

# Polypharmacy, medication adherence and medication management at home in elderly patients with multiple non-communicable diseases in Thai primary care

PASITPON VATCHARAVONGVAN<sup>1, A-G</sup>, VIWAT PUTTAWANCHAI<sup>1, A-G</sup>

Department of Community Medicine and Family Medicine, Faculty of Medicine, Thammasat University, Pathum-Thani, Thailand

A – Study Design, B – Data Collection, C – Statistical Analysis, D – Data Interpretation, E – Manuscript Preparation, F – Literature Search, G – Funds Collection

**Summary Background.** Polypharmacy among elderly patients in primary care settings is a global phenomenon that has not been well examined in Thailand.

**Objectives.** To determine (i) the prevalence rate of polypharmacy (using  $\geq 5$  medications) among elderly Thai patients  $\geq 60$  years of age who were diagnosed with multiple non-communicable diseases (NCDs) in primary care, (ii) medication adherence and (iii) quality of home medication management.

**Material and methods.** The electronic medical records of eligible patients were reviewed to obtain demographic data, current medications, medical diagnoses and medical outcomes such as blood pressure. Those with polypharmacy were interviewed at their homes using structured questionnaires to examine medication adherence and medication management at home. Data was collected between September 2014 and April 2015.

**Results.** Of the 397 participants, 146 (36.8%) had polypharmacy. Those with polypharmacy were more likely to have type 2 diabetes mellitus, poor disease control and more NCDs. High rates of poor medication adherence (61%) and poor medication management (60.2%) at home were found in the polypharmacy group, but these factors were not associated with poor disease control ( $p = 0.169$  and  $p = 0.683$ , respectively).

**Conclusions.** More than one-third of the sample of Thai elderly with multiple NCDs in primary care were recipients of polypharmacy. Of those with polypharmacy, almost two-thirds reported poor medication adherence and poor medication management at home. Strategies to decrease unnecessary polypharmacy and improve both medication adherence and home management are essential in this patient group.

**Key words:** aged, chronic diseases, polypharmacy, primary care, patient adherence.

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## Background

Polypharmacy, or the concurrent use of multiple medications, among the elderly is a global phenomenon. Recent data from Scotland indicates an increase in the prevalence of polypharmacy in this age group [1]. Approximately half of the elderly use multiple medications in various settings [2–4], including in primary care [5, 6]. A study of Scottish primary care patients reported that 36% of elderly patients aged 60–69 years used four or more medications concurrently and that this prevalence increased to 70.4% in those aged  $\geq 80$  years [7]. The medications prescribed in ambulatory care settings covered five main disease areas: cardiovascular, endocrine, central nervous system, digestive and psychiatric diseases [7–9]. The factors associated with polypharmacy included increasing age, the number of comorbid diseases, the number of health care visits and specific diseases such as type 2 diabetes mellitus (T2DM) and hypertension (HT) [10, 11]. In a study conducted in Finland, elderly diabetic patients had a two-fold greater risk of polypharmacy (2.28, 95% confidence interval [CI] 1.26–4.15) compared to those without diabetes [12].

Polypharmacy among the elderly has not been well examined in developing countries, including Thailand, but it may be common. Thailand has become an ageing society since 2007

[13], and the proportion of elderly increased from 10.7% (7 million) in 2007 to 14.9% (10 million) in 2014. More than two million elderly Thai adults (18.3%) have one or more non-communicable diseases (NCDs) [14], which means that they may need multiple medications to control their NCDs. Coupled with the universal coverage health plan launched in 2002 and the unrestricted access to over-the-counter medications, elderly Thai patients are at risk of taking multiple medications.

## Objectives

A primary objective of this study is to examine the prevalence of polypharmacy among elderly patients aged 60 years or older with multiple NCDs in primary care. A secondary objective is to explore medication adherence and medication management at home in those with polypharmacy.

