

Medication Use Situation in Thai Elderly: The Computerized Database from Four Tertiary Care Hospitals

สถานการณ์การใช้ยาในผู้ป่วยสูงอายุไทย: การศึกษาจากฐานข้อมูลคอมพิวเตอร์ของโรงพยาบาลระดับตติยภูมิ 4 แห่ง

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The objective of the study was to explore the situation of medication use among the elderly who visiting to the ambulatory care clinic, in four tertiary care hospitals. The situation presented both the medication use patterns of the elderly and the appropriateness of medication use according to high-risk medication use criteria. The cross-sectional descriptive study was conducted by using the computerized databases of elderly patients who were more than 60 years old, from four tertiary hospitals, during 1st October 2007 to 30th September 2008. To evaluate the appropriateness of medication use, the ATC (4th level code) and the Winit-watjana high-risk medication use criteria were used. Microsoft access 2003 for window was used for database management and all statistical computing was performed using SPSS software version 17.0. The total 115,047 elderly patients were included in the study. Female was 55.74% of the elderly. The average age of the patients was 70.26 years. Most of the patients (87%) used some kinds of health insurances and 50% were in the Universal Coverage Scheme. The average number of visit was 3.5 times per person per year. Hypertensive disease was the majority of the underlying diseases, and 60% of the patients were diagnosed having two or more diseases. The average number of drug items per prescription was 4.33 and 38% of the total prescription was counted as poly-pharmacy (having five or more medications in a prescription). More than 70% of medication prescribed was the medication in the National List of Essential Medicines (NLEM). Approximately 25% of the medication was in cardiovascular group, particularly simvastatin was the most common prescribed, followed by platelet aggregation inhibitor except heparin, and proton pump inhibitors, respectively. Duplication medication found in 117 chemical subgroups. Most common duplication found was medication in anti-vertigo preparation. With the Winit-watjana criteria, 14.68% of all the prescriptions were recorded as inappropriate medication prescription (IMP) and 1% of total prescriptions reported drug-drug interactions. The most common medication should be avoided found was NSAIDs group, especially diclofenac sodium. Prescribing NSAIDs together with aspirin was the majority of drug-drug interactions. This may be increased risk of adverse effect in the elderly. The finding from this study showed the overall picture of medication prescribing for elderly, at ambulatory care clinic. The information, i.e. patient characteristics, number of medication per prescription, type of medications in the prescription, duplication therapy and the level of appropriateness were valuable for presenting the quality of medication use among the elderly in Thailand.

Keywords: Medication use situation, elderly, duplication medication, inappropriate medication

