

Prevalence and Factors that Influence Potentially Inappropriate Medication Use among Thai Elderly in Primary Care Settings



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ABSTRACT

Background

Older age increases the likelihood of chronic diseases and polypharmacy with the likelihood of potentially inappropriate medications (PIMs) in secondary and tertiary care levels, but in the primary care settings of Thailand there still is a need for more evidence. This study aimed to examine the prevalence of PIM in primary care settings, and to identify factors that influence the use of PIM.

Methods

A cross-sectional retrospective study was conducted in 2017. Eight primary care units from four regions of Thailand were randomly selected. People aged ≥ 60 years in the eight units were studied as participants. The List of Risk Drugs for Thai Elderly (LRDTE) was used as the reference. Multivariate logistic regression was carried out to identify factors that influence.

Results

A total of 4,848 patients aged ≥ 60 years with 20,671 prescriptions were studied. The mean age was 70.7 ± 8.3 years for males, and 61.2% for females. A little more than 5% (5.1%) had ≥ 3 chronic diseases and 15.0% received polypharmacy (≥ 5 medications). The prevalence of prescriptions with PIMs was 65.9%. The most frequent PIMs were antidepressants: amitriptyline (28.1%), antihistamines: dimenhydrinate (22.4%) and chlorpheniramine maleate (CPM) (11.2%); and Benzodiazepines: lorazepam (6.5%). Three factors that significantly influenced prescribing of PIMs were polypharmacy (adjusted OR 3.51; 95% CI 2.81-4.32), having ≥ 3 chronic diseases (adjusted OR 1.44; 95% CI 1.04-2.01), and age ≥ 75 years (adjusted OR 1.18; 95% CI 1.01-1.38).

Conclusion

More than two-thirds of elderly Thai patients in the primary care settings were prescribed PIMs. Multidisciplinary prescription review and PIM screening in patients aged ≥ 75 years who have ≥ 3 chronic diseases or polypharmacy should be implemented in primary care and supportive computerized PIMs alert system is needed.

Key words: potentially inappropriate medications, primary care, elderly patient, influential factor, polypharmacy

INTRODUCTION

At present, there is a global trend towards an upward increase in the aging population, including in Thailand. According to a report by the Ministry of Social Development and Human Security of Thailand, in 2018 the number of Thai citizens aged ≥ 60 years, or older person as defined by Elderly Person Act, 2003 of Thailand, was 11.14 million or 16.7% of the whole population. This is expected to increase to 20.42 million (or 31.28% of the whole population) by the year 2040.⁽¹⁾ Older people have been found to be 4 times more likely to suffer from disease than those of other age groups. Eighty per cent of older people have at least one chronic disease, which enhances the probability of receiving ≥ 5 medications, known as polypharmacy. Such polypharmacy increases the likelihood of adverse drug events (ADEs). The use of criteria to screen the risks that are associated with different medications for the older patients may help to reduce the chances of problems resulting from such activity, and promote rational drug use for older patients.⁽²⁾

Potentially inappropriate medications (PIMs) are those that carry risks that are greater than their potential benefits,

or are prescribed in inappropriate doses and/or for unsuitable durations. Older patients are at greater risk of adverse events from PIMs. This issue is a major health-care problem, especially when greater health-care expenditure on older patients around the world is taken into account. Presently, there are many screening tools for identifying PIMs in order to improve drug safety for the older persons. Several countries have developed PIMs criteria with the hope that they will reduce the use of PIMs by older people. Two well-known standards for PIMs are Beers criteria and the Screening Tool of Older Persons' potentially inappropriate Prescriptions (STOPP). The Beers criteria were created in the United States, and are regularly updated. STOPP was created in Europe and updated in 2015. The medication list was organized by the physiology-organ system.⁽³⁾ Several countries showed that the PIMs prevalence ranged from 23–66.8%, according to the Beers and STOPP criteria.⁽⁴⁻⁶⁾

