A Quality Use of Medicines program for general practitioners and older people: a cluster randomised controlled trial

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ABSTRACT

Objective: To investigate the effectiveness of an educational Quality Use of Medicines program, delivered at the level of general practice, on medicines use, falls and quality of life in people aged ⩾ 65 years.

Design: Cluster randomised controlled trial conducted in 2002.

Setting: General practices in the Hunter Region, New South Wales, Australia.

Participants: Twenty general practitioners recruited 849 patients to participate in the study.

Intervention: Education (academic detailing, provision of prescribing information and feedback); medication risk assessment; facilitation of medication review; financial incentives.

Main outcome measures: Primary measures: a composite score reflecting use of benzodiazepines, non-steroidal anti-inflammatory drugs (NSAIDs) and thiazide diuretics; secondary measures: use of medication reviews, occurrence of falls, quality of life (as assessed by SF-12 and EQ-5D survey scores.

Results: Compared with the control group, participants in the intervention group had increased odds of having an improved medication use composite score (odds ratio [OR], 1.86; 95% CI, 1.21–2.85) at 4-month follow-up but not at 12 months. At 4-month follow-up, the intervention group had reduced odds of using NSAIDs (OR, 0.62; 95% CI, 0.39–0.99) and showed a non-significant reduction in use of benzodiazepines (OR, 0.51; 95% CI, 0.20–1.30) and thiazide diuretics (OR, 0.70; 95% CI, 0.48–1.01). Changes in drug use were not significant at 12-month follow-up. At 12 months, intervention-group participants had lower adjusted ORs (AORs) for having a fall (AOR, 0.61; 95% CI, 0.41–0.91), injury (AOR, 0.56; 95% CI, 0.32–0.96), and injury requiring medical attention (AOR, 0.46; 95% CI, 0.30–0.70). Quality-of-life scores were unaffected by the intervention.

Conclusion: Education and systems for medication review conducted by GPs can be used to improve use of medicines. These interventions are associated with a reduction in falls among older people, without adverse effects on quality of life.

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Older people face a range of medication-related problems such as non-adherence to treatment regimens, use of high-risk drugs and underuse of some medicines.[1] These problems can potentially lead to adverse events such as falls and reduced quality of life. Several interventions have the potential to promote quality use of medicines for older people through changing general practitioners' behaviour. These interventions include academic detailing,[2] provision of educational material,[3] patient-mediated interventions,[3] and audit and feedback.[4] Some studies have shown medication review to be beneficial for older people living in the community,[5] but others have not.[6] Most studies of this kind have involved medication review by a clinical pharmacist.[5,6] An alternative approach, which has not been adequately evaluated in randomised controlled trials,[7] is medication review by GPs.

The aim of our study was to investigate the effects of an educational Quality Use of Medicines program and medication review systems for GPs on use of medicines, number of falls and quality of life for people aged ⩾ 65 years.

METHODS

Our study was a cluster randomised controlled trial conducted in the Hunter Urban Division of General Practice in New South Wales in 2002. The general practice was the unit of randomisation. The intervention occurred at GP level. Outcome measurement and the unit of analysis were at patient level, with adjustment for general practice.

After extensive consultation, three drug classes were targeted.[7] Recommendations were in line with those given by the National Prescribing Service *at the time of the intervention*. Briefly, non-steroidal anti-inflammatory drugs (NSAIDs) with low risk of gastrointestinal adverse effects (ibuprofen and diclofenac) in low doses were to be used in preference to medium- and high-risk NSAIDs[8] and cyclooxygenase-2 (COX-2) inhibitors. Low-dose thiazide diuretics were promoted as first-line therapy for hypertension,[9] unless there was a contraindication or specific indications for another drug. Appropriateness of long-term benzodiazepine use was targeted because of its known adverse effects and its association with falls.[10]

Participants

Eligible practices were located within networks of the Hunter Urban Division of General Practice. Networks were randomly selected using random digit tables. GPs were eligible to participate if they had been based at their current practice for 12 months or more and practised 10 hours or more per week. Doctors within the selected networks were sent a letter asking if they wished to participate in the study, and our project manager met with consenting doctors and office staff to discuss study procedures.