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การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาสถานการณ์การใช้ยาในผู้ป่วยสูงอายุที่มารับการรักษาที่แผนกผู้ป่วยนอกของโรงพยาบาลระดับตติยภูมิจำนวน 4 แห่ง โดยศึกษาถึงรูปแบบของการสั่งใช้ยาและความเหมาะสมของการสั่งใช้ยาในผู้ป่วยสูงอายุตามเกณฑ์การใช้ยาที่มีความเสี่ยงสูงสำหรับผู้ป่วยสูงอายุ เป็นงานวิจัยเชิงพรรณนา และสำรวจแบบภาคตัดขวาง ทำการศึกษาในผู้ป่วยสูงอายุที่มีอายุมากกว่าหรือเท่ากับ 60 ปี โดยใช้ข้อมูลอิเล็กทรอนิกส์จากฐานข้อมูลเวชระเบียน ฐานข้อมูลการจ่ายยา และฐานข้อมูลการรักษา ของผู้ป่วยที่มารับบริการที่แผนกผู้ป่วยนอกในช่วงระยะเวลา 1 ปี (1 ตุลาคม 2550 - 30 กันยายน 2551) เครื่องมือที่ใช้ในการประเมินความเหมาะสมของการสั่งใช้ยา คือ รหัสยา ATC (รหัสระดับ 4) และเกณฑ์การใช้ยาที่มีความเสี่ยงสูงในผู้ป่วยสูงอายุของวินิจและคณะ โดยใช้โปรแกรมไมโครซอฟต์แอคเซส 2003 ในการจัดการฐานข้อมูลจากโรงพยาบาลทั้ง 4 แห่ง และใช้โปรแกรม SPSS เวอร์ชัน 17 ในการวิเคราะห์ข้อมูลทางสถิติ ผลการศึกษามีผู้ป่วยสูงอายุทั้งหมด 115,047 ราย ร้อยละ 55.74 เป็นเพศหญิง อายุเฉลี่ยของผู้ป่วยเท่ากับ 70.26 ปี ผู้ป่วยส่วนใหญ่ (ร้อยละ 87) ใช้สิทธิในระบบหลักประกันสุขภาพ และ ร้อยละ 50 ของผู้ป่วยอยู่ในระบบหลักประกันสุขภาพถ้วนหน้า ค่าเฉลี่ยของการมาใช้บริการที่แผนกผู้ป่วยนอกเท่ากับ 3.5 ครั้งต่อคนต่อปี ผู้ป่วยส่วนใหญ่เป็นโรคความดันโลหิตสูงและร้อยละ 60 ของผู้ป่วยได้รับการวินิจฉัยว่ามีภาวะเจ็บป่วยมากกว่าหรือเท่ากับ 2 โรค ค่าเฉลี่ยของการสั่งใช้ยาต่อใบสั่งยาเท่ากับ 4.33 และ ร้อยละ 38 ของใบสั่งยาทั้งหมดจัดเป็นใบสั่งยาที่ได้รับยาหลายขนานร่วมกัน (มากกว่าหรือเท่ากับ 5 รายการยาต่อใบสั่งยา) จากการสั่งใช้ยาทั้งหมด พบการสั่งใช้ยาที่เป็นยาตามบัญชียาหลักแห่งชาติมากกว่าร้อยละ 70 นอกจากนี้ยังพบว่าประมาณร้อยละ 25 ของการสั่งใช้ยา เป็นยาในกลุ่ม cardiovascular ยาที่มีการสั่งใช้มากที่สุดคือ simvastatin กลุ่มยาที่มีการสั่งใช้รองลงมาก็คือยาในกลุ่ม platelet aggregation inhibitor ยกเว้น heparin และ proton pump inhibitors พบการสั่งใช้ยาซ้ำซ้อนในกลุ่ม chemical subgroup จำนวน 117 กลุ่ม กลุ่มที่พบว่ามี การสั่งใช้ยาแบบซ้ำซ้อนมากที่สุดคือยาในกลุ่ม anti-vertigo การประเมินความเหมาะสมในการสั่งใช้ยาตามเกณฑ์ของ วินิจพบว่าร้อยละ 14.68 ของใบสั่งยาทั้งหมดมีรายการยาที่ไม่เหมาะสมตามเกณฑ์ และพบการสั่งใช้ยาที่อาจเกิดปฏิกิริยาต่อกันระหว่างยาร้อยละ 1 การสั่งใช้ยาที่อยู่ในกลุ่มยาที่ควรหลีกเลี่ยงในผู้สูงอายุมากที่สุดคือ NSAIDs โดยเฉพาะ diclofenac sodium และสำหรับการสั่งใช้ยาร่วมกันที่ไม่เหมาะสม พบการสั่งใช้ยา NSAIDs ร่วมกับแอสไพรินมากที่สุด ซึ่งการสั่งใช้ยาดังกล่าวอาจมีผลเพิ่มความเสี่ยงในการเกิดอาการไม่พึงประสงค์ในผู้ป่วยสูงอายุได้ ผลที่ได้จากการศึกษานี้แสดงถึงภาพรวมของการสั่งใช้ยาในผู้ป่วยสูงอายุที่เป็นผู้ป่วยนอก ข้อมูลการมารับบริการ เช่น ลักษณะของผู้ป่วย รายการยาต่อใบสั่งยา จากข้อมูลกลุ่มยา รายการยาที่มีการใช้มากและข้อมูลการสั่งใช้ยาซ้ำซ้อน ข้อมูลการสั่งใช้ยาที่ไม่เหมาะสม เป็นข้อมูลที่มีคุณค่าในการแสดงถึงคุณภาพการสั่งใช้ยาในผู้ป่วยสูงอายุในประเทศไทย

