

# Impact of joint consultation by a clinical pharmacist and a clinical geriatrician to improve inappropriate prescribing for elderly patients

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## ABSTRACT

**Objective** Appropriate prescribing is a key quality element in medication safety. It is unclear if therapeutic interventions resulting from medication review lead to clinically relevant improvements. The effect of medication review on prescribing appropriateness was evaluated in the setting of an outpatient consultation team, consisting of a clinical pharmacist and a clinical geriatrician, in a large non-academic teaching hospital in the Netherlands.

**Method** A group of 49 elderly patients with polypharmacy was included after referral by their general practitioner for drug related problems. After a regular assessment by a clinical geriatrician and medication record review by a clinical pharmacist, a treatment plan was implemented based on the recommended interventions. The main outcome measure was the change in the Medication Appropriateness Index (MAI) before and 3 months after primary consultation.

**Results** Overall 82% of the recommended interventions of the pharmacist were implemented by the geriatrician of which 63% persisted up to the last visit. Per patient an average of 6.6 interventions were carried out. The interventions showed a reduction of the MAI per patient of 50%. The number of drugs per patient was reduced from 12.1 to 11.0. The number of medications listed on the Beers list decreased from 2.3 to 1.5 and the number of drugs listed on the Hospital Admissions Related to Medication (HARM) Trigger list decreased from 2.1 to 1.5.

**Conclusions** Interventions from a multidisciplinary outpatient consultation team were effective in improving appropriate prescribing in elderly outpatients with polypharmacy.

## INTRODUCTION

Medication safety is one of the key issues in modern pharmacotherapy with the quality of prescribing as a major determinant. Along with the quality of prescribing, good patient's understanding on how best to use medicines also plays an important role. In that context the term of appropriate prescribing can be introduced. Appropriate prescribing can be defined as the selection of a drug and instructions for its use that agree with accepted medical standards.<sup>1</sup> This is often a complex subject in elderly patients, due to multiple pathologies including cognitive impairment, polypharmacy, changes in body composition and altered pharmacology.<sup>2</sup> Insufficient instruction can be one of the factors that influence adherence. It is known that non-adherence plays an important role in elderly people.<sup>3</sup> With this knowledge, medication review

by clinical specialists may have an important impact on the quality of pharmacotherapy and may ensure safety at an individual patient level.

Through the years, several medication review methods in both inpatient and outpatient settings have already been developed and tested giving evidence of improved outcome of the prescribing process.<sup>4–6</sup> Interventions in suboptimal medication by a geriatrician in elderly patients appear to be effective.<sup>7–8</sup> Review of the literature shows a benefit of inpatient comprehensive geriatric assessment, increasing the chance of patients living at home in the long term. For every 100 patients 3 more will be alive at home compared with usual care. However, it is unclear if therapeutic interventions to enhance appropriate polypharmacy result in clinically significant improvements.<sup>5</sup>

Studies in which a clinical pharmacist is participating in a multidisciplinary team show promising results but these are mostly limited to an institutionalised setting<sup>9–13</sup> or do not include patient counselling.<sup>14</sup>

In this study we evaluated the impact of an outpatient consultation team, consisting of a clinical pharmacist and a clinical geriatrician, on medication prescribing in the elderly. We aimed at improving appropriate prescribing for elderly patients with polypharmacy, expressed by an overall reduction in the Medication Appropriateness Index (MAI) score and of the number of drugs listed on the Beers list and the Hospital Admissions Related to Medication (HARM) Trigger list.

## METHODS

### Design and study population

A prospective intervention follow-up study from November 2009 to January 2012 was carried out in a large teaching hospital (Gelre Hospitals Apeldoorn/Zutphen, the Netherlands). Outpatients were included in the study after evaluation for eligibility by a clinical geriatrician. They needed to be referred by their general practitioner for drug related problems in the context of polypharmacy.

Polypharmacy was defined as using five or more medications, prescribed by at least two different prescribers.<sup>5</sup> The main exclusion criterion was that the patient should be mentally suitable for active participation in the study at the discretion of the clinical geriatrician. During the study the patients should appear on all counselling days, and they were not allowed to enrol in others studies or be institutionalised.

All oral medication, and topical drugs and parenteral drugs (ie, insulin) were subject to review.



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Existing side effects, medical symptoms that could result from the patients' medication, or the request of the patient to reduce the number of concomitant drugs were reasons for referral. In the outpatient department of our hospital these patients follow a programme in which different healthcare professionals, such as a nurse practitioner, a dietician, a social worker and a geriatrician see the patient individually. In this way possible interventions on different health related aspects can be suggested by specialised healthcare professionals. The costs of our programme that lasts for a whole day, is covered by standard health insurance in the Netherlands. A consultation with a clinical (hospital) pharmacist was newly introduced to specifically evaluate polypharmacy. In routine daily practice the role of the clinical pharmacist as a consultant specialist was already established. This means that no additional training was considered necessary. From this study the added value of a clinical pharmacist in an outpatient setting should become clear, leading to future reimbursement by the insurance companies.