In Thailand, there are two criteria for PIMs. One was developed for high-risk medication use in older patients⁽⁷⁾ which has not been updated since 2008. The Lists of Risk Drugs for Thai elderly (LRDTE) has been recently updated using Beers 2015 and STOPP version 2. The medication lists were categorized by age (60–74 years and ≥ 75 years), and by the severity of possible hazards that can result from medication use (mild/moderate/severe).⁽⁸⁻⁹⁾ Application of LRDTE criteria in one study showed that 79% of patients aged ≥ 60 years in secondary hospitals had received PIMs prescriptions.⁽⁸⁾ In primary care units (PCUs), problems with the use of PIMs was found 52% of the time when the Beers criteria were utilized.⁽²⁾ However, the prevalence of PIMs when the LRDTE was used has not been determined in Thai PCUs. This study was primarily aimed at the examination of the frequency of PIMs use in primary care settings, by using the LRDTE. A secondary objective was to identify factors that influenced the use of PIMs.

METHODS

Study Design and Population

A cross-sectional retrospective study was conducted in 2017 in order to examine the use of PIM among older patients at special PCUs in Thailand. These PCUs have been financially supported by the Thai government in order to honour the wishes of the Queen of Thailand, and have continued to be supported ever since. In 2017, there were a total of 80 PCUs around Thailand which provided outpatient services as part of primary care. These PCUs were divided by geographic location into four regions: Northern, Northeastern, Central, and Southern Thailand. A process of simple random sampling was then employed in order to choose eight eligible PCUs. All eight selected PCUs agreed to provide the required information from their health database. The eligible patients were Thai people those aged ≥ 60 , who visited as outpatients in the eight PCUs between January and December 2017, and who had at least one medication continuously prescribed for them. Missing medication data were excluded.

Data Source and Variables

Secondary data of eligible patients were retrieved from the Health Data Center (HDC) databases of PCUs, which record patient information including personal data, clinical data, diagnosis, prescriptions, and types of health-care services used by patients. Gender and age group data (60–74 years or ≥ 75 years), were collected based on the LRDTE criteria.⁽¹⁰⁾ Older persons' occupations were divided into two categories (yes/no). Their health insurance schemes were defined as the universal coverage scheme (UC) or non-UC which included Civil Servant Medical Benefit Scheme and the Social Security Scheme. Disease Diagnoses were classified according to the 10th revision of the International Statistical Classification of Disease and Related Health Problems (ICD-10).⁽¹¹⁾ Diseases were divided into two groups: Non-communicable diseases (NCDs) or Non-NCDs. Non-NCDs were any acute diseases or complaints of symptoms, including upper respiratory tract infections (URI), headache, dizziness, rash, and abdominal pain. Non-NCDs included specific medical conditions such as dental problems, dyspepsia, and muscle strain.

Screening of Potentially Inappropriate Medicines

PIM was assessed using the LRDTE criteria, the new explicit criteria to identify PIMs for elderly Thai persons that were developed from the 2015 Beers standards and STOPP version 2. The LRDTE principles consist of 76 medications and eight medication classes: anticholinergic, antithrombotic, anti-infective, cardiovascular, central nervous system, endocrine, gastrointestinal, and pain management. The long-term use of these medications for more than LRDTE recommendations was considered as PIM. The recommendations may differ between patients aged 60–74, and those aged ≥ 75 years.⁽⁸⁾

Data Analysis

All analyses were carried out using STATA software version 13 (Stata, College Station, TX, USA). The patient was used as the unit of analysis. Patients categorized as receiving PIMs were those receiving at least one drug on the Polypharmacy was defined as patients receiving ≥ 5 medications. The prevalence of PIM use was calculated. For univariate analysis, the influential factors of PIMs were analyzed for the Mantel-Haenszel common odds ratio estimate, by using the Chi-square test. Results with $p < .05$ were considered as statistically significant. Multiple logistic regression analysis was utilized to determine the factors that influenced PIMs. The risk factors were described by crude and adjusted odds ratios (ORs), and 95% confidence intervals (CIs). Model 1 was performed in order to adjust for regions of PCUs. Model 2 was adjusted more on gender, educational level, health insurance and occupation of patients.

