Original Article

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Prevalence of Under-Prescription in Elderly Type 2 Diabetic Patients in the Primary Care Unit of a University Hospital

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Abstract

Objectives: This study aimed to assess the prevalence of under-prescription among elderly type 2 diabetic patients in the primary care unit of a university hospital in southern Thailand and identify the associated factors.

Material and Methods: A 1-year retrospective medical record review was conducted in elderly type 2 diabetic patients treated continuously in the primary care unit. Under-prescription was the primary outcome assessed from criteria developed from the START criteria (2015), Thailand's clinical practice guideline for diabetes (2014), and for hypertension (2015).

Results: This study included 458 medical records that fit our inclusion criteria. The median age was 69.1 years old and more than 80% of them had a comorbidity of dyslipidemia or hypertension. The prevalence of under-prescription in elderly type 2 diabetic patients was 84.5%. The most commonly omitted medication was aspirin for primary prevention of cardiovascular disease. An increased number of medications received and having cardiovascular disease was associated with a lower risk of under-prescription.

Conclusion: The prevalence of the omission of beneficial medications in elderly type 2 diabetic patients in the primary care unit of a university hospital was high, especially under-prescription of aspirin for primary prevention of cardiovascular disease.

Keywords: diabetes, elderly, under-prescription

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Introduction

The global population of elderly persons has risen rapidly and most of these persons have one or more underlying diseases.[1] Studies show that prescriptions of beneficial medications to the elderly have benefits[2] along with some side effects as in younger patients.[3] However, some physicians do not prescribe these beneficial medications to the elderly even though there are no contraindications. This leads to under-prescription which is one kind of problem in inappropriate drug use in the elderly. This problem leads to increased morbidity or mortality and treatment failure.[4]

The reported prevalence of under-prescription ranges from 22.7 to 84.8%,[5–10] which depends on the population of the study and the criteria to define under-prescription. According to the START criteria that divide medication omissions by organ system, 16.5–33.4% of medications are omitted in elderly diabetic patients.[5,7,8] One study that evaluated elderly patients during hospital admission found that 64.6% of elderly diabetic patients had at least one medication omission which was significantly higher than non-diabetic patients.[11] Diabetes has many complications. A recent guideline recommended that physicians prescribe medications to prevent or slow the progression of these complications[12–14] but studies show that about half of the patients didn't receive these beneficial medications.[15,16] Previous studies showed various associated factors for under-prescription in elderly diabetic patients such as advanced age, multimorbidity, and polypharmacy.[6–10,17,18] Although many studies reported the prevalence and risk factors of under-prescription in various countries, no study has been done in the Primary Care Unit of Songklanagarind Hospital. The present study aimed to assess the prevalence of under-prescription among elderly type 2 diabetic patients in the primary care unit of Songklanagarind Hospital and identify the associated factors.

Material and Methods

Study design and setting

A cross-sectional study was conducted retrospectively in the Primary Care Unit of Songklanagarind Hospital using the medical records from 1 July 2016 to 30 June 2017. Songklanagarind Hospital belongs to the Faculty of Medicine, Prince of Songkla University in Hat Yai district of Songkhla province in Thailand. The hospital has 847 beds to serve the people in southern Thailand.

Study sample and sampling

The medical records were reviewed of all patients who were type 2 diabetic patients aged ≥ 60 years treated continuously in the Primary Care Unit of Songklanagarind Hospital between 1 July 2016 and 30 June 2017. We excluded the medical records of patients who didn't come to the hospital on their own or came to refill medications. The sample size was calculated using the population proportion formula that considered the prevalence of 64.6% in a previous study,[11] 95% confidence interval, and a precision error of 5%. The results indicated that at least 352 medical records of elderly type 2 diabetic patients were required. This study enrolled 458 medical records that fit our inclusion criteria.