Patients aged ⩾ 65 years who presented at participating practices during the study period and were living in the community were eligible to participate. They were invited by practice staff to complete a consent form. Patients who were confused at the time of consultation were also invited to participate if accompanied by a caregiver.

Assignment to groups

Assignment of general practices to the intervention or control group was undertaken by a statistician from another location within the University of Newcastle using computer-generated random number allocation in SAS software (SAS Institute, Cary, NC, USA). Assignment occurred after GPs returned their consent form. The sequence was not concealed from the project manager or the doctors who needed to conduct the intervention. However, participants, practice staff, data collectors, outcome assessors and data managers were unaware of treatment allocation.

Intervention and control

The intervention consisted of three major parts: education (academic detailing, giving prescribing information and feedback), medication risk assessment, and completion of a medication review checklist.

The education component was conducted by a clinical pharmacist with experience in conducting medication reviews for nursing-home patients. The pharmacist visited each doctor twice and provided tailored education on how to conduct medication reviews, with emphasis on benzodiazepines, NSAIDs/COX-2 inibitors and antihypertensives. Sources of information on prescribing were provided,[10,11] including one-page laminated desk-size sheets.* GPs also received feedback on the number of targeted drugs used by their patients.

Doctors received Practice Incentive Payments after completing 10 medication review checklists and were reimbursed for their time with the pharmacist.

Intervention-group participants completed a Medication Risk Assessment[12] while in the waiting room. They handed the form to their doctor, who then decided whether the patient would benefit from a medication review. The form contained 31 items assessing risk factors for medication misadventure — for example, having three or more health problems, using more than four medicines, and having possible side effects such as sleep deprivation. Doctors completed a Medication Review Checklist for "at-risk" participants (Box 1).

Control-group participants also completed a Medication Risk Assessment, but the forms were collected by the researchers rather than being handed to the GP. Control doctors received no intervention except for completing a clinical audit to encourage participation in the study, which included feedback on the number of medication reviews and medication risk factors.

1 Main components of the Medication Review Checklist

Each section contained a list of problems to consider and potential solutions to any problems:

- Awareness of number of drugs used
- Compliance issues
- Several specific drug categories (benzodiazepines, tricyclic antidepressants, selective serotonin reuptake inhibitors, antipsychotics, other sedatives/hypnotics/tranquilisers/ antidepressants, non-steroidal anti-inflammatory drugs, cyclooxygenase-2 inhibitors, other analgesics, diuretics, β-blockers, α-blockers, angiotensin-converting enzyme inhibitors, calcium channel blockers, H_2 antagonists, proton-pump inhibitors, prochlorperazine, metoclopramide, oral corticosteroids, sulfonylureas, metformin, other hypoglycaemics, digoxin, quinine, allopurinol, over-the-counter or complementary medicines and warfarin)
- Adverse drug reactions
- Recommendation section ◆

Data collection and measurement

Consenting participants were contacted by trained telephone interviewers at baseline (on average 3 weeks after recruitment) and at 4- and 12-month follow-up to record information about medication reviews, drug use, falls, quality of life and socio-demographic factors. Participants unable to complete the telephone interview were visited at home.

Participants were asked to bring to the phone all the medicines taken in the previous 7 days and to spell out the brand name and other details of each medication. All drugs were classified according to the Anatomical Therapeutic Chemical Classification 2001[13] by two raters who coded independently and discussed points of difference until 100% agreement on drug use was reached. The kappa (κ) statistic for agreement between coders, adjusted for overall prevalence of drug use and bias, was 0.81 (95% CI, 0.64–0.96), and the overall proportion of agreement between raters on drug use was 90%.

As the prevalence of drug use is a crude reflection of appropriate prescribing, we developed a "composite score". Simply recording the prevalence of drug use does not take into account other important issues such as dose reductions. Even small-scale changes, when added up, can have a significant effect on improving the use of medicines. In addition, multiple testing can lead to type 1 errors if all separate drug changes are included in the analyses. The proportions of participants using specific medicines were also included in the analysis, as this effect is easier to interpret than a composite score.