The study was approved by the Human Research Ethics Committee of Thammasat University, Thailand. No.1, 185/60 (MTU-EC-CF-1-185/60), on January 23, 2018. Access to the data was officially approved by eight PCUs and HDC.

RESULTS

Patients' Characteristics

A total of 4,848 patients aged ≥60 years were studied. They were given a total of 20,671 prescriptions. The mean age was 70.69 ± 8.26 years. 71.9% of the participants were in the age group 60-74 years, and 28.1% were aged ≥75 years. Females made up 61.2% of the patients. Most of patients had occupations (76.2%) and 84.2% had graduated from primary school. Most of them (89.5%) were covered by the UC health insurance scheme. Fifteen percent of them were dispensed polypharmacy (Table 1).

Prevalence of PIM Use per LRDTE & Factors Influencing PIM Use

The prevalence of PIM use in 4,848 older patients was 65.9%. When comparing the two age groups, those aged ≥75 years had a higher prevalence of PIMs use as compared to those aged between 60–74 years; the prevalence of PIMs was 71.1% in patients aged 75 and older and 63.9% in patients aged 60 to 75.

Females tended to have a higher frequency of PIM than males. Older patients who were educated only to primary school level had a higher prevalence (69.6%) than those with a higher level of education (46.2%). Patients who were unemployed were more likely to have been prescribed PIMs than those who had an occupation (83.0% and 62.6%, respectively). 67.8% of UC patients were prescribed with PIMs, and 73.9% of them had ≥3 chronic diseases. Most patients (83.6%) with polypharmacy had being prescribed PIMs. The factors that had a significant influence on PIM use were: age ≥75 years, educational level, occupation, UC health insurance, NCDs ≥3 diseases, and polypharmacy. These are shown in Table 2.

NCDs, Diagnostic Symptoms, Specific Medical Conditions and PIMs Use

From 3,195 older patients who were prescribed with PIM, 95.2% had NCD. Five major NCDs were dyslipidemia, hypertension, diabetes, asthma, and gout. Dyslipidemia showed the highest PIM use (77.3%). Hypertension and diabetes mellitus were other two NCDs that found high PIM

TABLE 1.
Characteristics of elderly patients aged ≥60 years from four regions of Thailand (N = 4,848)

Characteristics	n (%)				Total
	North	North-East	Central	South	
No. of Patients (n ₁) ^a	1,930	1,700	1,002	826	4,848
No. of Prescriptions (n ₂) ^a	9,680	3,564	3,878	3,549	20,671
Median no. of Prescriptions/Patient (Interquartile)	4 (1-8)	1 (1-2)	1 (1-3)	2 (1-7)	2 (1-6)
<i>Age</i>					
60–74 years	1,325 (68.7)	1,280 (75.3)	748 (74.8)	586 (70.9)	3,485 (71.9)
≥75 years	605 (31.5)	420 (24.7)	254 (25.3)	240 (29.1)	1,363 (28.1)
Mean ± SD	71.20±9.06	70.15±7.57	70.69±7.24	70.27±8.56	70.69±8.26
<i>Gender</i>					
Male	749 (38.8)	683 (40.2)	358 (35.7)	329 (39.8)	1,881 (38.8)
Female	1,181 (61.2)	1,017 (59.8)	644 (64.3)	497 (60.2)	2,967 (61.2)
<i>Education Level</i>					
Primary school	1,865 (96.6)	1,013 (60.6)	873 (87.1)	726 (87.9)	4,080 (84.2)
> Primary school	65 (3.4)	669 (39.4)	129 (12.9)	100 (12.1)	768 (15.8)
<i>Employed</i>					
Yes	1,441 (74.7)	1,585 (93.2)	874 (87.2)	713 (86.3)	4,054 (83.6)
No	489 (25.3)	115 (6.8)	128 (12.8)	113 (13.7)	794 (16.4)
<i>Health Insurance</i>					
Universal Coverage (UC)	1,743 (90.3)	1,515 (89.1)	946 (94.4)	643 (77.8)	4,340 (89.5)
Non-UC	187 (9.7)	185 (10.9)	56 (5.6)	183 (22.2)	508 (10.5)
<i>No. Chronic Diseases (DX)</i>					
1–2 Dx	1,576 (93.2)	1,376 (91.4)	1,002 (100)	826 (100)	4,603 (94.4)
≥3 Dx	115 (6.8)	130 (8.6)	-	-	245 (5.1)
Mean ± SD	1.37± 0.65	1.62± 0.65	-	-	1.32± 0.59
<i>Drug Items/Prescription</i>					
≥ 5 items (polypharmacy)	92 (5.4)	187 (12.4)	317 (36.4)	126 (16.6)	725 (15.0)
1–4 items	1,599 (94.6)	1,319 (87.6)	555 (63.6)	650 (83.4)	4,123 (85.0)

