was less than 5 days and 0.5% of them stayed more than 45 days.

83 Percent of elderly patients with a history of drug consumption before hospitalization, and had 77% history of the surgery in the past. 35.3% and 43.5% of elderly patients in the ICU, and CCU had especially the history of intensive care in hospitals. Most of the hospitalization duration was in the internal medicine section (32 Percent) and the lowest duration was in the ENT unit (6.3 Percent); while the most (53.8 Percent) acceptances were through the hospital emergency. Total number of prescribed drugs was 4744 and mean of the total prescribed has been reported 11.8 that 188 of these drugs were inappropriately prescribed based on the STOPP criteria. For 124 people (31.1 Percent) at least one bad drug is prescribed during the hospitalization. Most prescribed drugs of patients between 10 and 20 pharmaceutical drugs in teaching hospitals and non- teaching hospitals have been reported between 45.5% and 40% in the, respectively. 46.1% and 23.6% elderly people have received at least one inappropriate medication the STOPP criterion as 1 and 1 respectively (Table 1).

Most medications inappropriate in Non-teaching hospitals of drug classes Benzodiazepine (13.1 Percent) and long- acting metabolites (6.2 Percent) and in teaching hospitals, of drug classes

Table 1 Distribution table of the number of prescribed drugs for the elderly people in hospitals of Iran related to the University of Medical Sciences in Year 2013

Variable		Non-teaching hospitals		Teaching hospitals		All hospitals	
		Number	Percent	Number	Percent	Number	Percent
The number of drug patients	Less than 5	22	15.2	47	18.4	69	17.3
	Between 5 and 10	42	29	75	29.4	117	29.3
	Between 10 and 20	66	45.5	102	40	168	42
	Between 20 and 30	15	10.3	30	11.8	45	11.3
	More than 30	0	0	1	0.4	1	0.3
The number of inappropriate drugs According to STOPP criteria	No drug	81	55.9	195	76.5	276	69
	1 drug	39	26.9	44	17.3	83	20.8
	2 drug	15	10.3	9	3.5	24	6
	3 drug	6	4.1	5	2	11	2.8
	4 drug	4	2.8	2	0.8	6	1.5

Table 2 Distribution of inappropriate medication using a STOPP criterion based on the classification in the teaching and non- teaching hospitals affiliated to Iran University of Medical Sciences in Year 2013

Type of hospital	Non-teaching		Teaching	
	Number	Percent	Number	Percent
Non-prescribed inappropriate medication	81	55.9	195	76.5
Loop diuretic- opioid- Neuroleptics- long-acting metabolites	1	0.7	0	0
TCAs	1	0.7	0	0
opioid- Neuroleptics- ACE- Neuroleptics	1	0.7	0	0
PPIs	1	0.7	0	0
Antiplatelet	4	2.8	1	0.4
Antiplatelet- Benzodiazepine	1	0.7	0	0
Antiplatelet- Benzodiazepine- Antidiabetic	1	0.7	0	0
SSRIs - Loop diuretic – long-acting benzodiazepines	1	0.7	0	0
long-acting metabolites	9	6.2	5	2
long-acting metabolites–long-acting benzodiazepines	1	0.7	0	0
Neuroleptics	4	2.8	6	2.4

Table 3 Table of distribution of consumption of inappropriate prescribed drug and variables studied in elderly patients in hospitals of Iran University of Medical Sciences 2013

The main variables		No drug	1 drug	2 drug	3 drug	4 drug	p-value
Age	Non-teaching hospitals	81	39	15	6	4	0.958
	teaching hospitals	195	44	9	5	2	0.802
Sex	Non-teaching hospitals	81	39	15	6	4	0.994
	teaching hospitals	195	44	9	5	2	0.865
Ward	Non-teaching hospitals	81	39	15	6	4	0.800
	teaching hospitals	195	44	9	5	2	‹0.001
duration of stay	Non-teaching hospitals	81	39	15	6	4	0.079
	teaching hospitals	195	44	9	5	2	‹0.001

Table 4   Determination of the relationship between the number of diseases and the main variables assessed in Year 2013

Variable		The number of prescription drugs		The number of inappropriate drugs According to STOPP criteria	
		R	p-value	R	p-value
The number of illnesses	Non-teaching hospitals	0.21	‹0.001	0.16	‹0.001
	Teaching hospitals	0.10	0.120	- 0.01	0.870
	All hospitals	0.14	‹0.001	0.09	0.068

Table 5   Determination of the relationship between the total number of prescribed drugs and the number of inappropriate drugs prescription using STOPP criteria for the elderly in year 2013

Variable		The number of inappropriate drugs According to STOPP criteria	
		R	p-value
The number of prescription drugs	Non-teaching hospitals	0.48	‹0.001
	Teaching hospitals	0.33	‹0.001
	All hospitals	0.38	‹0.001

Benzodiazepine (9 Percent) and Anti-diabetic (2.7 Percent) has been difficult to arrange (Table 2).