We constructed ordinal outcome measures for each of the targeted drugs. The scoring algorithm of a neutral score (0), success (+1) (ie, recommendation was followed), or failure (–1) (ie, recommendation was not followed) was decided prior to the intervention (details available from the authors on request). The individual drug scores were then added up to form a composite score, a six-point ordinal outcome measure. A nurse (blinded to group allocation) and the project manager independently assessed the composite score. At 12-month follow-up, a nurse and a doctor who were blinded to group allocation assessed the composite score independently. Agreement between the two assessors was 99%.

Self-reported secondary outcome measures were the proportions of participants using benzodiazepines (excluding benzodiazepines used for epilepsy), NSAIDs and thiazide diuretics; the proportion receiving a medication review; the proportion having falls;[14,15] and the participants' quality of life, as assessed by the SF-12 (version 2, standard form)[16] and EQ-5D[17] questionnaires.

Statistical analyses

Statistical analyses were conducted using SAS version 8.02 (SAS Institute, Cary, NC, USA) and SUDAAN version 9.0 (Research Triangle Institute, Research Triangle Park, NC, USA). All analyses were adjusted for clustering at the practice level. Polytomous logistic regression was used to calculate the odds ratios (ORs) of a person in the intervention group having a better outcome for the composite score than a person in the control group. At 4-month follow-up, the categories "0" and "1" were combined, as this was the only combination for which the proportional odds assumption was met at a four-level ordinal scale ($\chi^2 = 16.8$; df = 10; $P = 0.08$). At 12-month follow-up, no four-level category was found to meet the proportional odds assumption; hence, a three-level category was chosen with the highest P value by combining "0", "1" and "2" ($\chi^2 = 4.3$; df = 5; $P = 0.50$). Logistic regression analysis was used for binary outcome variables, and linear regression analysis for quality-of-life scores. Crude and adjusted results for a priori potential confounders were calculated.

Sample size calculation

The sample size was based on the proportions of participants using benzodiazepines,

* Copies of the laminated desk-size sheets with information about the targeted drugs, Medication Risk Assessment form, Medication Review Checklist, and prescribing feedback are available from the authors on request.

NSAIDs, and thiazide diuretics.[18] The largest sample size needed to detect a difference on the three outcome measures was for NSAIDs, with 398 participants required for each group. With a power of 0.8, $\alpha = 0.05$, an intra-class correlation of 0.01,[19] an expected maximum cluster size of 60 participants per practice, and an inflation factor of 1.59 (because of clustering, we needed to inflate the sample size), this sample was sufficient to detect a 10% reduction from 25% to 15% in the proportion of participants using an NSAID. Allowing for 10% loss to follow-up over 4 months, we estimated that about 440 participants per group would be required.

Ethical approval

Ethical approval was received from the Australian National Department of Veterans' Affairs, the University of Newcastle Human Research Ethics Committee and the Hunter Health Research Ethics Committee.

RESULTS

Twenty-three of 195 doctors invited to participate in our study agreed to do so (a response rate of 12%). The flow of participants is summarised in Box 2. Twenty GPs from 16 practices took part. Recruitment took place in 2002, and 12-month follow-up finished in January 2004. Participation rates were higher in the intervention group ($\chi^2 = 2.18$; $P = 0.16$). Reasons for loss to follow-up were similar between the two groups. There were no statistically significant differences between participants lost to follow-up and those who remained in the study in relation to sex and occurrence of previous falls by experimental group. However, a higher proportion of intervention-group participants aged ⩾ 85 years were lost to follow-up ($\chi^2 = 8.93$, $P = 0.03$).

