



Prescription of potentially inappropriate medications to older adults. A nationwide survey at dispensing pharmacies in Japan

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ABSTRACT

Objectives: Prescriptions to older adults were surveyed to elucidate factors associated with potentially inappropriate medications (PIMs) in Japan.

Methods: Adults aged ≥ 65 years, who were prescribed medications at 585 dispensing pharmacies across Japan, participated (N = 180,673). Data were collected between October 1 and October 31, 2014.

Results: Proportion of polypharmacy and that of PIMs increased with age ($p < 0.001$). Analgesic drugs were most commonly prescribed for the older adults aged 65–74 years, whereas benzodiazepines were prescribed most commonly for those aged over 75 years. A logistic regression analysis revealed that the increase of PIMs was explained by polypharmacy and mainly the use of central nervous systems (CNS) and psychotropic drugs.

Conclusions: The increased prevalence of polypharmacy with age and the common use of CNS and psychotropic medications account for the PIMs in old age in the current nationwide survey.

1. Introduction

With the increase in the population of older adults in Japan, various risks are emerging in terms of the pharmacotherapy of older patients, resulting from their increased pharmacodynamic or pharmacokinetic vulnerability. In addition, coping with various symptoms older patients present with may result in a snowball increase in the number of medications, thereby rendering adherence to pharmacotherapy at risk. Moreover, the potential harms of polypharmacy and its association with adverse drug reactions (ADRs), resulting in poor health outcomes, have been previously reported (Fried et al., 2014; Husson et al., 2014; Pedrós, Formiga, Corbella, & Amau, 2016). Furthermore, some conditions such as dementia commonly occur in older people, but these are not sufficiently recognized by clinicians, eventually leading to the underuse of indicated medications (Wright et al., 2009).

Regarding actual prescriptions for older adults, previous reports have mainly focused on medications prescribed at specialist-based institutions, such as university hospitals (Suzuki et al., 2006), which may not have represented the general population of older adults living in communities. In 2005, the Japan Geriatrics Society (JGS) published a

list (JGS drug list) of potentially inappropriate medications (PIMs) in the use for older patients (Akishita et al., 2011). The JGS list is equivalent to the lists that have already been established in other countries, such as the Beers criteria (Beers Criteria Update Expert Panel, 2015) or STOPP and START (O'Mahony et al., 2015), which are widely acknowledged by clinicians in Japan. Although the prevalence of PIMs in community-dwelling older patients has been investigated using the aforementioned criteria (Davidoff et al., 2015; Tommelein et al., 2015), a complete survey reflecting the actual prevalence of PIMs in broad clinical settings has not been implemented to date. Therefore the present study attempted to use a nationwide network of dispensing pharmacies in order to identify the prevalence of PIMs, based on prescription records of drugs prescribed for older patients and to elucidate factors associated with PIMs in Japan.

2. Methods

2.1. Data sources and acquisitions

This cross-sectional study is based on records of all prescriptions

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issued to patients aged ≥ 65 years between October 1 and October 31, 2014, at 585 dispensing pharmacies across Japan (145 in metropolitan areas, 243 in central Japan, and 197 in western Japan). The pharmacies surveyed in the present study belong to the largest pharmacy chain in Japan and accept prescriptions issued for outpatients visiting all types of medical institutions, including district general hospitals and local clinics. Written consent was obtained from all participants after providing them with complete description of the study by attending pharmacists regarding the acquisition of data, which included age, sex, number and type of drugs prescribed. These data were copied from prescriptions to a sheet prepared for each patient. One sachet of powdered medicine was counted as one pill. Medications issued *pro re nata* and topical applications, such as poultices and ointments, were excluded from the analysis.

2.2. Data analysis

The average number of drugs prescribed and the proportion of polypharmacy/hyperpolypharmacy, defined as having more than five/ten regular medications, were compared among three age groups (65–74, 75–84, > 85 years). PIMs according to the JGS drug list were first identified by a pharmacist and were subsequently confirmed by an experienced geriatrician. The proportions of polypharmacy/hyperpolypharmacy and PIMs among the three age groups were compared using chi-square analysis. The three age groups was compared using one-way analysis of variance (ANOVA), followed by Tukey's post-hoc test and Student's *t*-test, respectively. In order to determine factors associated with the prevalence of PIMs, univariate analysis followed by multivariate logistic regression was used to calculate odds ratios and 95% confidence intervals (95% CIs) after simultaneously controlling for potential confounders. Independent variables included age, sex, and the number and classification of drugs prescribed. The multicollinearity among independent variables was assessed by calculating the correlation coefficient for continuous variables and ϕ for categorical variables, respectively. All the analyses were performed using a statistical software package (SPSS version 22.0 for Windows, SPSS Inc., Chicago, IL, USA), and a *p*-value of < 0.05 was assumed to denote statistical significance. All identifying personal data were coded in order to secure anonymity of the participants in this study. The protocol was approved by the ethical committee of the Nagoya University Graduate School of Medicine (No. 2014-0195).