According to Mann-Whitney test, there was a significant difference in the number of inappropriate medications for the elderly based on the STOPP criterion with their duration of residence and also the hospital departments in the teaching hospitals. Although there was not a significant relationship between the numbers of inappropriate medication using the STOPP criterion with the variables in elderly including age, gender in non-teaching and teaching hospitals, while there was also no significant relationship between inappropriate prescribing drugs with different duration of the patients residence in non-teaching hospitalization (Table 3).

Based on the Spearman correlation coefficient, there was a direct relationship between non-teaching hospitals and all hospitals in terms of the number of the prescribed drugs and the number of inappropriate prescription drugs for the elderly. A significant association was not found in teaching hospitals (Table 4).

Also, The Spearman correlation coefficient also showed that there was a significant correlation between the total number of prescribed drugs and the number of inappropriate drugs due to the STOPP criterion for the elderly (Table 5).

DISCUSSION

Based on the results, this research is one of the limited valid studies in which clear criteria were used for monitoring the prescription drugs for elderly (19-21). This study has several important findings.

First, the mean consumption of drugs has been prescribed for elderly was 11.8. Heydari and colleagues (2012 year) showed that an average of medications for older people was 5.47,[19] while Dalleur and colleagues (2012 year) had reported an average of medications as 6.[22] Karandikar and colleagues (2013 year) also showed that the mean consumption of drugs was 8.18.[23] In the study of Nightingale and colleagues (2015 year) on the elderly, the mean had been reported for drug 9.23 medication.[24]

Moreover, for most patients (42 Percent) between 10 and 20 drugs had been prescribe. Heydari and colleagues (2012 year) showed that 43.4% of elderly people had consumed more than five drug at the same time.[19] In addition to the old age, other variables such as income, education levels and aspects of cultural, social, religious elders also affect the patients. Similar studies in Sweden and Taiwan (2015 year) also showed that elderly patients had consumed 24.5% of elderly patients consumed more than 10 drug and 37.2% of this population also consumed more than 5 drug (25,26). Lower consumption of medications among elderly people in this country compared to Iran may be due to the implementation of the drug therapy in care centers for long term and also with regard to pharmaceutical standards, geriatric medicine specialists and medical staff. The study also revealed that the drugs per prescription regardless of age and gender of the participants in 12 developing countries compared to developed countries was between 2.2 – 3.8 drugs while this rate has been reported 1.3 – 2.2 drugs per prescription in the developed countries (27-28). This suggests that the physicians prescribe drugs for the treatment of diseases in people of all ages, not

only older people. Although elderly patients have usually chronic diseases than in other age groups, therefore various drugs are applied in order to diagnose and treat.

The second important finding of this study research was the 46.1% and 23.6% elderly people who had received prescribed at least one inappropriate medication in the non- teaching and teaching hospitals, Respectively. A similar study in Britain (2014 year), showed that the share of inappropriate drugs prescribed for hospitalized elderly patients in the hospitals of 2621 Medication prescribed for them were 6.3%,[29] while in the Uruguay (2014 year) showed that the share of inappropriate drugs prescribed for hospitalized elderly patients in teaching hospitals with tertiary referral level 862 Medication prescribed for them had been 21.2%.[30]

Furthermore a study in the Ireland (2011 year) on 400 elderly patients showed that 27.75% of them had received inappropriate prescribed drugs.[31] According to another study in Australia (2015 year) of 200 of the elderly people, 101 elderly patients (51 Percent) of them were prescribed at least one inappropriate drug.[32] Additionally, Nightingale and colleagues (2015 year) among 248 studied elderly, (119 patients) 51% of patients were prescribed with inappropriate drugs.[24] According to the previous studies in other countries and also the results of this research, the currency of the prescription of inappropriate drugs is higher in this group because some factors including adsorption, distribution, and the metabolism of these drugs (especially less effective of Hepatic metabolism and renal removal of drugs) which were age- related factors are changed in these patients that the changes are caused by changes in receiver sensitivity, multiple medications and drugs in these ages.[33,34]