All doctors in the intervention group, except one who dropped out, had two academic detailing visits. The first visit took place before patient recruitment so that doctors were aware of what to look for when identifying patients for medication review. One doctor conducted reviews with all patients on the same day the Medication Risk Assessment was completed and so did not actually see all the participants' medications (ideally, patients should have been invited back for a separate consultation to show the doctor their medications). Another doctor did not conduct any medication reviews, arguing that all patients' medications were checked routinely. Drug-related problems identified during the reviews and actions taken to solve those problems have been published elsewhere.[20]

Characteristics of doctors in the two groups were generally similar, except that seven doctors in the intervention group had had over 20 years' experience in general practice compared with only two in the control group. Participants in the intervention and control groups were reasonably similar at baseline (details available from the authors on request), except that the intervention group contained a higher proportion of women (67% versus 51%). We adjusted for this in the analysis. Participants in the intervention group had higher odds of having an improved composite score than control-group participants (OR, 1.86; 95% CI, 1.21–2.85) at 4-month follow-up, but not at 12-month follow-up (Box 3). Participants in the intervention group had lower odds of using NSAIDs than control-group participants at 4-month follow-up but not at 12 months. No significant changes were found for benzodiazepines or thiazide diuretics at 4- and 12-month follow-up.

At 4-month follow-up, crude ORs, but not adjusted ORs, showed significant differences between the groups in relation to the proportion of people having falls (Box 4). At 12-month follow-up, intervention-group participants had lower adjusted odds of having a fall, fall injury or fall requiring medical attention. The intervention produced no significant difference in quality-of-life scores after adjustment for age, sex and baseline scores (Box 5).

DISCUSSION

Our intervention, which aimed to encourage medication review by GPs, improved medicines use in the short term but not in the longer term, and the effects were modest. Prescription of NSAIDs was the only drug-use measure to show a statistically significant change. As in a similar Australian study,[21] thiazide diuretic use did not increase. There was a reduction in falls in the intervention group that was sustained over a 12-month period. This was not easily explained by changes in medication use and may be a chance finding, but it raises the possibility that the intervention had other effects (see below).

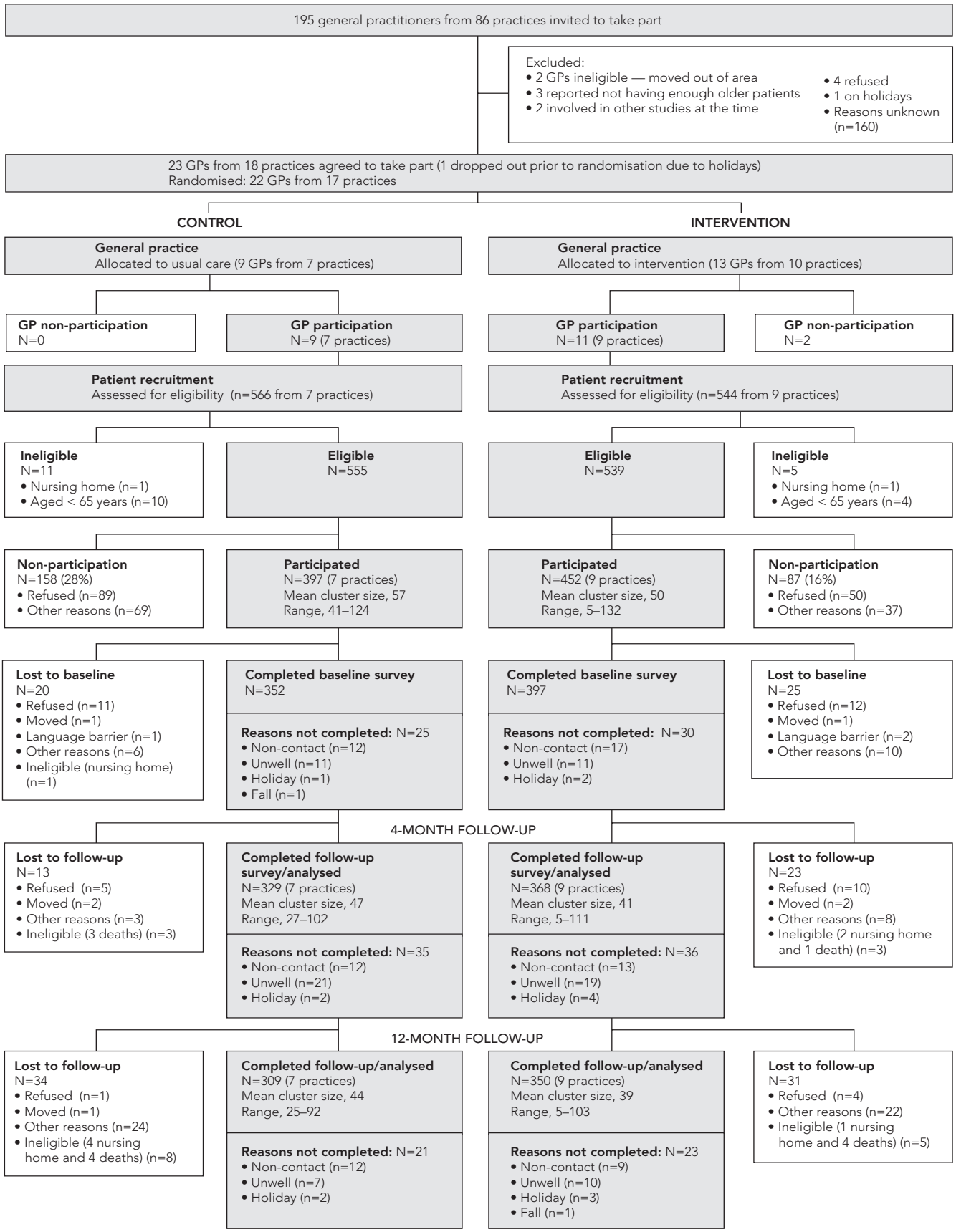
The intervention may not have adequately addressed barriers to prescribing thiazides. There may be conceptual and behavioural differences between adding and reducing medications. Changes in prescribing are more likely to occur in newly diagnosed hypertensive patients and less likely to be seen in patients who have been using antihypertensive drugs without any problems. Moreover, as specialists have a substantial impact on prescribing, there may be a need to involve both GPs and specialists in efforts to improve prescribing behaviour.[22]

