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Els Mehuys, L. Dupond, Mirko Petrovic, Thierry Christiaens ...+6 more authors

Institutions: Ghent University, Ghent University Hospital

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Medication management among home-dwelling older patients with chronic diseases: possible roles for community pharmacists.

Els Mehuys[1], Laurence Dupond[1], Mirko Petrovic[2],Thierry Christiaens[3], Luc Van Bortel[4], Els Adriaens[1], Leen De Bolle[1], Inge Van Tongelen[1], Jean-Paul Remon[1] and Koen Boussery[1].

[1] Pharmaceutical Care Unit, Ghent University, Ghent, Belgium.

[2] Department of Geriatrics, Ghent University Hospital, Ghent, Belgium.

[3] Department of General Practice and Primary Health Care, Ghent University, Ghent, Belgium.

[4] Heymans Institute of Pharmacology, Ghent University, Ghent, Belgium.

Corresponding author:

Els Mehuys
Pharmaceutical Care Unit
Ghent University
Harelbekestraat 72
B-9000 Ghent (Belgium)
T: +3292648043
E-mail: els.mehuys@ugent.be

Abstract

Objective: To describe medication management among home-dwelling older adults. These data should allow us to identify potential problems and to indicate target areas for community pharmacist intervention.

Design: Cross-sectional observational study

Setting: Community pharmacies (n=86) in Belgium.

Participants: Home-dwelling older adults using at least one chronic medicine (n=338).

Measurements: Data on drug use were taken from the electronic pharmacy databases, while drug adherence was measured by pill count, self-report and estimation by GP and pharmacist. Drug knowledge and practical drug management capacity were assessed by patient interview and questionnaire, respectively.

Results: The study population (n=338) used a median of 5 chronic drugs per patient. Half of our sample (n=169) used psychotropic medication chronically, mainly benzodiazepines. In 100 patients (29.6%) at least one drug-drug interaction of potential clinical significance was observed. The overall mean adherence per patient was very high (98.1%), but 39.6% of individuals was underadherent with at least one medication. Seventy-six % of patients had an acceptable knowledge of the indication for at least 75% of their medication. In nearly 15 % of the study population cognitive impairment was suspected by the Mini-Cog Test. The participants reported several practical problems with drug taking: difficulties with vision (32.0%), blister opening (12.1%), tablet swallowing (14.8%), tablet splitting (29.7% [represents % of patients who have to split tablets]) and distinction between different drug packages (23.4%).

Conclusion: This study identified the following aspects of medication management by home-dwelling older adults that could be improved by pharmaceutical care services: (i) assistance of cognitively impaired patients, (ii) management of practical drug taking problems, (iii) DDI screening, (iv) drug adherence, and (v) chronic benzodiazepine use.

Keywords

Home-dwelling elderly, medication management, community pharmacy, pharmaceutical care.

Introduction

Older persons often suffer from several co-morbidities, and pharmacotherapy is a fundamental aspect of their disease management. However, older adults are at higher risk of adverse drug reactions (ADR) due to age-related pharmacokinetic and pharmacodynamic changes and polypharmacy (1). They are also more susceptible to non-adherence and to practical difficulties with medication taking such as cognitive impairment and various functional problems (2).

The majority of older patients still live in their own homes and are responsible for their own medication management (3). Appropriate medication use – a key factor to maximize therapeutic benefits and to minimize the risk of ADRs – is known to be a major concern in this patient group. For example, Barat *et al.* performed interviews with 75-year-old home-dwelling persons in Denmark and found that more than 80% of them used three or more drugs, and that non-adherence was prevalent (20 to 70% depending on the measuring method) (4, 5). Tordoff *et al.* interviewed community-dwelling people aged ≥75 years in New Zealand and observed problems with reading and understanding drug labels (9 and 4%, respectively) and leaflets (12 and 6%), and difficulty with swallowing solid dosage forms (14%) (6). Community pharmacists are in the unique position of having frequent contact with ambulatory older patients at the time of medication purchase. This position enables pharmacists to assist them in their medication management, by using their drug-related expertise to ensure that patients use their medicines appropriately (e.g., by facilitation of adherence, patient education to increase knowledge of the purpose of their medicines, resolving practical problems with drug taking). This is in line with the recent evolution of the pharmacist profession towards more patient-oriented activities (called “pharmaceutical care” or “clinical pharmacy”). However, community pharmacy-based studies investigating medication management of home-dwelling elderly are rare. The already published pharmacy studies report on home-based medication reviews aimed at improving the appropriateness of prescribing (7-11).