Results showed that inappropriate prescriptions in hospitals were higher than drug class Benzodiazepine. Drug classes Long-acting metabolites and Anti-diabetic, respectively were the second most inappropriate prescriptions classes in non-teaching and teaching hospitals. A similar study in Britain (2014 year) revealed that most inappropriate prescribing of medications by the elderly, were 20.7% and 20.1% from pharmaceutical class Long-acting benzodiazepines and NSAID respectively.[29] The same study (2014 Year) also showed that the highest rate of inappropriate prescribing of medications in the Uruguay by the elderly, were 18 and 11 from pharmaceutical classes NSAID and Long-term opiates, respectively.[30] In the study of Zargarzadeh (2008 Year) drugs Naproxen, Fluoxetine, Clidinium-C and Indometacin were among the most frequently prescribed inappropriate drugs.[35] Additionally in another study in Tehran (2010 Year), the most common drugs prescribed to the elderly were from drug classes benzodiazepines.[31]

The most common adverse drug classes in accordance with the STOPP criterion in most studies, was administration of Benzodiazepine Long acting such as Diazepam. The probable reason of this result may be that these drugs cause classes sleepiness during the day, the risk of falling in the elderly is increased and also administration of the short- acting drugs, especially in low doses are safe. Lorazepam is ideal because it acts rapidly and it is absorbed from the oral mucosa and it is appropriate for patients who had not swallow power.[36] However drug classes Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) and Long-term Opiates are also important because of three properties to reduce inflammation, pain and fever as one of the most medicines. Also due to inappropriate prescribing in elderly patients too but the most common drug classes other inappropriate and frequent prescription in elderly patients in accordance with STOPP criterion has been reported as the most inappropriate drugs.[29,37,38]

The results of the present research also demonstrated that the number of inappropriate drugs, according to the STOPP criterion had significant difference between teaching and non-teaching hospitals, and it suggests the better condition of elderly people in the teaching hospitals rather than the patients of non- teaching hospitals and its reasons can be educational nature of the hospitals and the doctors employed teachers with work experience and their experience in the hospital rather than their counterparts in other hospitals. The study of Vali (2009 Year) also showed that the rate of drugs prescription inappropriately in non-teaching hospitals had the difficult conditions rather than the teaching hospital.[21] In teaching hospitals, there was significant differences in terms of the number of inappropriate drugs prescription based on the variable in the different hospitalization sections, Length of stay. In hospitalization sections (ICU، CCU and Surgery) Due to the critical condition that elderly patients need medication therefore the possibility of inappropriate drugs prescription was far more. However, due to the presence of professor physicians working at the hospital, and considering the lack of good cooperation between the medical staff with clinical pharmacists in providing quality health care, this issue is emerged for consumers.

There was an indirect correlation and statistically significant relationship in the non-teaching hospitals between the number of illnesses with the number of prescription drugs and the number of drugs prescribed inappropriately for the elderly and also in the studied hospitals, there was a statistically significant relationship and indirect correlation between the total number of prescribed drugs with the number of drugs prescribed inappropriately for the elderly. This means that elderly who suffer from

multiple diseases consume more medications that can increase the drug- drug and the drug- disease interactions. However, in the teaching hospitals, the number of diseases with inappropriate drug prescription using STOPP criterion has an inverse correlation with the increased number of diseases in the elderly, while the number of prescribed drug was reduced. It is possible that the knowledge of the pharmacodynamics and pharmacokinetics on the drugs in elderly practitioners of the changes in the pharmacokinetics for elderly and awareness of importance of the administration of the correct amount of medication in the elderly than other groups is the reason for this issue.

LIMITATIONS

Limitations of this study include cross-sectional study and collect some of the data of hospitalized elderly patients with complement deficiencies faced carefully case by the clinical staff, so we recommend regarding the effectiveness of about a prescription for a longitudinal study potential inappropriate medicines to doctors and nurses on the incidence of medical complications, mortality and hospitalizations of the elderly in the hospital.

CONCLUSION

Due to high levels of potentially dangerous drugs by the elderly in this study and similar studies in the country and impose huge costs of drug complications, mortality and hospitalizations due to these medications, clinical pharmacists and doctors and nurses need more training The medication can be prescribed and hospitals by taking measures such as drug-therapy committee, formed for the study and prevention of Advers Drug Reactions (ADR) and designing a system Formulary for Hospitalized patients, especially the age group of the elderly can a more effective role while living in the hospital for patients, their families and society will therefore require more monitoring by the authorities there.

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