คำสำคัญ: สถานการณ์การใช้ยา, ผู้สูงอายุ, การใช้ยาซ้ำซ้อน, การใช้ยาไม่เหมาะสม

Introduction

Thailand is moving forward to be an ageing society. The number of Thai elderly was increasing from 4.02 million in 1990 to 10.78 million in 2020¹. The percentage of elderly will be 17.5% and 25.1% in the year 2020 and 2030 respectively². The ageing process among the elderly increases the risk of drug

related problems because of the changing in pharmacokinetics and pharmacodynamics of drugs within the impaired renal and liver function, and/or changes in the receptor sensitivity³. Additionally, the elderly often face with multiple chronic diseases, require multiple physicians, and result in multiple medications, while lacking of geriatrics expertise among doctors

and clinical pharmacists.

Evidence suggests that the medication use in elderly people is often inappropriate because of the complexities of prescribing in multiple diseases. Moreover, a study suggest that inappropriate prescription is a major cause of adverse drug reaction and medication related problems^{4,5}. Prescribing of potentially inappropriate medication in the elderly is a main problem throughout the world, not only in the United States but also in Asia. Potentially inappropriate medication (PIM) includes the medications that have contraindication in the elderly, potentially harmful drug-drug interaction and omits indicated medication. Many studies were report a prevalence of PIM in a wide range, prevalence was between 2.2 % and 62.5 %^{6-12,14}. A systematic review by Opondo and colleague¹² reported the median rate of inappropriate medication prescription (IMP) to elderly patients in the primary care setting was 20.0 %. Moreover, another systematic review by Guaraldo found the range of inappropriate medication prescription from 11.5% to 62.5%¹³. The lowest PIM found in a study from Croatia¹⁴ at 2.2% and the highest rate of PIM found in the study from Taiwan at 62.5¹⁵.

There are several sets of criteria developed for detecting the PIM in adult patients and some are specifically for the elderly¹⁶. There are two types of criteria for assessing the potentially inappropriate medication use - the implicit and the explicit criteria. The implicit criteria is a judgment-based criteria, relies on the expert's judgment such as the Medication Appropriate

Index¹⁷, while the explicit criteria has a clear-cut criteria. The explicit criteria are useful for assessing the appropriateness of medication prescribing in the elderly patients, especially when using database that have limitation of clinical information¹⁸. Normally, the explicit criteria compose of a list of medications that are contraindicated or should be avoided in the elderly. Therefore, the explicit criteria are easier to implement in routine practice for physicians and pharmacists. Up to date, there are several sets of explicit criteria for assessing PIMs that were established. The most widely use of explicit criteria is Beers criteria¹⁶. Although Beers criteria are worldwide cited, they have limitation for use in Asia since a half of medication listed in the criteria is unavailable in the Asia market¹⁹. Therefore in 2008, Winit-Watjana and colleagues developed a new criteria, the first Asian criteria, for assessing high risk medication and was applied to Thai elderly patients¹⁹. Winit-Watjana criteria compose of 77 statements, 23 of all statements (29.9%) were classified as medications that should be avoided for 5 statements, medications that are rarely appropriate for 7 and medications with some indications for older patients, and the remainder was unclassified.

Many sources of data have been used for studying the inappropriate use of medication in the elderly such as patient survey, administrative claims records and pharmacy dispensation records^{6,7,20}. The limitation by using patient survey was underreporting biases, while using data from electronic health records was more accurate for measuring of PIM prevalence¹¹.

Objectives

The objective of this study was to explore the situation of the medication prescription in Thai elderly. The pattern of medication use, duplication medication prescription and potentially inappropriate medication prescription were presented.