The present observational community pharmacy-based study aimed to describe medication management among home-dwelling older adults using at least one chronic medicine, by examining:

(i) types of drugs used and presence of drug-drug interactions, (ii) drug adherence, (iii) patient knowledge of the purpose of their drugs and (iv) practical drug management capacity. These data should allow us to identify potential problems and to indicate target areas for community pharmacist intervention.

Method

Study design

This cross-sectional observational study was carried out from December 2008 till May 2009 in 86 randomly selected community pharmacies in Flanders (the Dutch-speaking northern part of Belgium). Approval for the study was granted by the Ethics Committee of the Ghent University Hospital, and all patients gave written informed consent. The patients' general practitioners were informed about the purpose of the study.

Patients

In consecutive order, older patients visiting the pharmacies were invited to participate in the study when fulfilling the following inclusion criteria: (i) aged 70 years or older, (ii) using at least one chronic medicine (≥90 defined daily doses (DDD) per year), (iii) home-dwelling, (iv) ambulatory (i.e., personally collecting their medication at the pharmacy), and (v) regular clients of the pharmacy. From each of the pharmacies, four patients were planned to be recruited.

Data collection

Patient characteristics

At inclusion, patients completed a questionnaire collecting socio-demographic characteristics, the number of GP visits and the number of home visits by a home nurse. Cognitively impaired patients were assisted by a relative or caregiver when completing this questionnaire.

Types of drugs used and presence of drug-drug interactions (DDIs)

Each patient's current chronic medication regimen (≥ 90 DDD/year) was taken from the electronic patient records at the community pharmacy. All chronic medicines were categorized according to the Anatomical Therapeutic Chemical (ATC) classification system. All chronic drugs were also screened for drug-drug interactions (DDIs) using Lexi-Interact® software (Lexi-Comp). Only potentially severe interactions (classified as 'consider therapy modification' or 'avoid combination') were included in the Results section. Delphi Care software (Belgian Pharmacist Association) was used for interaction analysis of drugs marketed in Belgium but not listed in Lexi-Interact®.

Drug adherence

Adherence to chronic medication was measured by pill count. For every chronic medicine, the daily dose prescribed was asked to the treating physician and pills were counted at two home visits performed with a 4 week-interval. The number of pills actually taken during this interval was divided by the number of pills that should have been taken (according to the prescribed dosing regimen) and was expressed as adherence rate (%). For each patient, mean adherence was calculated by summing adherence percentage for all chronic drugs and then dividing the sum by the number of chronic drugs the patient was taking. Patients were considered as underadherent when having at least one medication with adherence <80%.

In addition, overall adherence was self-reported by the participants, and estimated by pharmacists and GP's on a scale ranging from 0 to 5 (with 5 indicating 100% adherence).

Drug knowledge

The patients' knowledge about the indication of their chronic medication was evaluated by asking for drug indications ("*Do you know why you have to use this medicine?*"). Their drug understanding was classified as correct (when reporting the correct indication or the correct target organ), wrong or no knowledge. Correct answers scored 1 point, the other answers scored zero. The patients' drug

knowledge was then calculated by dividing the number of points scored by the number of drugs used. We considered patients scoring a ratio of 0.75 or more as having acceptable knowledge of their medication. This cut-off value of 75% was already used by other investigators (5, 12).

Practical drug management capacity

At inclusion, patients completed a questionnaire collecting the following items: medication management tool use (e.g., pill organizer), medication management assistance, self-reported visual and cognitive impairment, and self-reported problems with tablet swallowing, tablet splitting, blister opening and distinction between different drug packages. In addition, the participants' cognitive impairment was assessed by subjecting them to the Mini-Cog Test. This validated test combines two simple cognitive tasks (three-item word memory and clock drawing) as a brief screening test for cognitive impairment (13).