## Material and methods

### Study design

A cross-sectional survey study using electronic medical records (EMRs) and face-to-face interviews at the homes of partic-



Participants with polypharmacy was conducted between September 2014 and December 2015 at a primary care practice in Pathum-Thani, Thailand. According to Thailand's Older Persons Act of 2003, individuals are defined as elderly if they are  $\geq 60$  years of age. This study was approved by the Human Ethics Committee of Thammasat University No. 1, Faculty of Medicine, Thammasat University (MTU-EC-CF-2-072/57). A review of the electronic medical records (EMRs) was approved by the director of the primary care practice.

## Participants and data collection

The EMRs of 394 patients aged  $\geq 60$  years were selected using a systematic random sampling method. Inclusion criteria were elderly patients with  $\geq 2$  following NCDs: T2DM, hyperlipidemia, HT, ischemic heart disease, chronic heart failure, cerebrovascular disease and epilepsy. Age-eligible patients were excluded if they had not been prescribed medications for their NCDs for at least 6 months prior to recruitment.

Data collection included two steps. To determine the proportion of polypharmacy, the EMRs of eligible patients were reviewed. Those with polypharmacy ( $\geq 5$  medications for their NCDs) were invited to face-to-face interviews to examine medication adherence and medication management at home using structured questionnaires. Signed informed consent was obtained from all patients who participated in the interviews.

## Statistical analysis

Poor medication adherence was defined as having at least one medication for NCDs that was (a) taken at the wrong time, (b) missed or (c) intentionally stopped by the patients. To reduce recall bias, patients were asked about incidents of poor medication adherence that occurred in the two weeks prior to the interview. Poor medication management at home was defined as the occurrence of at least one of the following: (a) removing medications from medication packages, (b) having expired or duplicated current medications at home, (c) having unused medications at home or (d) sharing medications with other people.

The patients were categorized into two groups: good and poor disease control. Patients with good disease control were those with any one of the following criteria: (a) fasting blood sugar was between 90–130 mg/dL in patients with T2DM during the last two visits, (b) systolic and diastolic blood pressure was lower than 150 and 90 mm Hg, respectively, in patients with HT during the last two visits, and (c) there were no hospital admissions due to NCDs within the previous six months.

Descriptive statistics were used to analyze the socio-demographic data, the prevalence of polypharmacy and the proportions of variables related to medication management at home and medication adherence. Chi-squared and Fisher's exact tests were used to compare proportions, and an independent Student's *t*-test was used to analyze the mean differences between the groups. A *p*-value  $< 0.05$  indicated statistical significance.

## Results

### Participants

The EMRs of 397 patients were included in the data analysis. Table 1 illustrates the characteristics of the patients. The mean age of the patients was 70 years (standard deviation, SD = 6). Hypertension was the most common diagnosis (96.2%). The

median numbers of NCDs and medications used were 2 and 4, respectively. Only half of the patients had good disease control.

## Polypharmacy

Of the patients included in the sample, 146 (36.8%) used five or more medications. Compared to the non-polypharmacy group, the polypharmacy group had more NCDs and was less likely to have good disease control and dyslipidemia, but was more likely to have T2DM (Table 1). There were no statistically significant differences in the mean age, gender, marital status or proportions of the remaining NCDs.

**Table 1. Participants' characteristics (n = 397)**

Characteristics	Polypharmacy		<i>p</i>
	Yes (n = 146)	No (n = 251)	
Age – mean (SD)	69 (6)	70 (6)	0.078
Female – n (%)	97 (66.4)	186 (74.1)	0.104
Marital status – married – n (%)	96 (65.8)	171 (68.1)	0.627
Number of chronic diseases – median <sup>a</sup>	3	2	$< 0.001$
Diseases <sup>b</sup> – n (%)			
HT	143 (97.9)	239 (95.2)	0.170
DLP	97 (66.4)	226 (90.0)	$< 0.001$
T2DM	126 (86.3)	60 (23.9)	$< 0.001$
CAD	4 (2.7)	7 (2.8)	1.000
CVD	5 (3.4)	6 (2.4)	0.542
CHF	2 (1.4)	2 (0.8)	0.627
Epilepsy	0 (0)	1 (0.4)	1.000
Number of medications <sup>a</sup> – median (interquartile range)	6 (2)	3 (2)	$< 0.001$
Good disease control <sup>d</sup> – n (%)	36 <sup>c</sup> (24.8)	169 <sup>c</sup> (67.9)	$< 0.001$