Method

Study design and Data collection

A retrospective cross-sectional descriptive study, using computerized database from four tertiary care hospitals was employed. From each hospital, three main computerized databases were used as the sources of the medication data, including the administrative database, the pharmacy database and the medical service database. The data of the targeted patients who were sixty and older; and visited to ambulatory care clinic at selected hospitals in the study period were extracted from the database for the analysis. The study period was between October 1st, 2007 and September 31st, 2008.

Ethical considerations

Approval of the study protocol was obtained from the institutional review boards at faculty of Pharmaceutical Sciences, Chulalongkorn University and from all four regional hospitals.

Data analysis

The data retrieved from the four hospitals were processed to reflect the patterns of medication prescribed and the situation of suboptimal medication prescription. The process of database management include of data cleansing, merging

the three databases - the administrative database, pharmacy database and the medical service database, using Microsoft Access 2003 for database management. The variables required for analysis were patient hospital number, registration number, date of visit, age, gender, type of health insurance scheme, ICD-10, medication prescribed in that visit. Only patients who complete all variables above were eligible into the study for analysis the pattern of medication and suboptimal use.

The descriptive statistics was employed to present the demographic data and clinical characteristic of the elderly patients, and the patterns of medication prescribed and the situation of suboptimal medication including the inappropriate medication prescription and duplication prescription. All statistical computing was performed using SPSS software version 17.0.

Results

I. Population descriptive statistics

The total 115,047 elderly patients who aged 60 years and older who visited at ambulatory care clinic in four tertiary care hospitals (H1 - H4) were included. The average age (mean \pm SD) was 70.26 ± 7.42 years and approximately 55% were females. Most of the patients were in the Universal Coverage Scheme (UC). Average number of OPD visit in one year was 3.57-4.89. The demographic and clinical characteristics of the patients from 4 hospitals were summarized in Table 1. Hypertensive disease was a major disease found among the patients, followed by diabetes mellitus and metabolic disorders. The

finding of this study reported approximately 60% of patients have been diagnosed with 2 or more diseases.

II. Pattern of medication prescribing

A total of 1,278,496 medications were prescribed to elderly patients via 299,190 prescriptions, giving a mean of 3.97-4.52 medications per prescription. Thirty-eight percent (a range of 4 hospitals: 34%-42.2%) of prescription had five or more medications in prescription and was recorded as poly-pharmacy.

The difference of the number of medication prescribed to patients between the three age group was statistically significant ($P < 0.001$) in all 4 hospitals. Additionally, the findings showed that more than 70% of medication prescribed in all age group and all hospitals were in the National List of Essential Medicine (Table 2)

Approximately 25% of medication prescribed was medication in cardiovascular system according to ATC (Anatomical Thera-

Table 1. Demographic characteristics of the study population (n=115,047)

Demographic	H 1	H 2	H 3	H 4
	n (%) N = 19,597	n (%) N = 33,737	n (%) N = 35,612	n (%) N = 24,541
Age				
Age 60-69.99	9,926 (50.65)	17,472 (51.79)	19,327 (54.27)	16,502(67.24)
Age 70-79.99	7,271 (37.10)	12,157 (36.03)	12,216 (34.30)	7,614 (31.02)
Age ≥80	2,400 (12.24)	4,108 (12.81)	4,069 (11.42)	425 (1.73)
Mean age±SD	70.68±7.32	70.43±7.55	69.97±7.40	78.99±7.81
Gender				
Male	8,199 (41.83)	14,840 (43.98)	16,828 (47.26)	10,623 (43.29)
Female	11,398 (58.16)	18,897 (56.01)	18,784 (52.74)	13,918 (56.71)
Health insurance scheme				
UC ¹	9,392 (47.92)	19,365 (57.40)	18,684 (52.46)	3,150 (12.83)
CSMBS ²	5,474 (27.93)	13,721 (40.67)	11,781 (38.08)	10,171 (41.44)
SSS ³	287 (1.46)	241 (0.71)	323 (0.91)	266 (1.08)
Other	4,444 (22.67)	410 (1.21)	4,824 (13.55)	10,954 (44.65)
No. of visit, mean ± SD	4.35±3.73	4.52±4.40	3.57±3.35	4.89±3.59

¹ = Universal coverage, ² = Civil Servant Medical Benefit Scheme, ³ = Social Security Scheme.