Variables

The primary outcome was under-prescription assessed by the criteria the researcher developed from three sources: i) the START criteria 2015[12] which is the guideline to warn of potential under-prescription in the elderly, ii) the Clinical Practice Guideline for Diabetes in Thailand 2014,[14] and iii) the Thai Guidelines on the Treatment of Hypertension 2015.[13] The criteria of under-prescription in this study consisted of aspirin and statins for primary and secondary prevention of cardiovascular diseases (CVDs) (e.g., coronary heart disease, ischemic

stroke, and peripheral arterial disease), renin-angiotensin system blockers in chronic kidney disease or albuminuria, and antihypertensive medications when either the systolic or diastolic blood pressure was ≥140/90 mmHg, respectively. Independent variables included characteristics of patients from previous studies which were found to be associated with under-prescription, such as age, sex, number and types of underlying diseases, and the number of chronic medications received. The data collection form of this study was sent to 3 professors to do an Item Objective Congruence (IOC) index[19] of each question. The results showed an IOC≥0.5 in 9 of 11 questions. We then edited 2 questions that had an IOC<0.5 by following the recommendations of our professors.

Data collection

The details of every visit in the study period of the medical records of each patient were reviewed by the corresponding author and another one author. If the results from the two authors were different, another one author was required to review the results and select the answer that was the same in two out of three. Patients who didn't receive at least one beneficial medication according to our criteria were documented as under-prescription. The number and name of the omitted medications were listed from each patient.

Data management and analysis

Data were entered in EpiData (version 3.1, Denmark) with double entry basis and analyzed using the R program (R Core Team 2017, Vienna, Austria). Descriptive statistical analysis was used to analyze the prevalence of under-prescription, baseline characteristics of the patients, and the characteristics of the omitted medications. We present the categorical data in terms of percentage and continuous data in terms of median and interquartile range (IQR). We used the multiple logistic regression model to test the relationships between the associated factors and under-prescription. P-values less than 0.05 were considered statistically significant.

Ethical considerations

This research was approved by the Ethics Committee of Faculty of Medicine of Prince of Songkla University. Informed consent of each patient was not obtained because the study was a retrospective medical record review. However, patient confidentiality was protected by codifying the recorded information and all results were reported in overall data.

Results

The baseline characteristics of 458 elderly type 2 diabetic patients are shown in Table 1. Two-thirds of them were female and the median age was 69.1 years. More than 80% of them had comorbidities of dyslipidemia or hypertension. Twenty-nine patients had already established CVD.

The prevalence of under-prescription in the elderly type 2 diabetic patients was 84.5% (387 of 458 patients). The numbers of types of medications that were under-prescribed in each patient ranged from 1 to 4. Two-thirds of the patients determined to be under-prescription had one type of under-prescription (66.1%). One hundred and three, 25, and 3 patients did not receive 2, 3, and 4 types of beneficial medications, respectively. Table 2 shows the details of the prevalence of each type of medication that was under-prescribed. The results showed that the prevalence of under-prescription in secondary prevention and statins for primary prevention of CVD was low. However, 80.2% of elderly type 2 diabetic patients who were indicated to receive aspirin for primary prevention did not receive a prescription. Approximately 30.0% of elderly type 2 diabetic

patients who had an indication for renin-angiotensin system blockers did not receive medication and 11.3% did not receive an antihypertensive medication when either the systolic or diastolic blood pressure was ≥140/90 mmHg, respectively.

Table 3 shows the multivariate analysis for factors associated with under-prescription in elderly type 2 diabetic patients. The results showed that an increased number of medications received and the comorbidity of CVD was associated with a lower risk of under-prescription.

Table 1 Patient characteristics (N=458)

Characteristic	Number (%)
Sex	
Male	171 (37.3)
Female	287 (62.7)
Age (year) [median (Q1,Q3)]	69.1 (65.0, 74.7)
Number of underlying diseases [median (Q1,Q3)]	3.0 (3.0, 4.0)
Type of comorbid disease	
Dyslipidemia	382 (83.4)
Hypertension	369 (80.6)
Chronic kidney disease	96 (21.0)
Cardiovascular disease	29 (6.3)
Osteoarthritis of knee	21 (4.6)
Fatty liver	18 (3.9)
Dyspepsia	14 (3.1)
Number of medications received [median (Q1,Q3)]	5.0 (3.0, 6.0)