<sup>a</sup>Mann-Whitney U test; <sup>b</sup>HT – hypertension; DLP – dyslipidemia; T2DM – type 2 diabetes mellitus; CAD – coronary artery disease; CVD – cerebrovascular disease; CHF – chronic heart failure; <sup>c</sup>missing data = 1; <sup>d</sup>good disease control was defined as those with any one of the following criteria: (a) fasting blood sugar between 90–130 mg/dL in patients with T2DM during the last two visits, (b) systolic and diastolic blood pressure lower than 150 and 90 mm Hg, respectively, in patients with HT during the last two visits and (c) no hospital admissions due to NCDs within the previous six months.

## Medication management at home

All patients with polypharmacy were invited for face-to-face interviews; 124 (84.9%) agreed to participate. Of the interviewees, 61% reported poor medication adherence, such as taking medications at the wrong time, and 60.2% reported poor medication management at home, such as removing medications from medication packages. Approximately 80% managed their medication themselves, and the rest had their medication managed by a relative. Compared to those with good disease control, those with poor disease control had more chronic diseases and storage locations and were more likely to have T2DM and unused medications. Poor medication adherence and poor medication management at home were not associated with poor disease control (Table 2).

**Table 2. Characteristics of 124 patients with polypharmacy as a function of disease control**

Characteristics	Disease control <sup>c</sup>				p
	Poor (n = 94)		Good (n = 30)		
Age – mean (SD)	69	(5)	70	(6)	0.353
Female – n (%)	62	(66)	20	(66.7)	0.943
Number of chronic diseases – mean (SD)	3	(0.6)	2	(0.5)	0.006
Diseases <sup>a</sup> – n (%)					
HT	92	(97.9)	29	(96.7)	0.568
DLP	59	(62.8)	24	(80.0)	0.081
T2DM	89	(94.7)	17	(56.7)	< 0.001
Number of medications – mean (SD)	6	(1)	6	(1)	0.099
Number of medication storage locations – mean (SD)	2.0	(0.6)	1.7	(0.5)	0.004
Poor medication adherence – n (%)	59 <sup>b</sup>	(64.1)	15	(50.0)	0.169
Taken at the wrong time	37	(39.4)	9	(30.0)	0.355
Missed medications	51	(54.3)	12	(40.0)	0.174
Stopped intentionally	9 <sup>c</sup>	(9.9)	4	(13.3)	0.734
Poor medication management at home – n (%)	56 <sup>b</sup>	(60.9)	17	(56.7)	0.683
Had expired medications	12 <sup>d</sup>	(12.9)	1	(3.3)	0.184
Had unused medications	40	(42.6)	6 <sup>d</sup>	(20.7)	0.033
Removed medications from medication packages	40 <sup>d</sup>	(43.0)	14	(46.7)	0.726
Had duplicate medications	9 <sup>d</sup>	(9.7)	2	(6.7)	1.000
Shared medications with others	14 <sup>d</sup>	(15.1)	4	(13.3)	1.000

<sup>a</sup>HT – hypertension; DLP – dyslipidemia; T2DM – type 2 diabetes mellitus; <sup>b</sup>missing data = 2; <sup>c</sup>missing data = 3; <sup>d</sup>missing data = 1; good disease control was defined as those with any one of the following criteria: (a) fasting blood sugar between 90–130 mg/dL in patients with T2DM during the last two visits, (b) systolic and diastolic blood pressure lower than 150 and 90 mm Hg, respectively, in patients with HT during the last two visits and (c) no hospital admissions due to NCDs within the previous six months.