Statistical analysis

Stepwise backward logistic regression was performed to identify patient-related predictors of underadherence (i.e., having at least one medication with <80% adherence), using R software (version 2.12.0). We started from a model with main effects only. From this model, non-significant factors were consecutively removed. When statistically significant predictors were found, a two-way interaction test was performed.

Results

In the 86 participating pharmacies, 840 potentially eligible patients were screened. Three hundred patients (35.7%) were excluded: 135 (45.0%) were younger than 70 years, 50 (16.7%) did not collect the medication from the pharmacy by themselves, 54 (18.0%) were no frequent clients of the pharmacy, 47 (15.7%) did not use chronic medication, and 14 (4.7%) were not home-dwelling. Among the 540 patients who matched the inclusion criteria, 202 (37.4%) refused to participate in the

study for several reasons: no interest (n=102; 50.5%), deprivation of privacy (n=33; 16.3%), lack of time (n=27; 13.4%), poor health status (n=12; 5.9%) and other reasons (n=28; 13.9%).

Patient characteristics and social medical status

The baseline characteristics of the 338 included patients are described in Table 1. Most of the participants were aged between 70 and 80 years. About 60% of the patients lived together with a partner or family member(s), while 40% lived alone. Most patients (53.6%) consulted their general practitioner (GP) once a month.

Types of drugs used and presence of DDIs

The 338 participants in this study used a total of 1889 chronic medicines, with a median of 5 per patient (IQR 4-7). Thirty-nine percent (n=133) of the population consumed 1 to 4 chronic drugs, 47.0% (n=159) 5 to 8 drugs and 13.6% (n=46) 9 or more drugs. The most frequently used medicines were lipid modifying drugs, antithrombotics, agents acting on the renin-angiotensin system, psycholeptics and beta-blockers (Table 2). Half of our sample used psychotropic medication (N05 and/or N06) chronically (n=169, 50.0%), with 56 of them (56/169, 34.9%) consuming 2 or more psychotropics concurrently. Thirty psychotropic users (30/169, 17.8%) were identified as having potential cognitive impairment (by Mini-Cog). The most common class of psychotropics was benzodiazepines (used by 34.3% of the total population), followed by antidepressants (used by 14.8% of the total population) and benzodiazepine-related drugs (ATC: N05CF) (used by 8.6% of the total population). Twenty-three benzodiazepine users were on long-acting benzodiazepines.

Fifty-nine percent (n=198) of the study population had purchased non-prescribed over-the-counter medication or dietary supplements during the past year. The most commonly used non-prescribed products were: respiratory drugs (mainly cough suppressants and nasal preparations for topical use), alimentary tract drugs (mainly laxatives), analgesics (mainly paracetamol) and dietary supplements

(used by 58.3%, 31.1%, 26.6% and 20.7% of the total population, respectively). Ten percent of participants (n=34) reported taking dietary supplements from the supermarket.

In total, we found 140 potentially severe DDIs in the chronic medication regimens. In 100 patients (29.6%) at least one DDI of potential clinical significance was observed. The maximum number of potentially severe DDIs found per patient was 5. The most frequently occurring DDIs are shown in Table 3. Drugs or drug classes most frequently involved in DDIs were: amiodarone (n=23), statins (or HMG CoA reductase inhibitors) (n=22), beta-blockers (n=22), serotonin modulating drugs (n=21) and NSAIDs (n=14). In 7 patients, we found a clinically important DDI between non-prescription and chronic medication (i.e., concurrent use of aspirin or NSAID with vitamin K antagonist or SSRI).

Drug adherence

The overall mean adherence per patient was 98.1%. However, we found that 134 patients (39.6%) were underadherent with at least one medication. According to the regression model, underadherence was predicted by: the number of medications used (OR 1.21; 95% CI 1.11 to 1.33 for each 1-unit increase in number of medications; $p<0.001$), living situation (living with partner/family vs. living alone) (OR 0.55; 95% CI 0.34 to 0.89; $p<0.05$), swallowing problems (OR 2.36; 95% CI 1.24 to 4.56; $p<0.01$), medication management assistance (OR 0.47; 95% CI 0.22 to 0.96; $p<0.05$), cognitive impairment indicated by the Mini-Cog Test (OR 1.99; 95% CI 1.00 to 3.98; $p<0.05$), and patient self-report of sometimes stopping medication on own initiative (OR 2.44; 95% CI 1.32 to 4.56; $p<0.01$).