## Intervention

Patients enrolled in the study were seen in the geriatric outpatient department of our hospital on three different counselling days. Seeing a patient on three counselling days was already the standard procedure in our outpatient department. The first was aimed at looking into all health related aspects of the patient. The second visit was used to implement a treatment strategy, which was evaluated at the third consultation. In this study a medication review by a clinical pharmacist was added to this setting.

Before the first visit, medication records were collected from the patient's community pharmacy and evaluated by the clinical pharmacist.

On the first visit the clinical geriatrician performed a regular assessment of the patient. In a separate consultation the clinical pharmacist reviewed the medication record together with the patient or, in case of cognitive impairment, with his community caregiver. This was done using a standard drug related problems list as used by Vinks *et al*,<sup>15</sup> and other current national pharmacotherapeutic guidelines and recommendations.<sup>16 17</sup>

The review was aimed at encountering potential drug related problems, which can be subdivided into patient related potential drug related problems, prescriber related potential drug related problems and drug related potential drug related problems. The list that Vinks *et al* used comprises 10 MAI questions. In table 1 these MAI questions are presented.

Using the MAI questions for each drug the patient was using, the clinical pharmacist interviewed the patient to establish possible medication related healthcare problems. A medication is fully appropriate if every question could be answered with 'yes'. When the answer is 'no', the weighing factor presented in the second column is linked to the drug. In this study the total sum of weighing factors is presented as the MAI. The assessment of the geriatrician was taken into account during this interview. At the end of the day the pharmacist and the geriatrician discussed the possible interventions and a medication treatment plan was determined.

In our geriatric outpatient department the follow-up of the patient already existed of two follow-up visits: the first one was 2 weeks after the initial visit, and a last consultation after 3 months. In our study these moments were also used for the follow-up of improving the medication of the patient. Two weeks after the first visit, the proposed interventions adopted in the treatment plan were carried out by the geriatrician or were redirected to the patient's general practitioner (baseline measurement).

**Table 1** MAI questions

MAI questions	Weighing
Is there an indication for the drug?	3
Is the medication effective for the condition?	3
Is the dosage correct?	2
Are the directions correct?	2
Are the directions practical?	2
Are there significant drug-drug interactions?	2
Are there significant drug-disease/conditions interactions?	1
Is there unnecessary duplication with other drugs?	1
Is the duration of therapy acceptable?	1
Is the drug the least expensive alternative compared with others of equal usefulness?	1

MAI, Medication Appropriateness Index.

On the third visit, after 3 months, the geriatrician evaluated the outcome of the interventions with the patient and the medication records were updated.

## Data collection

Demographic and medical data, like residency, living situation and comorbidities, were derived from the medical referral letter, the electronic medical records, the geriatric assessment and medication records of the patient's community pharmacy.

Additional questions about the living situation and drug related problems were asked as part of a standardised survey.

The quality of drug prescribing was assessed using a cumulative score of MAI of all medications,<sup>18 19</sup> which has been translated and validated for use in the Netherlands.<sup>20</sup> The MAI score for each medication consists of 10 questions to evaluate the appropriateness. Table 1 lists the 10 questions. To further standardise the validated method a local instruction was developed to enable two investigators who performed the medication reviews to reach consensus on MAI score assessment. Both investigators primarily assessed the MAI score after data collection for all included patients was completed, followed by a check on correct assessment by the other investigator.

## Outcome measures

Primary outcome measure was the change of MAI score between baseline measurement (t=0 months) and the third visit (t=3 months).

Secondary outcome measures were changes in the total number of drugs and in the number of risk drugs as mentioned in the Beers list and the HARM Trigger list.<sup>16 17</sup> The Beers list comprises medication, which is associated with drug-related hospitalisation. We aimed at reducing the number of drugs listed on the Beers list, because they pose potential risks outweighing potential benefits for people 65 years and older.

The HARM Trigger list includes drugs that can lead to hospital admissions due to gastrointestinal and other bleeding events, electrolyte disturbances, lack of diabetic control, renal failure, heart failure, constipation or bradycardia. This list comprises 10 drug classes that were responsible for more than half of all potentially preventable hospital admissions in the HARM study. Our aim was to reduce the number of drugs on that list.