^aNumber of patients (n₁) that had medication from all number of prescriptions (n₂).

TABLE 2.
Prevalence of potentially inappropriate medication (PIM) use and influencing factors; univariate analysis (N = 4,848)

Factors	n (%)		Crude OR (95% CI)	P Value ^a
	No PIM Use (n = 1,653)	PIM Use (n = 3,195)		
Age				
60–74 years	1,259 (36.1)	2,226 (63.9)	1	
≥75 years	394 (28.9)	969 (71.1)	1.39 (1.21-1.59)	<.001 ^b
Gender				
Male	726 (38.6)	1,155 (61.4)	1	
Female	927 (31.2)	2,040 (68.8)	1.38 (1.23-1.56)	<.001 ^b
Education Level				
Primary school	1,240 (30.4)	2,840 (69.6)	2.67 (2.78-3.12)	<.001 ^b
> Primary school	413 (53.8)	355 (46.2)	1	
Occupation/Work				
Yes	1,518 (37.4)	2,536 (62.6)	1	
No	135 (17.0)	659 (83.0)	2.92 (2.40-3.55)	<.001 ^b
Health Insurance				
UC	1,398 (32.2)	2,942 (67.8)	2.12 (1.76-2.55)	<.001 ^b
Non-UC	255 (50.2)	253 (49.8)	1	
Number of Chronic Diseases (Dx)				
1–2 Dx	1,589 (34.5)	3,014 (65.5)	1	
≥3 Dx	64 (26.1)	181 (73.9)	1.49 (1.11-1.99)	.004 ^b
Polypharmacy				
Yes (≥ 5 items)	119 (16.4)	606 (83.6)	3.02 (2.46-3.71)	<.001 ^b
No (1–4 items)	1,534 (37.2)	2,589 (62.8)	1	

^aChi-square test of the Mantel-Haenszel common odds ratio estimate.

^bSignificance level at $p < .05$.

use (22.8% and 21.2%, respectively). Eight acute symptoms and the specific conditions caused older patients to visit PCUs and be prescribed long-term medications, 53.9% of them were PIMs. The most frequent PIMs for muscle strain and headache were 35.5% and 12.5%, respectively. These are shown in Table 3.

Prevalence of PIM Use Between Patients in Different Age Groups

When comparing two age groups, aged 60–74 years, and ≥75 years, the older people showed a significantly higher prevalence of PIM use (71.1% and 63.9%, respectively, $p < .001$). Amitriptyline was the drug that showed the highest PIM use (28.1%) in both groups. In term of drug class, antihistamines, including chlorpheniramine maleate (CPM), hydroxyzine, and dimenhydrinate, was the drug class that showed the highest PIM prevalence (34.2%). Dimenhydrinate and lorazepam showed substantial differences in prescription rates between the two age groups. These are shown in Table 4.