Table 2. Number of the drugs in the National List of Essential Medicine in the prescription in different age groups

Age group	Total	H1	H2	H3	H4
60-69.99	77.76	77.25	80.32	81.10	73.64
	N = 1103587	N = 238664	N = 300194	N = 225939	N = 338790
70-79.99	77.12	77.21	80.08	79.33	72.61
	N = 462766	N = 93373	N = 110152	N = 124409	N = 134832
80 and older	77.67	77.59	76.69	81.83	72.84
	N = 15923	N = 2753	N = 3682	N = 5522	N = 3966

peutic Chemical Classification System by WHO), 1st level. When consider in chemical subgroup of medication—the ATC, 4th level, medication in HMG CoA reductase inhibitors (C10AA), platelet aggregation inhibitors excl. heparin (B10AC) and proton pump inhibitors (A02BC) were the top three prescribed in 4 hospitals. From aggregate data of 4 hospitals, the most common medication prescribed were simvastatin (3.82%), followed by aspirin (3.50%), omeprazole (3.45%), vitamin B 1-6-12 (3.36%) and paracetamol (2.48%).

III. Suboptimal medication prescription

This study was reviewed the suboptimal of medication prescribed in two points. Firstly, the duplication medication prescribing was identified by using the ATC, 4th level and the second point was inappropriate medication prescription (IMP) that was determined by using the Winit-watjana criteria. The finding of this study reported 3.36–7.89 % duplication medication of the total prescription. The duplication medications were found in 117 chemical subgroups in 4 hospitals. Most common duplication medication was medication in anti-vertigo preparation (N07CA) accounted for 16,836

times of prescribed or 5.63 % of total prescription. For example, elderly patient received cinnarizine, flunarizine and betahistinesylate in the same prescription, all of these medications were in the same chemical subgroup according to the ATC classification system. (Table 3)

The inappropriate medication prescription (IMP) was determined by using the Winit-watjana criteria. The percentage of IMPs was highest at 8.92% among patients in age group 60–69.99 years. Moreover, IMP were more prescribed in female than in male (Table 4). The accumulated data from 4 hospitals showed 1,278,496 prescribing medications in 299,190 prescriptions. There were evidence of PIM in 11.46 % and evidence of inappropriate drug-drug interaction in 1.20% of 299,190 ambulatory care visits with prescriptions. The total of 52,558 PIMs were found in 19 medications according to the criteria. NSAIDs were the most frequency prescribing, followed by NSAID Cox II inhibitors. Diclofinacwas the most common PIM in four hospitals, followed by celecoxib and meloxicam found in 5.43%, 2.75% and 2.31% respectively. Potentially drug-drug interaction was issued to 3,582

Table 3. Number of prescription with duplication medication

Rank	ATC, 4 th level	Chemical subgroup	Medications	Number of prescription (%)
1	N07CA	Anti-vertigo preparations	Cinnarizine + flunarizine + betahistinesylate	16,836 (5.63%)
2	B01AC	Platelet aggregation inhibitors excl. heparin	Aspirin + beroprost sodium or clopidogrel or ticlopidine	3,102 (1.04%)
3	C01DA	Organic nitrates	Isosorbide 5 mononitrate + isosorbidedinitrate	2,362 (0.79%)
4	A10BB	Sulfonamides, urea derivatives	Glibenclamide + glipizide + gliclazide	1,757 (0.59%)
5	N05BA	Benzodiazepine derivatives	Diazepam + alprazolam + lorazepam	1,653 (0.55%)

prescriptions or 1.20 % of total prescriptions, most common drug-drug interaction in this study the interaction of aspirin and NSAIDs was the population (Table 5).