## Statistical analysis

Collected data were recorded in a dedicated MSAccess database. Assuming an average decrease of the MAI in the study population from 9.6 to 5.9<sup>21</sup> a sample size of 26 patients was calculated (G\*Power V3.0.8,  $\alpha=0.05$ , statistical power 0.8, two-tailed t test,

matched pairs, a priori, correlation 0.5). Study results were analysed (Predictive Analytics SoftWare Statistics 18) using a paired-samples *t* test for normally distributed data and a Wilcoxon signed-rank test for non-normally distributed data.

## RESULTS

### Patient characteristics

During the study period a total of 948 patients visited our outpatient department. Of these patients 898 patients were not eligible or were judged by the geriatrician to be not mentally suitable for participation in the study. Fifty patients  $\geq 65$  years of age met the inclusion criteria of the study: they were poly-pharmacy patients who were referred by their general practitioner with drug related problems. No patient refused informed consent, and only one patient missed two of the counselling days and was therefore excluded from the study. There were no patients that were excluded during the study because of enrolment in other studies, or patients who were institutionalised during the study period. All of our patients were accompanied by a community caregiver. The average age of these 49 participants was 79 years and 69% were female. Table 2 represents the patient characteristics.

The costs of all medication evaluated in this study were covered by health insurance companies.

The clinical pharmacist suggested 323 interventions, an average of 6.6 interventions per patient. These consisted of a start ( $n=31$ , 9.6%), a stop ( $n=143$ , 44.3%) or a switch ( $n=56$ , 17.3%) of drug, a change of use ( $n=75$ , 23.2%) or supplementary instructions for proper use of the medication ( $n=18$ , 5.3%). In formulating the medication treatment plan 265 (82%) of these suggestions were adopted, and applied at the second visit.

Some suggestions were carried out immediately at the second visit, some were redirected to the general practitioner to be implemented stepwise.

New drugs were advised when an indication was not treated according to guidelines, or instead of a drug that was on the Beers list, the HARM Trigger list or when it resulted in too many side effects or drug-drug interactions. This means that the primary outcome of our study includes the initiation of new drugs (0.6 per patient) and supplementary instructions for better medication use.

### Outcome

The average MAI score per patient was reduced from 19.9 at  $t=0$  to 10.0 on the last visit, a reduction of 50% (Wilcoxon signed-rank test;  $p<0.001$ ).

The average number of drugs per patient was reduced from 12.1 to 11.0 (paired samples *t* test;  $p=0.001$ ). The number of possible medications listed in the HARM Trigger list decreased with 0.5 from 2.3 to 1.8 and the possible medications from the Beers list decreased with 0.6 from 2.1 to 1.5 (Wilcoxon signed-rank test;  $p<0.001$ ).

## DISCUSSION

In this prospective follow-up study the deployment of an outpatient consultation team, consisting of a clinical geriatrician and a clinical pharmacist, leads to a statistically significant decrease of MAI score of 50%. A decrease of the MAI score is related to a reduction in adverse drug events, hospital admissions,<sup>22–26</sup> morbidity and mortality.<sup>24–27</sup> Due to the relatively short follow-up period of 3 months, the study was not designed and powered to evaluate long-term effects. To do so, a further long-term study with more patients would be necessary. In such

**Table 2**

#### Patient characteristics (n=49)

Male/female, number (%)	15/34 (31/69)
Age, average (range)	79 (65–95)
Number of medications, average (range)	
T=0	12.1 (5–25)
T=3	11.0 (4–19)
Residency, number (%)	
Own home	27 (55)
Sheltered housing	7 (14)
Nursing home	2 (4)
Other	13 (26)
Living situation, number (%)	
Single	27 (55)
Cohabiting	22 (45)
Documented morbidities, number (%)	
Hypertension	27 (55)
Diabetes	22 (45)
Stroke	13 (27)
Rheuma/gout/osteoarthritis	15 (31)
Hypercholesterolaemia	13 (27)
Dysrhythmia	12 (24)
Pain	25 (51)
Eye disorders	13 (27)
Osteoporosis	11 (22)
Gastrointestinal complaints	17 (35)
Coronary disease	16 (33)
Depression/anxiety	15 (31)
Asthma/chronic obstructive pulmonary disease	9 (18)
Heart failure	12 (24)
Other	12 (24)
MAI score, average (range)	
T=0	19.9 (0–59)
T=3	10.0 (0–41)
Number of drugs in the HARM Trigger list, average (range)	
T=0	2.3 (0–7)
T=3	1.8 (0–5)
Number of drugs in the Beers list, average (range)	
T=0	2.1 (0–6)
T=3	1.5 (0–5)

MAI, Medication Appropriateness Index.

a study we would exchange the Beers list and the HARM Trigger list for the Screening Tool of Older Peoples' Prescriptions (STOPP)/Screening Tool to Alert doctors to Right Treatment (START) criteria.<sup>28</sup> The STOP/START criteria were not available at the start of our study. These criteria are more evidence based and are subject to consensus validation among a European panel of experts.