Influencing Factors Associated with PIM Use in Thai Older Patients in Primary Care Settings

After adjustment for a covariate variable of region of PCUs in Model 1, there were seven significant factors that were

associated with PIM use: age ≥75 years, female, educated from primary school, no occupation, had UC health insurance, received polypharmacy, and had three or more chronic diseases.

Model 2 was analyzed by using multivariate logistic regression whilst adjusting for four more variables; three major influencing factors were found to be associated with PIM use. The most substantial was polypharmacy (adjusted OR of 3.51 and 95% CI of 2.81-4.32). Patient with ≥3 chronic diseases was another risk factor (adjusted OR of 1.44 and 95% CI of 1.04-2.01). Another influencing factor was an age of ≥75 years (adjusted OR of 1.18 and 95% CI of 1.01-1.38). These are shown in Table 5.

DISCUSSION

This study explored the prevalence and influencing factors of PIM use among Thai elderly patients in eight PCUs representing all four regions of Thailand. We used the LRDTE criteria which are applied from the 2015 Beers and the 2008 STOPP to make it more practical for older Thai people and in the context of the primary care system in Thailand. This study found PIMs prevalence of 65.9%. The frequency of PIM (65.9%) prescriptions in this study was similar to that found in the Portugal study (68.5%)⁽¹⁰⁾ and

another research in Thailand (75.3%),⁽¹²⁾ which also used the 2015 Beers criteria. Compared to other studies that used the previous version of the 2012 Beers criteria, the prevalence of PIM prescriptions in our study was higher—for example, 33.8–51.8%,⁽³⁾ 52.2%,⁽¹³⁾ and 28.4%⁽¹⁴⁾ of the samples in Brazil (2015), Indonesia (2014), and Thailand (2011–2012), respectively. From the review of using STOPP, we found that a newer version of the STOPP criteria for PIMs, which comprises different yardsticks than previous versions, may provide an explanation of the difference in frequency of PIM use—for example 45.3–51.0% in Ireland,⁽¹⁵⁾ and 34.7% in the Netherlands.⁽¹⁶⁾ Using the old version of STOPP as a comparison, our review showed a different prevalence, but

similar to the study in Northern Ireland in 2013, with PIMs prevalence of 64.4%.⁽¹⁷⁾ The review of PIMs studies showed that the 2015 Beers standards could identify more PIMs than the 2015 STOPP.

Our findings in this study indicate that the LRDTE showed similar prevalence of PIMs to the 2015 STOPP and the 2015 Beers criteria in terms of the identification of PIMs in the Thai population. The prevalence of PIM used in other settings was higher than the findings from our study. For example, it was 79% in secondary care hospitals which utilized the LRDTE criteria.⁽¹²⁾ The lower prevalence of PIMs in the primary care than in secondary or tertiary care hospitals is probably due to the lower numbers of medications in PCUs,

TABLE 3.
PIM use according to NCD and diagnostic symptoms or specific medical conditions (n = 3,195)

<i>Diseases</i>	<i>n</i>	<i>%</i>	<i>Symptoms/Conditions</i>	<i>n</i>	<i>%</i>
Total NCD	3,042	95.2	<i>Acute Symptom</i>	1,721	53.9
Dyslipidemia	2,470	77.3	Headache	398	12.5
Diabetes	677	21.2	Abdominal pain	132	4.1
HT with complication	464	14.5	Rash	53	1.7
Asthma	351	11.0	URI	32	1.0
Hypertension (HT)	264	8.3	Dizziness	70	2.2
Gout	6	1.9	<i>Specific Medical Conditions</i>		
			Muscle strain	1,135	35.5
			Dental problem	125	3.9
			Dyspepsia	81	2.5

TABLE 4.
Prevalence of PIM use in old and older patients (N = 4,848)