Table 2 Prevalence of under-prescription by type of under-prescription

Type of under-prescription	Number (%)
1. Secondary prevention of cardiovascular disease (n=29)	
Aspirin	2 (6.9)
Statins	5 (17.2)
2. Primary prevention of cardiovascular disease	
Aspirin (n=415)	334 (80.5)
Statins (n=419)	79 (18.9)
3. RAS blockers in chronic kidney disease or albuminuria (n=310)	88 (28.4)
4. Antihypertensive medication when BP≥140 and/or 90 mmHg (n=382)	43 (11.3)

RAS=renin-angiotensin system, BP=blood pressure

Table 3 Multivariate analysis for factor associated with under-prescription in elderly type 2 diabetic patient

Factor	Crude OR (95% CI)	Adjusted OR (95% CI)	P-value (Wald's test)
Sex	0.83 (0.49-1.42)	0.76 (0.41-1.37)	0.358
Age	0.99 (0.96-1.03)	1.00 (0.96-1.04)	0.971
Number of underlying diseases	0.82 (0.63-1.06)	1.25 (0.72-2.17)	0.424
Hypertension	0.41 (0.18-0.92)	0.71 (0.25-2.01)	0.523
Dyslipidemia	0.91 (0.45-1.82)	0.83 (0.34-2.03)	0.685
Cardiovascular disease	0.15 (0.07-0.34)	0.20 (0.07-0.57)	0.002
Dyspepsia	1.10 (0.24-5.04)	1.15 (0.20-6.76)	0.876
Osteoarthritis	3.81 (0.50-28.88)	2.34 (0.28-19.34)	0.429
Chronic kidney disease	1.36 (0.70-2.65)	1.66 (0.65-4.24)	0.29
Fatty liver	0.91 (0.26-3.24)	1.48 (0.31-7.08)	0.624
Number of medications received	0.70 (0.62-0.79)	0.70 (0.61-0.80)	<0.001

OR=odds ratio, CI=confidence interval

Discussion

The prevalence of under-prescription is high among elderly type 2 diabetic patients in the primary care unit of a university hospital in southern Thailand, especially under-prescription of aspirin for primary prevention of CVD. An increased number of medications received and the comorbidity of CVD can help to reduce the risk of under-prescription.

The prevalence of under-prescription in this study was higher than a previous study in elderly diabetic patients during admission.[11] This may be possible due to different criteria to define under-prescription and the high prevalence of omission of aspirin prescription for primary prevention of CVD in this study.

The prevalence of underuse of aspirin and statins for primary prevention of CVD in this study was common. This was similar to previous studies that reported both types of medications were commonly omitted in elderly patients.[7,9,11,20,21] The prevalence of under-prescription of aspirin for primary prevention of CVD, which was the most common omitted medication in elderly type 2 diabetic patients in this study, was close to a previous study by Sabitha, et al.[22] The reason may be because that article used the criteria for under-prescription based on the Thai diabetes guideline of 2014. For the use of aspirin, the guideline gives a moderate recommendation based on evidence from previous studies that showed the benefit of aspirin in the primary prevention of CVD.[23,24] However, a recent study showed no benefit of aspirin use in patients with atherosclerotic risk for primary prevention of CVD[25] which complied with the weak recommendation for aspirin as a primary prevention of CVD in the latest Thai diabetes guideline (2017). In addition, the use of aspirin, especially in the elderly, should be a concern due to possible adverse gastrointestinal effects. The reason the physicians in this study did not prescribe aspirin for the primary prevention of CVD was possibly the concern that the harm outweighed the benefit. This was in compliance with the recommendation to weigh the benefits and risks before prescribing aspirin for primary prevention of CVD.[26] Evidence clearly showed

the benefits of statins use in diabetic patients in the primary prevention of CVD.[27,28] Therefore, the recent guideline recommends prescribing statins for the primary prevention of CVD in diabetes patient with high cardiovascular risks.[14,29] But there are some side effects, such as elevated liver enzyme transaminases (transaminitis) or rhabdomyolysis. Therefore, the recent recommendation in the management of dyslipidemia in Thailand suggests that physicians prescribe statins for the primary prevention of CVD in patients where the benefits outweigh the risks.[30] Some patients in this study may underuse statins for the primary prevention of CVD because the physicians think that no clear benefit outweighs the risks such as the limitation of life expectancy.