Compared with our study, Zermansky et al[5] reported a large increase in medication review rates over a 1-year period during their intervention in the United Kingdom (97% of patients in the intervention group had medication reviews compared with 44% in the control group). This difference may be attributable to several factors. In the study by Zermansky et al, a pharmacist conducted medication reviews and review rates were determined from medical records, whereas we relied on self-report. Thus, medication reviews may have been under-reported in our study.

The effect of our intervention on the number of falls was more visible after 12 months than after 4 months. It may be that the higher number of reported falls over a 12-month period increased the power of the study to detect a difference. The intervention itself may have had other effects, as it addressed issues besides drug use, such as compliance, postural hypotension and doctors' awareness of falls (eg, as a risk factor on the Medication Risk Assessment form). Alternatively, the apparent impact on falls may have been due to a type 1 error or to loss of some patients to follow-up. A higher proportion of intervention-group participants aged ⩾ 85 years were lost to follow-up, which may partly explain the lower proportion of falls in the intervention group at follow-up. Also, there may have been self-report bias, with those in the intervention group being less likely to report falls (however, previous research shows that participants in intervention groups are *more* likely to report falls).[14] Our results are supported by other studies aimed at reducing falls through medication review. However, these interventions also addressed fall-risk factors other than drugs, such as home modification (Dr Sue Carter, Director of Strategic and Clinical Service Planning, Division of Population Health, Planning and Performance, Hunter New England Area Health Service, NSW, personal communication) or exercise.[23] Meredith et al,[24] who solely addressed medication problems for older people, found no effect of their intervention on falls.