Most patients (95.9%, n=324) self-reported to take their medicines according to the GP's instructions, although nearly one fifth (n=82) admitted forgetting medicine intake occasionally. Moreover, 16.9% (n=57) admitted having stopped a medication on their own initiative. The pharmacists' and GPs' estimates about their patients' overall drug adherence were very similar: a median adherence of 4 (on a scale from 0 to 5) was estimated by pharmacists as well as by GPs.

Drug knowledge

Seventy-six percent (n=258) of the participants had an acceptable knowledge of the indication for at least 75% of their medication. Correct indications were most common among gastrointestinal drugs. Wrong indications were most common among urogenital drugs and anticoagulants (Table 4).

Practical drug management capacity

Approximately 10% (n=29) of the participants self-reported to suffer from cognitive impairment, while in nearly 15 % (n=49) cognitive impairment was suspected by the Mini-Cog Test (Table 5). Only 12 of the 49 persons with positive Mini-Cog (24.5%) had self-reported cognitive impairment. Almost one third of the study population reported to have visual problems. Other self-reported difficulties refer to blister opening (12.1%), tablet swallowing (14.8%), tablet splitting (29.7% [represents % of patients who actually split tablets]) and distinction between different drug packages (23.4%) (Table 5).

Half of the participants reported to use a medication management tool, with the pill organizer being the most frequently used (Table 5). The majority of our population did not receive assistance in their medication management (n=286; 84.6%). Only 18 of the 49 persons with positive Mini-Cog (36.7%) received medication management assistance.

Discussion

Types of drugs used and presence of DDIs

We found that the prevalence of polypharmacy was high, with two thirds of the home-dwelling older adults using five or more chronic medicines. A striking finding is the common long-term use of psychotropic drugs, mainly benzodiazepines. The rate of benzodiazepine use in this study (35.5%) was considerably higher than that observed in previous studies carried out amongst community-dwelling older adults in Europe and USA (ranging from 6.4% to 15.3%) (14-17), though similar to the rate of 31.9% reported by Fourrier *et al*. (in France) (18). According to the International Narcotics

Control Board (INCB), Belgium is one of the leading consumers of benzodiazepines worldwide (19). It is well documented that continued use of benzodiazepines may lead to dependence, and is associated with an increased risk of accidents/falls and cognitive function impairment (20). Therefore, current guidelines advocate a conservative prescription policy, especially with respect to long-term prescription (21). Our data demonstrate that these recommendations are not yet fully implemented in Belgian practice.

About 30% of the study population was exposed to drug combinations at risk of potentially severe DDIs. In literature, the prevalence of potential DDIs in community-dwelling older adults ranges from 4% to 46% (22-26). It is important to note that we screened for potential DDIs using DDI software, without knowing whether the interaction actually resulted in an adverse effect for the patient. A recent study showed that computerized screening overestimates considerably in identifying clinically relevant DDIs: only 7% of DDIs detected by computerized screening were recorded using prospective bedside screening, despite the fact that an active search was undertaken by clinical pharmacists (27). This means that each potentially severe DDI flagged by the pharmacy or physician software should be evaluated case-by-case for its clinical relevance, taking into account drug dosage and duration of therapy, severity and frequency of the ADR related to the DDI, and patient-related risk factors (28).

Drug adherence

The overall patient adherence was very high. Prior studies reported rates ranging from 26% to 59% (29). Our higher adherence rate might be due to a positive selection bias, since patients participated voluntarily in the study (without payment) and were regular pharmacy customers (this was done intentionally, in order to maximize the completeness of the computerized pharmacy records). These selection criteria might reflect a higher medication adherence. Moreover, examining overall patient adherence could be misleading as it may mask non-adherence with one or few drugs (especially in polypharmacy patients). Indeed, we found that underadherence with at least one medicine was present in 40% of individuals.

Drug knowledge

About three-quarters of the participants could describe the indication of at least 75% of their medicines correctly. This figure is in agreement with a recent study performed among older patients in Swedish primary care (71%) (12), but higher than that observed in a Danish study conducted in the late nineties (60%) (5). This recent increase in drug knowledge might result from the trend of increased interaction between patient and healthcare provider and the easier access to health information.