3. Results

During the one month period of sampling, drugs were prescribed to 180,673 elderly patients aged > 65 years at 585 dispensing pharmacies. The age of patients ranged from 65 to 105 years (average age, 76.1 ± 7.7 years), and there were 75,122 men (41.5%) and 105,551 women (58.4%). The number of patients in the three age groups included the following: 90,539 (50.1%) in the 65–74 years group, 64,270 (35.6%) in the 75–84 years group, and 25,864 (14.3%) in the > 85 years group. The average number of prescribed medications was 4.0 ± 3.2 drugs, and the number increased with age (65–74 years group, 3.6 ± 2.8 ; 75–84 years group, 4.2 ± 3.3 ; and > 85 years group, 5.0 ± 3.7 ; ANOVA, $p < 0.001$ and 65–74 vs 75–84, 75–84 vs > 85, 65–74 vs > 85; Tukey's post-hoc test, $p < 0.001$) (Fig. 1).

Accordingly, the proportions of polypharmacy/hyperpolypharmacy, defined as having more than five/ten regular medications, increased with age (65–74 years group, 27.2%/5.1%; 75–84 years group, 36.0%/9.6%; and > 85 years group, 47.3%/15.6%; chi-square test, $p < 0.001/p < 0.001$) (Fig. 2).

Drugs included in the JGS drug list were prescribed to 41,404 patients (22.9%). Proportions of PIMs, calculated by prescriptions included in the JGS drug list, increased with age (65–74 years group, 21.7%, 75–84 years group, 23.5%; and > 85 years group, 25.6%; chi-square test, $p < 0.001$) (Fig. 3).

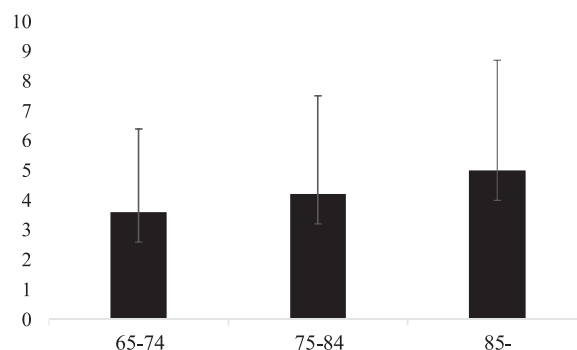


Fig. 1. Number of drugs prescribed in three age categories. Columns denote average \pm SD $p < .001$ by ANOVA.

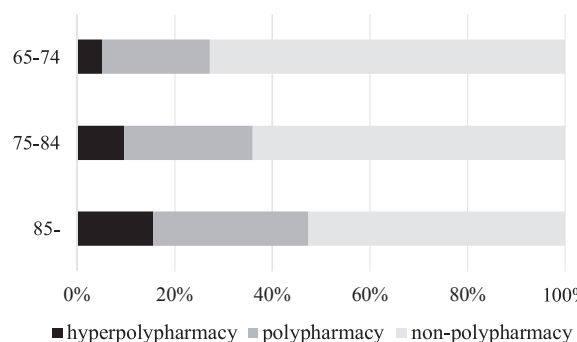


Fig. 2. Proportion of polypharmacy/hyperpolypharmacy in three age categories. $p < .001$ by chi-square test.

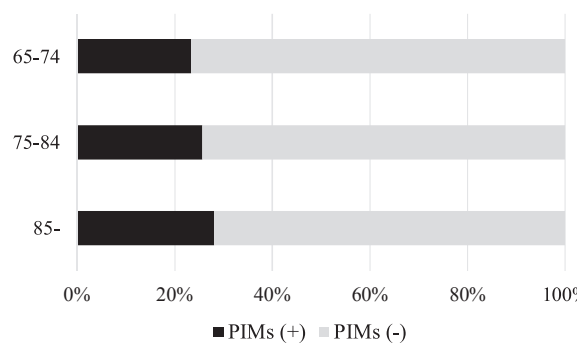


Fig. 3. Proportion of PIMs (Drugs included in the JGS drug list) in three age categories. Significant age group difference was observed by chi-square test $p < .001$.

Regarding the breakdown of drugs included in the JGS drug list, analgesic drugs (loxoprofen) were most commonly prescribed for older patients aged 65–74 years, whereas benzodiazepines (brotizolam and etizolam) were prescribed more often than analgesics for those aged > 75 years (Table 1).

A logistic regression analysis simultaneously controlling for age, sex, number and classification of drugs prescribed as independent

Table 1
PIMs (Drugs included in the JGS drug list) most frequently prescribed in three age categories.

Age	1	2	3	4	5
65–74	loxoprofen	metformin	etizolam	brotizolam	triazolam
	3522(3.9%)	3244(3.6%)	2718(3.0%)	2646(2.9%)	979(1.1%)
75–84	etizolam	brotizolam	loxoprofen	metformin	triazolam
	2508(3.9%)	2425(3.8%)	2311(3.6%)	1012(1.6%)	908(1.4%)
85-	brotizolam	etizolam	loxoprofen	α -calcidol(high dose)	triazolam
	1143(4.4%)	1105(4.3%)	744(2.9%)	519(2.0%)	416(1.6%)

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