There was an apparent tendency for quality-of-life scores to increase over time in both groups, but adjusted ORs showed the

2 Flow of participants



3 Number (%) of patients reporting having had a medication review since taking part in the study and drug use* at baseline and at 4- and 12-month follow-up, by experimental group (logistic regression); and comparison of composite scores at 4- and 12-month follow-up, by experimental group (polytomous logistic regression)†

	Baseline	4-month follow-up						12-month follow-up					
	n/N (%)	n/N	%	COR (95% CI)	*P*	AOR (95% CI)	*P*	n/N	%	COR (95% CI)	*P*	AOR (95% CI)	*P*
Medication review													
Intervention group	55/396 (14%)‡	101/368	28%	5.55 (2.88–10.68)	< 0.001	7.95 (3.50–18.30)§	< 0.001	74/350	21%	4.33 (2.20–8.52)	< 0.001	6.10 (3.35–11.11)§	< 0.001
Control group	56/341 (16%)‡	21/329	6%	1		1		18/309	6%	1		1	
Benzodiazepines													
Intervention group	30/397 (8%)	28/368	8%	0.45 (0.19–1.04)	0.060	0.51 (0.20–1.30)¶	0.14	26/350	7%	0.61 (0.27–1.37)	0.21	0.65 (0.27–1.57)¶	0.31
Control group	42/352 (12%)	51/329	16%	1		1		36/309	12%	1		1	
NSAIDs (including COX-2 inhibitors)													
Intervention group	94/397 (24%)	72/368	20%	0.67 (0.44–1.00)	0.049	0.62 (0.39–0.99)¶	0.044	76/350	22%	0.82 (0.57–1.19)	0.28	0.77 (0.51– 1.16)¶	0.19
Control group	99/352 (28%)	88/329	27%	1		1		78/309	25%	1		1	
Thiazide diuretics													
Intervention group	75/397 (19%)	65/368	18%	0.75 (0.49–1.16)	0.18	0.70 (0.48–1.01)¶	0.06	66/350	19%	0.86 (0.55–1.34)	0.47	0.85 (0.53– 1.38)¶	0.50
Control group	70/352 (20%)	73/329	22%	1		1		66/309	21%	1		1	

	4-month follow-up**††						12-month follow-up††‡‡					
Composite score§§	–2	–1	0	1	2	3	–2	–1	0	1	2	3
Intervention group	0	37 (10%)	215 (58%)	98 (27%)	18 (5%)	0	0	41 (12%)	192 (55%)	95 (27%)	22 (6%)	0
Control group	7 (2%)	56 (17%)	158 (48%)	98 (30%)	10 (3%)	0	5 (2%)	42 (14%)	149 (48%)	104 (34%)	9 (3%)	0

AOR = adjusted odds ratio. COR = crude odds ratio. COX-2 inhibitors = cyclooxygenase-2 inhibitors. NSAIDs = non-steroidal anti-inflammatory drugs. * Drug use in the past 7 days. † Adjusted for clustering (general practice). ‡ Medication review in past 12 months. § Adjusted for general practice, baseline medication review, sex, age, use of four or more medicines, SF-12 summary scores. ¶ Adjusted for general practice, sex, age, SF-12 summary scores. Intraclass correlation coefficient for NSAIDs was 0.0026. ** COR, 2.04 (95% CI, 1.29–3.21), *P* = 0.004; AOR, 1.86 (95% CI, 1.21–2.85), *P* = 0.0076. †† Adjusted for general practice, sex, age, SF-12 summary scores. ‡‡ COR, 1.37 (95% CI, 0.89–2.11), *P* = 0.14; AOR, 1.33 (95% CI, 0.83–2.14), *P* = 0.22. §§ Composite score: –2 (worst possible score), 0 (neutral), 3 (best possible score). Data expressed as number (%) of patients with that score. ◆

4 Comparison of falls* at baseline and at 4- and 12-month follow-up, by experimental group (logistic regression analysis)†