## Discussion

There is a paucity of research in polypharmacy among the elderly with multiple NCDs in developing countries [15]. Currently, there is still a need to understand polypharmacy in this particular group [16]. To respond to the need of evidence, this study explored polypharmacy, medication adherence and medication management in the homes of elderly patients with multiple NCDs in primary care in Thailand. The prevalence of polypharmacy in the elderly patients was almost 37%. Most patients with polypharmacy managed medications at home themselves. Approximately two-thirds of the polypharmacy patients exhibited poor medication adherence or poor medication management at home.

The prevalence rate of polypharmacy in this study was similar to previous studies [3–5, 17, 18] reporting polypharmacy rates between 25% and 50% in elderly patients. The elderly patients with polypharmacy were more likely to have T2DM,

more NCDs and poor disease control than those without polypharmacy. The proportion of T2DM in the polypharmacy group was higher than the findings of Jyrkkä et al. [12], which may be explained by the high proportion of T2DM patients in our study. Regarding the number of NCDs, our study supports previous studies [10, 19] suggesting that elderly patients with several NCDs are more likely to have polypharmacy.

Standard practice guidelines for treating NCDs [e.g. 20] partly contribute to the use of polypharmacy to control NCDs and prevent their complications, especially in patients with poor disease control. However, an association between the quality of disease control and polypharmacy has not been well explored. In our study, 75.2% of those with poor disease control had polypharmacy, which may imply that they needed multiple medications due to poor disease control.

Polypharmacy is one of the risks of potentially inappropriate prescriptions and is related to negative health outcomes. Implementing an appropriate intervention can minimize unnecessary polypharmacy [21]. In primary care, a systematic approach of professional education with continuing support can improve appropriate prescriptions to the elderly [22–25]. A multi-professional intervention, such as LAKSAK, showed that potentially inappropriate medications decreased by 22% after the intervention [22].

Elderly patients generally exhibit poor medication adherence, which is worse in those on multiple medications [10]. In our study, the rate of poor adherence was high (approximately 60%), similar to rates reported by others [10]. The findings call for active steps by medical doctors and pharmacists in primary care to monitor the medication adherence of these patients and provide a patient-centered education program to improve medication adherence [26].

In our study, more than half of the patients with polypharmacy reported poor medication management at home, such as having unused prescription medications. Compared to previous work in Australia [27], our rate of having expired medications was lower (10.6% vs 19.6%), whereas the rate of unused medications was higher (37.4% vs 21.1%). Nevertheless, the high proportion of poor medication management at home was not associated with poor disease control.

There were some limitations in this study. First, the prevalence of polypharmacy in this study may be under-estimated, as only the medications for six specific NCDs were examined. Over-the-counter medications and medications for other conditions that require multiple medications, such as mental illness and orthopedic conditions, were not included for analysis. Next, data was collected from patients at only one time point, and the prevalence of poor adherence could be better or worse at other time points. The operational definition of poor medication adherence was very strict and possibly resulted in an overestimation of poor medication adherence. However, Sakthong et al. [28] supported this approach, as it improves the sensitivity for detecting poor medication adherence. Finally, the sample size in the polypharmacy group was relatively small, which limited our statistical power; this may explain why some comparisons were not statistically significant, e.g. the lack of association between disease control and medication adherence.

## Conclusions

More than one third of elderly Thai patients with multiple NCDs in primary care reported polypharmacy with a high proportion of poor medication adherence and poor medication management at home. These findings urge primary care practices to implement evidence-based interventions to prevent unnecessary polypharmacy and improve medication adherence and medication management at home in elderly patients with polypharmacy. Further research is required to examine other medical conditions that require multiple medications, as well as the factors affecting polypharmacy and medication-related problems associated with polypharmacy.

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Address for correspondence:

Pasitpon Vatcharavongvan, MD, PhD

Department of Community Medicine and Family Medicine

Faculty of Medicine

Thammasat University

Pathum-Thani 12120

Thailand

Tel.: +6629269802

E-mail: pasitpon@staff.tu.ac.th