Table 4. Number of potentially inappropriate prescription according to age group and gender (n=299,190)

Age (years)	Number of potentially inappropriate prescriptions (percentage of total prescriptions)		Total number of potentially inappropriate prescriptions (%)
	Male	Female	
60.00-69.00	9,258	17,446	26,704 (8.92%)
70.00-79.99	2,970	5,388	8,358 (2.45%)
80 and more	95	140	235 (0.08%)
Total	12,323 (4.12%)	22,974 (7.68%)	34,297 (11.46%)

Table 5. Number of prescriptions with potentially inappropriate medication (PIP)

No.	Drug or drug class	Number of prescriptions (%)
Potentially inappropriate medication prescription		
1	Phenylbutazone	0
2	Antispasmodics	
	Hyoscine	4,589 (1,53%)
	belladonna	0
3	Metoclopramide	1,696 (0.57)
4	NSAIDS	
	oxoprofen	265 (0.9%)
	clinoril	1,228 (0.41%)
	diclofenac	16,247 (5.43%)
	Tenoxicam	1
	meloxicam	6,897 (2.31%)
	ibuprofen	4,369 (1.46%)
	mefenamic acid	535 (0.18%)
	nimesulide	3,510 (1.17%)
	diacerein	1,274 (0.42%)
	lornoxicam	1 (0.00%)
5	NSAIDS, COX II inhibitors	
	celecoxib	8,235 (2.75%)
	parecoxib	89 (0.03%)
	valdecoxib	1 (0.00%)
	etoricoxib	2,084(0.69%)
	lumiracixub	386 (0.13%)
6	NSAIDS, long-action	
	piroxicam	535 (0.18%)
	naproxen	616 (0.21%)
7	Oxybutynin	0
Drug-drug interaction		
8	Aspirin - NSAIDs	3,356 (1.12%)
9	Warfarin - NSAIDs	226(0.08%)

Discussion

This study attempted to explore the patterns of medication prescription and to determine the quality of medication prescribing in the elderly by using the Winit-watjana criteria - the country-specific criteria - by analyzing the computerized databases from 4 tertiary care hospitals. The majority of disease found in this study is hypertensive diseases that is similar to study from Nigeria and India²¹⁻²². An average number of ambulatory care visits in this study was 3.5 visits per year, which was less than the result from the USA (5.6-6.8 visits/year)¹¹.

The average number of medication per prescription from four hospitals, 3.97- 4.52, was consistent with the average number of medication prescribed to elderly from other studies. Studies from India, Nigeria, and Brazil reported a mean of 4.3, 3.8 and 3.2 medications per prescription respectively^{13,21-22}, while some study from USA, Croatia and Poland reported a higher mean number than this study, which were 5.6-9.1, 7.5 and 6.6 respectively^{11,14,23-25}. The difference of the average number of medication per prescription between the study and the others, especially in developed countries, could be partly affected by health insurance policy for the elderly, medical culture or the budget constrain. The most frequent medication prescribed in the study was in cardiovascular system, especially for dyslipidemia, that was similar to the study by Higashi et al.²⁶, while other studies reported antihypertensives drug was the most prescribed medication^{21-22,27}. Study from India and Nigeria reported that calcium

channel blocker (10.5%) and diuretic (10.4%) were most prescribed and followed by multivitamin and analgesic drug, while this study reported that simvastatin was the most prescribed medication, followed by aspirin and omeprazole. The patterns of medication prescription were difference and it could be resulted from the difference of diseases, environment, culture, and treatment guidelines.

The quality of medication prescription in this study was assessed both in forms of duplication medication and inappropriate medication prescription. Based on a search from published literatures, this study seem to be the first study in Thailand that using the ATC classification system for detecting any duplication medication. The average rate of duplication medication is 6.17% (3.36%-7.89%). Most common duplication medication was medication in anti-vertigo preparation (N07CA) found in 5.63% and benzodiazepine derivatives (N05BA) in 0.55% while a study from the USA²⁸ reported the concomitant use of at least 2 benzodiazepines in 8.5%.