The prevalence of the underuse of renin-angiotensin system blocker in elderly type 2 diabetic patients with chronic kidney disease or albuminuria in this study was lower than a previous study.[16] This was possibly due to a difference in the indications for the prescription of this drug which are in addition to the drug indications for the treatment of diabetes in patients with hypertension.[16] Although the prevalence of under-prescription in this type of drug was about 30.0%, it is an important medication that physicians should prescribe. The evidence showed the benefits of this medication in the prevention and slow progression of nephropathy.[31] The rates of benefits and adverse effects in elderly diabetic patients were similar in adult patients.[3] Elderly diabetic patients with either systolic or diastolic blood pressure ≥140/90 mmHg, respectively, are in the high risk group for CVD. Therefore, the recent recommendation in the management of hypertension in Thailand suggests to immediately commence antihypertensive medications together with lifestyle modifications.[13] However, this study found that 11.3% of the indicated patients did not receive the antihypertensive medications. It was possibly because most of them had high blood pressure in mild hypertension (systolic blood pressure 140–149 or diastolic blood pressure 90–99 mmHg or both), so the physician encouraged lifestyle modifications which may decrease blood pressure up to 20 mmHg.[13]

Our study revealed two factors that were associated with lower under-prescription in elderly type 2 diabetic patients. The first associated factor was the increased number of medications received, which was similar to a previous study.[7] This may be explained in this group by the number of beneficial medications already received. The other associated factor was underlying CVD. This was possible because strong evidence has shown that beneficial medications can prevent the recurrence of cardiovascular events and decrease the mortality rate.[26] Therefore, the physicians have confidence in prescribing medications to patients with a history of previous CVD. This result was consistent with the low prevalence of under-prescription of aspirin and statins for secondary prevention of cardiovascular events in this study which was similar with a previous study.[22]

The strength of this study is that it is one of the few studies on under-prescription in elderly type 2 diabetic patients. The results can bring improvements in the quality in the care of diabetic patients in this setting. The main limitation of our study is the retrospective medical record review study design. Some records had incomplete data which possibly affected the prevalence of under-prescription in both overestimation and underestimation. Examples of incomplete data were no data on contraindications or reasons not to prescribe the indicated medication, such as limited life expectancy or the patient's refusal which may cause an overestimation of the prevalence, while no data on cardiovascular risk factors that would cause the patient to be included for a prescription of a medication for primary prevention of CVD may cause an underestimation of the

prevalence. The next limitation is the study setting. Since this study was done in the primary care unit of a university hospital, the results cannot be applied to other hospital settings. However, the high prevalence of under-prescription can be corrected at a university hospital where training of medical students and residents takes place which may help decrease the problem of under-prescription in the future.

Suggestions

Physicians should focus on solving the problem of under-prescription. Appling a screening tool for under-prescription, such as the START criteria, as a reminder for the completeness of essential medications is one easy way to help identify potentially beneficial medications that should not be omitted in the elderly.[17,32] In addition, it may be a benefit in decreasing health care costs and the incidence of fall in the elderly.[33] Furthermore, the use of a computerized clinical decision support system to remind the physicians of beneficial medications would help reduce the time of caring for many patients in the outpatient clinics.[34] Future research should be conducted in another hospital setting and in elderly patients with other conditions.

Conclusion

The current research showed that the prevalence of beneficial medication omissions in elderly type 2 diabetic patients in the primary care unit of a university hospital was high at 84.5%. The most commonly omitted medication was aspirin for primary prevention of CVD. The increased number of medications received and the comorbidity of CVD was associated with a lower risk of under-prescription.

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Conflict of interest

No

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