Practical drug management capacity

We found that most of our patients with suspected cognitive impairment managed their medication alone, without help from family or caregiver. About half of participants used a medication management tool, which is considerably less than in the USA (82%) (30). However, adherence aids (e.g., pill organizers) can improve drug adherence (31-33). Practical problems with medicine-taking (distinction between different drug packages, tablet swallowing and splitting, blister opening) were common. Many of these could easily be resolved by health professionals by proactive enquiry.

Potential community pharmacist roles

Based on the results of this study, five target areas for community pharmacist intervention were identified. First, although our study population consisted of ambulatory home-living older adults, still 15% was suspected as cognitively impaired (by Mini-Cog) and most of them did not receive help in managing their medicines. The Mini-Cog is a simple and effective tool to uncover cognitive impairment, which is suitable for application in pharmacy practice. Patients with cognitive impairment warrant extra pharmaceutical care (e.g., clear verbal and written information using simple language, introduction of reminder strategies, and involvement of family member or home nurse). Second, pharmacists should routinely ask older patients about practical drug taking problems. For example, difficulties with tablet swallowing can often be overcome by switching to alternative

galenic forms or medications that can be crushed or capsules that can be opened. Third, community pharmacists should play an important role in screening for potentially severe DDIs, since they have an integrated view on the patient's medication history (including OTC-products and medication prescribed by different physicians). This requires availability of improved DDI software with clinical decision support (34) and sufficient pharmacist training on drug- and patient-related risk factors for DDI occurrence. Fourth, a substantial number of participants was underadherent with at least one medication. Pharmacists should alertly follow up older patients at risk for underadherence and intervene when necessary. A systematic review of George *et al*. advised to use combinations of educational and behavioural strategies to improve medication adherence in older patients (35). Fifth, pharmacists could assist GPs in applying a minimal intervention strategy to reduce chronic benzodiazepine use (i.e., sending of a discontinuation letter). Such minimal intervention has been proven effective in short- and long-term (36, 37). Nevertheless, the sending of letters to chronic users has not been incorporated in routine primary care. Practical assistance by the community pharmacist may improve implementation. By using their electronic dispensation records, pharmacists can easily identify chronic benzodiazepine users and transfer these data to the GP. A recent pilot study conducted in The Netherlands evaluated such joint pharmacist and GP intervention as a practical and effective way to reduce benzodiazepine use (38)

Study limitations

Our patients might not be fully representative of the overall general population of community dwelling older adults with chronic diseases, since they participated voluntarily in the study and were regular pharmacy customers taking at least one chronic medicine. This means that our data might reflect an underestimation of the problems in real world, and an overestimation of drug use patterns, such as for benzodiazepines. In addition, it is likely that the prevalence of impairments is higher in the general old population as we only included ambulatory older patients (i.e. still able to

visit the pharmacy). Also the fact that we evaluated drug taking problems by questionnaire and not by direct assessment may have led to an underestimation of these problems.

We did not perform a formal evaluation of the quality of prescribing, as we intended to focus on problems that can be tackled by basic community pharmacy services. In Belgium (as in most other European countries), implementation of pharmaceutical care is still in development. Thus, finding a basic and feasible intervention was our primary objective.

Conclusion

This observational study identified several aspects of medication management by home-dwelling older adults that could be improved by pharmaceutical care services: (i) assistance of cognitively impaired patients, (ii) management of practical drug taking problems, (iii) DDI screening, (iv) drug adherence, and (v) chronic benzodiazepine use.

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Conflicts of interests

None

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TABLES

Table 1: Patient characteristics (n = 338).

	n (%)
Male sex	157 (46.4)
Age	
70-80 y	234 (69.2)
81-90 y	100 (29.6)
>90 y	4 (1.2)
Education, stopped school at	
≤ 15y	144 (42.6)
16-18 y	124 (36.7)
>18 y	70 (20.7)
Current living arrangement	
Alone	133 (39.3)
With partner	194 (57.4)
With family member	11 (3.3)
Frequency of GP visits	
1x/week	9 (2.7)
2x/month	40 (11.8)
1x/month	181 (53.6)
1x/trimester	86 (25.4)
1x/year	22 (6.5)
Frequency of home visits by home nurse	
Never	274 (81.1)
Sometimes	34 (10.1)
Often	30 (8.9)

GP = general practitioner

Table 2: Most frequently used chronic medicines (classified according to ATC level 2).