Prescribing concomitant medication in same chemical subgroup (the ATC, 4th level) might be either appropriate or inappropriate depending on the dosage of the medications, drug administration, drug regimen, disease and the guideline of the therapy. Prescribing duplication medication to the elderly may increase the risk of medication related problems, particularly increase the side effects. Medication in anti-vertigo preparation was the most common found as duplication medication in this study

because vertigo or dizziness was frequency found in the elderly. For treating this symptom, the combination of cinnarizine, flunarizine and betahistine mesylate were usually prescribed in clinical practices. However, this pattern was not consistent with the guideline of treatment according to Thai National Formulary 2010: for central nervous system, volume 1 that recommended only betahistine mesylate²⁹. Moreover, prescribing glibenclamide combined with glipizide for diabetes mellitus was also found in this study, was not concordant with the guideline recommendation³⁰. The other duplication medication found in this study were clopidogrel and aspirin for patient at high risk of cardiovascular disease³¹. This pattern is rational for prescribing according to the guidelines. Therefore, for analyzing the appropriateness of medication prescribing in term of inappropriate duplication, the ATC, 4th level can be used as a screening tool.

In the study, 11.46% of total prescription with IMPs was in line with the rate of PIM reported from Western countries at ambulatory care visit (7-40%)^{6,24,32-36}. However, the study showed lower range than the results from the USA (23% - 27.5%), Brazil (34.5%), Ireland (27.6%), Taiwan (19.1%-62.5%) and lower than the median rate from a systematic review of inappropriate medication prescription (20.5%)^{9-12,15,37}; and higher than the result from Turkey (9.8%) and Croatia (2.2%)^{14,38}. Thavornwattanayong and colleague, the study in Thailand, using the Winit-watjana criteria for assessing inappropriate medications repor-

ted the lower rate of PIM than this study³⁹. The reason of the difference might be caused by the different study populations, using the different explicit criteria and different in the methodology.

In our study, NSAIDs was the most common PIMs in 65.31% of all IMPs or 12.28% of total prescriptions, followed by NSAIDs, COX II inhibitors but other studies using Beers criteria reported the differences. The most common PIM from other studies were long-acting benzodiazepines, diazepam, followed by diphenhydramine and amitriptyline^{5,11,28,40}. For example, a study from Croatia reported diazepam as PIMs in 56% of all IMPs or 1.2% of total prescriptions¹⁴. Moreover, the nationwide study in Taiwan reported antihistamine prescription as the most common PIMs in 48.3% of all IMPs and 27.6% of total prescriptions; and reported nonselective NSAIDs use in 18.1% and 8.9%¹⁵. By the way, the result of this study was consistent with Nigerian study which reported NSAIDs as the most common PIMs (30.3%)²². The absolute different PIMs could be the effect of explicit criteria using in each study. This study employed the Winit-watjana criteria¹⁹, which was developed for Thai older patients in year 2008. Only medications that classified as "drugs should be avoided" and "drug rarely appropriate" were applied in this study while medications that classified as "drug with some indications" for older patients did not include in this study and Benzodiazepine was classified in the latter group.

There were 2 strengths of this study.

First, this study was using the large computerized prescription database from several hospitals for analysis, that reflected a large part of the situation of medication prescription for the elderly in Thailand and giving more accurate information than using patient medication records. The second strength was the tool for assessing the appropriateness of medication prescription that were ATC, 4th level system and the Winit-watjana criteria which was proper for assessing PIM in Thailand. However, there were some limitations of this study. This study did not apply a full version of the criteria for assessing the inappropriate medication since the researcher wanted to focus only high severity of inappropriate medications. The other weak point was that this research lacked of the data on medication dosage, duration of treatment, medication adherence and adverse drug reaction and this study was not take into account

of the medication costs. For further research, the full version of the criteria and more medication information should be taken into account; and the factor associated of inappropriate prescription should be incorporated into the study.

Conclusions

This study explored the situation of medication prescription in the elderly by using the computerized prescription database from four tertiary care hospitals. Medication in cardiovascular system is the most common prescribed, particular simvastatin. This study found approximate 15% of the inappropriate duplication medication prescribing and inappropriate medication use among elderly patient who visit at ambulatory care clinic. Moreover, this suboptimal prescribing can be prevented by using the appropriate guideline. The guideline for medication use in elderly sound be apply in real setting for improve the situation.

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