	Baseline	4-month follow-up						12-month follow-up					
Questions relating to falls‡	n/N (%)	n/N	%	COR (95% CI)	*P*	AOR§ (95% CI)	*P*	n/N	%	COR (95% CI)	*P*	AOR§ (95% CI)	*P*
Have you slipped, tripped or stumbled inside or outside your home in the last x_i¶ months? (definition: a momentary loss of balance that does not *include a fall)*													
Intervention group	122/396 (31%)	68/365	19%	0.90 (0.51–1.56)	0.68	1.00 (0.59–1.68)	1.0	94/339	28%	0.79 (0.54–1.17)	0.22	0.83 (0.52–1.35)	0.43
Control group	119/351 (34%)	66/324	20%	1		1		96/294	33%	1		1	
Have you had a fall inside or outside your home in the last x_i¶ months? (definition: body comes to rest unintentionally on the floor/ground, no longer weight-bearing — does not include slips/ trips or stumbles)													
Intervention group	86/396 (22%)	46/366	13%	0.76 (0.60–0.96)	0.02	0.90 (0.69–1.18)	0.43	70/350	20%	0.57 (0.40–0.81)	0.0036	0.61 (0.41–0.91)	0.02
Control group	100/351 (29%)	52/327	16%					94/309	30%	1		1	
Have you been injured as a result of a fall in the last x_i¶ months? (definition: body comes to rest unintentionally on the floor/ground, no longer weight-bearing)													
Intervention group	58/396 (15%)	21/366	6%	0.63 (0.42–0.93)	0.025	0.74 (0.48–1.14)	0.15	35/350	10%	0.51 (0.31–0.84)	0.011	0.56 (0.32–0.96)	0.04
Control group	71/351 (20%)	29/327	9%	1		1		55/308	18%	1		1	
Have you needed to seek medical attention (eg, doctor, hospital) for an injury from a fall, trip or accident in the last x_i¶ months?													
Intervention group	43/396 (11%)	15/366	4%	0.62 (0.37–1.06)	0.08	0.67 (0.38–1.18)	0.15	22/350	6%	0.45 (0.31–0.65)	0.0004	0.46 (0.30–0.70)	0.0014
Control group	54/351 (15%)	21/327	6%	1		1		40/308	13%	1		1	
Have you had any other injury from an accident at your home in the last x_i¶ months? (eg, burns, cuts, bruises from gardening, kitchen tasks, broken furniture, etc)													
Intervention group	96/396 (24%)	98/364	27%	1.08 (0.61–1.92)	0.77	1.20 (0.68–2.12)	0.50	92/347	27%	0.84 (0.50–1.44)	0.51	0.91 (0.49–1.68)	0.74
Control group	97/350 (28%)	83/327	25%	1		1		91/304	30%	1		1	
Have you felt faint, weak or dizzy in the last month, especially at first standing up in the morning?													
Intervention group	93/396 (24%)	97/364	27%	1.08 (0.76–1.54)	0.65	1.51 (0.88–2.60)	0.12	85/349	24%	0.91 (0.61–1.35)	0.61	1.16 (0.76–1.76)	0.46
Control group	107/351 (31%)	82/326	25%	1		1		81/309	26%	1		1	

AOR = adjusted odds ratio. COR = crude odds ratio. * Adjusted for clustering (general practice). † Source of questions: Mackenzie et al[14] and Cohen et al.[15] ‡ Data expressed as number (%) of participants answering "yes" to question. § Adjusted for general practice, baseline score, sex, age, SF-12 summary score. ¶ $x_i = 3$ for 4-month follow-up; $x_i = 12$ for baseline and 12-month follow-up. ◆

5 Mean and standard error (SE) for SF-12[16] and EQ-5D[17] summary scores at baseline and at 4- and 12-month follow-up, by experimental group* (linear regression analysis)