<i>Medications</i>		<i>PIM Use, n (%)</i>			<i>P Value^a</i>
<i>Drug Class</i>	<i>Drug Name</i>	<i>Total PIM Use (n = 4,848)</i>	<i>Aged 60–74 Yrs. (n = 3,485)</i>	<i>Aged ≥75 Yrs. (n = 1,363)</i>	
All Medications		3,195 (65.9)	2,226 (63.9)	969 (71.1)	<.001 ^b
Antihistamines	CPM	541 (11.2)	372 (10.7)	169 (12.4)	.086
	Hydroxyzine	27 (0.6)	19 (0.5)	8 (0.6)	.861
	Dimenhydrinate	1,088 (22.4)	754 (21.1)	334 (24.5)	.031 ^b
NSAIDs	Diclofenac	31 (0.6)	21 (0.6)	10 (0.7)	.607
	Naproxen	40 (0.8)	33 (0.9)	7 (0.5)	.134
	Ibuprofen	83 (1.7)	54 (1.5)	29 (2.1)	.163
Proton Pump Inhibitors	Omeprazole	217 (4.5)	152 (4.4)	65 (4.8)	.537
Benzodiazepines	Lorazepam	317 (6.5)	211 (6.1)	106 (7.8)	.029 ^b
Opioids	Brown mixture	26 (0.5)	16 (0.5)	10 (0.7)	.239
Thiazolidinedione	Pioglitazone	103 (2.1)	76 (2.2)	27 (2.0)	.664
Antidepressants	Amitriptyline	1,363 (28.1)	0 (0)	1,363 (100.0)	n/a

n/a = not available due to unable to calculate.

^aChi-square test between patients aged 60–74 yrs. and aged ≥75 yrs.

^bSignificance level at $p < .05$.

TABLE 5.
Factors influencing PIM use among elderly Thai patients in primary care settings; multivariate logistic regression (N = 4,848)

<i>Factors</i>	<i>Crude OR (95% CI of OR)</i>	<i>Model 1^a Adjusted OR (95% CI)</i>	<i>Model 2^b Adjusted OR (95% CI)</i>
Age \geq 75 years	1.39 (1.21-1.59)	1.17 (1.00-1.36)	1.18 (1.01-1.38)
Gender: Female	1.38(1.23-1.56)	1.23 (1.08-1.41)	-
Education Level (Primary school)	2.67 (2.78-3.12)	1.64 (1.38-1.94)	-
Occupation: No job	2.92 (2.40-3.55)	2.05 (1.66-2.54)	-
Health Insurance: Universal Coverage	2.12 (1.76-2.55)	1.90 (1.55-2.33)	-
Polypharmacy (\geq 5 drug items)	3.02 (2.46-3.71)	4.44 (3.57-5.51)	3.51 (2.81-4.32)
Chronic Disease (\geq 3 Dx)	1.49 (1.11-1.99)	1.12 (0.81-1.56)	1.44 (1.04-2.01)

CI = confidence interval; OR = odds ratio.

^aModel 1: adjusted for region of primary care setting with model goodness of fit; chi-square of 1011.52, $p < .001$ and 65.9% correct classification.

^bModel 2: adjusted for region of primary care setting, gender, education level, occupation, and health insurance with model goodness of fit; chi-square of 1011.51, $p < .001$ and 71.9% correct classification.

meaning that some medications that could be classified as PIMs are unavailable in PCUs. The high incidence of PIMs in PCUs in our study, leads us to urge health professionals in primary care settings to be cautious when prescribing medications to the older patients. In some countries, PIMs screening criteria have been initiated and modified, such as the 83-drugs list PRISCUS from Germany⁽¹⁸⁾ and 13-classes drug list of STOPP-J criteria from Japan,⁽¹⁹⁾ which then showed a difference in PIMs prevalence of 22.0% and 26.7%, respectively.