Our study clearly shows that improving medication appropriateness means more than just stopping medication prescriptions. Medication was stopped when no current indication was present anymore, when the maximum duration of therapy was reached (eg, bisphosphonates), when side effects outweighed the benefits of a drug (eg, stopping cholesterol lowering drugs because of myalgia), and so on. A mean recommended number of interventions of 6.6 per patient has led to a mere decrease of 1.1 drugs per patient.

It is noteworthy that undertreatment does not influence the MAI score, because a justified start of a new drug does not lead to a better MAI score. Therefore, the observed decrease of the

MAI score in our study may imply an underestimation of the actual positive effect of the interventions on the quality of pharmacotherapy.

Some of the suggestions to intervene in the medication of a patient led to discussions, which in some resulted in a rejection of the intervention. For example, a suggestion to stop a drug was not adopted, because when making up a treatment plan we concluded that an indication was still present. Or the suggestion to start a drug was not adopted, because we decided to await what would happen when no therapy was initiated. And finally, sometimes we decided not to adopt a change in the use of a drug, because we expected that a patient was not willing to accept that change. In these cases those changes in the use of drugs were held pro memoria for a later moment.

At the last visit only 167 (63%) applied and redirected recommendations were carried out and persisted after 3 months. The large number of recommendations of the pharmacists often resulted in a stepwise approach of changes in the medication. After 3 months time, not always all changes were implemented yet. Other reasons why recommendations were not carried out or did not last until the last visit were a lack of the patient's motivation, a lack of urgency of the change or doubts about a suggested association between an adverse drug event and the medication. Restarting drugs also occurred, for example, because a new drug was not tolerated.

## LIMITATIONS OF THE STUDY

This study had some practical limitations. First, the study is a mere single centre study, the study is not randomised and it is an uncontrolled preintervention versus postintervention study.

It does not become clear whether the same results would have been achieved if the patient would only have been seen by one consultant (clinical pharmacist or clinical geriatrician), or in a different outpatient setting than in our hospital. In that respect it is interesting to compare our results with the results from the study of Hanlon *et al.*<sup>29</sup> They used a similar study design, but did not involve a clinical geriatrician. Also, none of the interventions was promptly implemented by the clinical pharmacists. All recommendations were redirected to a general practitioner for consideration. They found a reduction in MAI score of 24% (from 17.7 to 13.4), which is considerably less than in our study. This is why we decided to continue the use of a multidisciplinary team when we translated our method into routine clinical practice.

A second limitation is that patients were excluded by the geriatrician when judged as mentally not suitable for active participation in the study. This judgement is subjective and we did not exactly keep track on why patients were excluded. Furthermore, the investigators and reviewers were the same people. In theory this might lead to bias.

In order to determine effects of our study period on end points, such as the number of hospital admissions or the quality of life, a longer period of follow-up is needed, and more patients need to be included. Although our study showed encouraging results a more robust study is needed to support our findings and see effects on clinical end points. Nevertheless, our study appears beneficial in terms of reducing inappropriate prescribing and medication related problems in terms of medications listed on the HARM Trigger list and the Beers list.

The consultation of the clinical pharmacist was time-consuming. Preparing the consultation, reviewing the medication with the patient, reporting the interventions and discussing them with the clinical geriatrician took almost 90 min per patient. Efforts are

currently made to agree upon a fixed fee for this effort with insurance companies.

## CONCLUSIONS

This study shows that interventions carried out by an outpatient consultation team, consisting of a clinical geriatrician and a clinical pharmacist, led to a substantial quality improvement of prescribing in elderly outpatients with polypharmacy. The improvement was quantified as a 50% reduction of the MAI score.

## What this paper adds

### What is already known on this subject?

- ▶ Several medication review methods show improved outcome of the prescribing process in the elderly.
- ▶ Interventions result in an increase of the chance of patients living at home in the long term.
- ▶ The participation of a clinical pharmacist in a multidisciplinary team shows promising results, but so far only in an institutionalised setting.

### What this study adds?

- ▶ An outpatient consultation team, consisting of a clinical pharmacist and a clinical geriatrician, can achieve a major reduction of the Medication Appropriateness Index score on medication prescribing in the elderly.
- ▶ This study shows that interventions by a clinical pharmacist and a clinical geriatrician are effective to improve the quality of pharmacotherapy in the elderly outpatient.

**Competing interests** None declared.

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