	Baseline		4-month follow-up						12-month follow-up					
			Crude results				Adjusted results†		Crude results				Adjusted results†	
Quality of life	N	Mean (SE)	N	Mean (SE)	β (SE β)	t test: β = 0	P	β (SE β)	t test: β = 0	P	N	Mean (SE)	β (SE β)	t test: β = 0	P	β (SE β)	t test: β = 0	P
SF-12: PCS																		
Intervention group	389	44.1 (0.7)	365	45.8 (0.5)	1.12 (0.64)	1.74	0.10	–0.38 (0.65)	–0.59	0.56	350	47.0 (0.6)	1.70 (0.72)	2.34	0.033	0.35 (0.67)	0.52	0.61
Control group	339	42.4 (0.5)	327	44.7 (0.4)							309	45.3 (0.4)						
SF-12: MCS																		
Intervention group	389	54.13 (0.4)	365	54.1 (0.3)	0.41 (0.82)	0.49	0.63	0.087 (0.59)	0.15	0.88	350	55.0 (0.3)	0.76 (0.50)	1.52	0.15	0.25 (0.64)	0.38	0.71
Control group	339	53.07 (0.8)	327	53.7 (0.8)							309	54.3 (0.4)						
EQ-5D: VAS																		
Intervention group	389	77.0 (0.8)	364	79.0 (0.8)	2.51 (0.83)	3.04	0.008	0.62 (0.83)	0.75	0.46	346	80.4 (0.8)	2.56 (0.97)	2.64	0.02	0.59 (0.94)	0.63	0.54
Control group	348	73.5 (0.8)	324	76.4 (0.4)							302	77.9 (0.5)						
EQ-5D: index score																		
Intervention group	395	0.83 (0.02)	365	0.86 (0.01)	0.028 (0.015)	1.84	0.086	0.001 (0.021)	0.04	0.96	350	0.89 (0.01)	0.018 (0.012)	1.48	0.15	–0.008 (0.02)	–0.39	0.70
Control group	348	0.78 (0.02)	327	0.84 (0.01)							309	0.87 (0.01)						

β = regression coefficient. MCS = Mental Component Summary. PCS = Physical Component Summary. VAS = Visual Analog Scale. *Adjusted for clustering (general practice). †Adjusted for general practice, baseline score, sex, age.

differences to be non-significant. Similarly, a systematic review investigating the effects of pharmaceutical services on quality of life[25] concluded that what appeared to be a positive trend was non-significant.

Limitations

The doctors' low response rate to the invitation to participate in our study may limit the generalisability of the findings, as it is likely that participating doctors were those with an interest in medicine-related issues in elderly patients. However, participating GPs' demographic and practice characteristics were similar to national data. The low response rate was in line with the rate for other high-intensity intervention studies.[26,27] Patient response rates were difficult to determine, as office staff did not always systematically record information about non-participants. Reasons for loss to follow-up were similar in both groups. The fact that participation rates were higher in the intervention group raises questions about the effectiveness of blinding. Furthermore, improvements were found in the control group as well, suggesting a Hawthorne effect. Our study was underpowered to detect significant differences for the proportions of benzodiazepines, NSAIDs and thiazide diuretics used between study arms due to higher loss of participants to follow-up than expected.

Academic detailing took place before patient recruitment. In addition, the telephone surveys occurred, on average, 3 weeks after participants signed the consent form. The data collected during the telephone interviews may therefore not truly represent baseline data, but rather a first-point-of-time measurement. It is therefore possible that, for some intervention-group participants, medicine use had already improved by the time of collecting baseline information. If this is the case, the true impact of improved prescribing observed in our study may have been underestimated.

Our approach of recording the prevalence of use of several targeted drugs was a crude measure of appropriate prescribing. For example, it did not take into account the indications for prescribing. For all the outcome measures, we attempted to approximate participants' comorbidity profiles by controlling for quality of life, which has been shown to be correlated with physical and mental health conditions.[28]

Self-reporting of medicine use may lead to bias. The reliability of self-reporting was validated by comparing self-reports with findings obtained from home visits and pharmaceutical claims data. There was high agreement between self-reported and actual drug use (> 90% for home visits and > 86% for pharmaceutical claims data).[7] The composite score also showed high agreement between self-reported and actual drug use obtained from home visits ($\kappa = 0.87$; 95% CI, 0.76–0.98).

Standardised instruments were used to measure falls and quality of life. The only measure that had not been validated in previous research was patient self-report of having a medication review. This issue was addressed by carefully training the interviewers and explaining to the participants what was meant by a medication review in our study.

Conclusion

Systems for medication review have the potential to reduce costs to the health care system by improving the use of medicines and reducing adverse events such as falls. It appears that continued reinforcement of appropriate prescribing is required to sustain long-term improvements.

Our results suggest that this type of intervention could be routinely used in general practice to improve use of medicines and that it may help reduce falls among older people without adversely affecting quality of life.

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COMPETING INTERESTS

None identified.

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