Medication classes associated with PIMs in this study were medications with anticholinergic effects such as antidepressants, the first generation of antihistamines, and benzodiazepines. Medications with these effects were often prescribed for patients aged \geq 75 years with NCD and for long-term use for acute symptom, such as CPM for the common cold, dimenhydrinate for vertigo, amitriptyline for neuropathic pain, and NSAIDs for muscle strain. The findings were congruent with previous studies in the same context using different criteria.⁽¹⁴⁾ Again, use of the LRDTE Thailand list in our study and the PRISCUS German list⁽¹⁸⁾ in another study produced similar top PIMs. In Ireland, the use of STOPP v.2 detected medications with anticholinergic effects, benzodiazepine, NSAIDs, and PPI as the most common PIMs.⁽¹⁵⁾ For NSAIDs, Beers 2019 criteria⁽²⁰⁾ and STOPP v.2⁽²¹⁾ have different standards, resulting in a difference in the prevalence of NSAIDs being listed as PIM. Specifically, Beers 2019 allows a short-term usage of NSAIDs for acute conditions. In our opinion, although there is a limitation on the use of medications with anticholinergic effects and NSAIDs, they can be prescribed with caution in PCUs. Short-term administration with close monitoring is key to the prevention of adverse drug events. For PPI, we recommend that prescribers follow recent practice guidelines with evidence-based clinical practice⁽²²⁾ to limit the use of PPI only in those with strong indications.

Similar to other studies,^(3,12,13,16,17,19) our study showed that polypharmacy is associated with PIMs. The details of PIM

prevalence, screening criteria, PIM, and influencing factors of each study in primary care is shown in Table 6. The ratio of prescriptions with PIMs ranged from 1.87 to 2.78 in those who were being treated by with polypharmacy.^(13, 23) Nevertheless, completely avoiding polypharmacy in an elderly person is difficult. Their health conditions and comorbidities related to the aging process put them at a higher risk of polypharmacy. A deprescription process is of the essence in this group. However, beliefs which are held by elderly patients about health and medications may make them reluctant to participate in the identification of PIMs and other unnecessary medications. The use of technology can ease the difficulties of physicians in the identification of PIMs, with criteria that will need to be updated from time to time. If the relevant technology is utilized, a prescription with PIMs will automatically trigger an alert during the prescription process, and doctors can therefore choose alternative medications, or use with caution. Monterio *et al.* have recently looked at the effectiveness of computerized decision support with regard to a reduction in the use of PIMs.⁽²⁴⁾

Patients with multiple comorbidities were associated with an increased likelihood of PIM use.^(10,25) After adjusting for five covariates in Model 2, the presence of three or more chronic diseases was a positive predictor of use of PIM. In outpatients with multiple diseases, the main complaints of more than half (53.9%) of them were acute symptoms such as muscle strain, headache, abdominal pain, and dizziness. This finding provides clarification on why older persons in our studies were prescribed with anticholinergic drugs. The prevalence of anticholinergic drug prescriptions reported 26.95% in patients with dementia⁽²⁶⁾ and was related to hospitalization. Polypharmacy is always an issue for older people.⁽²⁷⁾ In order to avoid PIM prescriptions, health professionals in PCUs should receive PIM training, in order to prepare them to recognize the use of PIMs in older patients.^(28,29) Computerized PIM detection may also be effective in the prevention and diminution of PIM use.⁽³⁰⁾