ATC Code	ATC Class Name	% of total number of chronic medicines (n = 1889)	% of study population using this medicine (n = 338)
C10	Lipid modifying agents	10.7	58.0
B01	Antithrombotic agents	10.7	51.5
C09	Agents acting on the renin-angiotensin system	9.6	50.0
N05	Psycholeptics	8.6	41.7
C07	Beta blocking agents	8.0	44.4
A10	Drugs used in diabetes	5.2	19.8
C08	Calcium channel blockers	4.8	26.3
C03	Diuretics	4.8	25.7
R03	Drugs for obstructive airway diseases	4.6	13.0
C01	Cardiac therapy	4.4	18.9
A02	Drugs for acid related disorders	4.3	22.2
N06	Psychoanaleptics	4.3	19.8

ATC = Anatomical Therapeutic Chemical

Table 3: Top 5 of most frequently occurring potentially severe drug-drug interactions (DDIs).

Interacting drug pair	Prevalence n (%)*	Potential interaction effect
Beta-blockers + Alfa$_2$-agonists	12 (8.6)	Beta-blockers may enhance the rebound hypertensive effect of alfa$_2$- agonists, when the alfa$_2$- agonist is abruptly withdrawn.
Amiodarone + HMG-CoA reductase inhibitors (except: pravastatin)	11 (7.9)	Amiodarone may decrease the metabolism of HMG-CoA reductase inhibitors.
ACE Inhibitors + Allopurinol	9 (6.4)	ACE inhibitors may enhance the potential for allergic or hypersensitivity reactions to allopurinol.
Simvastatin + Diltiazem	8 (5.7)	Diltiazem may increase the serum concentration of simvastatin.
Serotonin modulator + Serotonin modulator	8 (5.7)	Risk of serotonin syndrome.

* Percentages represent % of all potentially severe DDIs observed in the study population.

Table 4: Patients' knowledge of medicine's indication, classified per drug class.

Drug Class	Indication correct n (%)	Indication wrong n (%)	Indication unknown n (%)
Gastrointestinal (ATC-A) (n = 187)	174 (93.0)	3 (1.6)	10 (5.3)
Anticoagulants (ATC-B) (n = 203)	159 (78.3)	29 (14.3)	15 (7.4)
Cardiovascular (ATC-C) (n = 800)	623 (77.9)	69 (8.6)	108 (13.5)
Urogenital (ATC-G) (n = 27)	22 (81.5)	4 (14.8)	1 (3.7)
Systemic Hormones (ATC-H) (n = 32)	26 (81.3)	4 (12.5)	2 (6.3)
Musculoskeletal (ATC-M) (n = 98)	80 (81.6)	7 (7.1)	11 (11.2)
Central Nervous System (ATC-N) (n = 313)	260 (83.1)	37 (11.8)	16 (5.1)
Respiratory (ATC-R) (n = 113)	93 (82.3)	5 (4.4)	15 (13.3)

Table 5: Practical drug management capacity.

	N = 338
Cognitive impairment	
Self-reported*	29 (8.6)
According to Mini-Cog Test	49 (14.5)
Visual impairment (self-reported**)	108 (32.0)
Self-reported difficulties with	
Blister opening	41 (12.1)
Tablet swallowing	50 (14.8)
Tablet splitting	49 (29.7)†
Distinction between different drug packages	79 (23.4)
Medication management tool use	
None	168 (49.7)
Pill organizer	99 (29.3)
Medication scheme	33 (9.8)
Pill organizer + medication scheme	14 (4.1)
Other	24 (7.1)
Medication management assistance	
None	286 (84.6)
By partner	33 (9.8)
By family member	10 (3.0)
By nurse	7 (2.1)
By other person	2 (0.6)

Data are presented as n (%).
* "Do you have severe memory problems?"
** "Do you have vision problems, even if you are wearing glasses?"
† Percentage represents % of those patients who actually split tablet(s).