TABLE 6.
PIM use studies in elderly patients at primary care settings

Country (study year)	N	Criteria	PIM Prevalence	PIM	Influencing Factors on PIM
Thailand (This Study) ⁽¹²⁾ 8 primary care settings from 4 parts of Thailand	4,848	LRDTE (Thai PIM list)	65.9%	28.1% Amitriptyline 22.4% Dimenhydrinate 11.2% CPM 6.5% Lorazepam 4.5% Omeprazole (PPI) 3.2% NSAIDs	Polypharmacy Age Number of Chronic Dx
Brazil (2015) ³	142	2012 Beers STOPP criteria	33.8-51.8%	32.9% ASA 17.4% Nifedipine 11.9% Glyburide	Polypharmacy
Portugal (2018) ¹⁰	757	2015 Beers criteria	68.5%	PPI NSAIDs Benzodiazepines	Female Number of chronic Dx Number of medication Number of prescribers
Thailand (2016-2017) ¹² 1 primary care setting	400	Winit-Watjana 2015 Beers STOPP v.2	75.3%	22.7% Orphenadrine 20.5% NSAIDs 18.5% ACEI 10.0% Benzodiazepines	Polypharmacy Female
Indonesia (2014) ¹³	3,819	2012 Beers & McLeod Criteria	52.2%	CPM NSAIDs	Polypharmacy
Thailand (2011-2012) ¹⁴ 1 primary care setting	430	2012 Beers criteria	28.1%	17.5% Lorazepam 17.2% Diclofenac 15.2% Doxazosin	Age Age of prescribers Number of OP visit
Ireland (2012-2015) ¹⁵	38,229	STOPP v.2	45.3%-51.0%	26.9% PPI 19.1% Benzodiazepines	Female After hospital admission
Netherlands (2007-2014) ¹⁶	36,297	STOPP/START	34.7%	20.2% Benzodiazepines 12.9% Opiates 7.5% Antipsychotics 11.8% NSAIDs	Female Age Number prescribed drugs
Northern Ireland (2013) ¹⁷ Dementia patients	6,826	STOPP	64.4%	25.2% Anticholinergics/ anti-muscarinic medication	Female Polypharmacy
Germany (2016) ¹⁸	448 Positive Dementia	Priscus List (German PIM list)	22.0%	14.4% Amitriptyline 9.9% Etoricoxib 7.2% Diazepam	Number of drugs
Japan (2015) ¹⁹	8,080	STOPP-J	26.7%	48.2% Benzodiazepines 24.2% H2 Blockers 10.0% Diabetes drugs	Polypharmacy Number of prescribing physician/patients
Malaysia (2019) ³¹	155	STOPP & 2015 Beers criteria	21.3%	5.2% Loop diuretics 4.5% Antihistamines 4.5% Antipsychotics	Number of chronic medication Comorbidities

A significant difference of PIM prevalence in patients aged 60–74 years and aged ≥75 years was found. Increasing age showed a trend of polypharmacy due to increasing incidence of NCD. The complaints of the elderly of acute symptoms, such as muscle pain or bodily pain, were also more likely to increase the risk of the use of PIM.

Our study was limited in that it was reliant on data from an electronic data source. It is to be expected that the frequency

of PIMs would be underestimated because information about medications that are commonly found in other countries and in health services other than PCU could not be collected.^(19,26,30) Other health-care providers have health information systems that are not shared with others. Nevertheless, we believe that the data source in this study was accurate and served our study’s objective. Using the LRDTE for PIMs screening was appropriate because it was developed specifically for Thai

older people. The findings of our study, from our perspective, can be employed to conduct comparisons with other studies using STOPP v.2 or Beer 2015 standards, because the LRDTE was developed using these two criteria.

CONCLUSION

The prevalence of PIM use in elderly Thai patients in primary care settings, according to the LRDTE criteria, was 65.9%. The most common PIMs were drugs with anticholinergic effects (i.e., antidepressants, antihistamines, and benzodiazepines). The biggest influences on the prescription of PIMs were polypharmacy, having three or more chronic diseases, and age ≥ 75 years. The effective strategies for PIM reduction are avoiding or deprescribing the specific drugs on the list LRDTE and improving polypharmacy. An interprofessional approach to monitor the use of medication among the older people is needed. Geriatric case conferences among health professionals led by geriatric doctors, clinical pharmacists, and dementia experts could be organised for preventing PIM use. Pharmacist intervention on medication reviews is recommended as this has shown to reduce the use of PIM. Further research on the prescribing process and computerized alert systems should be conducted in primary care settings, in order to reduce the practice of polypharmacy and the prescribing PIMs.

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CONFLICT OF INTEREST DISCLOSURES

The authors declare that no conflicts of interest exist.

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