Age and Ageing 2001; **30:** 33–40

A pharmacy discharge plan for hospitalized elderly patients—a randomized controlled trial

Irwin Nazareth, Ann Burton, Sally Shulman[1], Paul Smith, Andy Haines, Heather Timberall[1]

Department of Primary Care and Population Sciences, Royal Free and University College Medical School, University College London, Rowland Hill Street, London NW3 2PF, UK
[1]Camden and Islington Community Trust Health Services Pharmacy, St Luke's Woodside Hospital, London, UK

Address correspondence to: I. Nazareth. Fax: (+44) 20 7 794 1224. Email: i.nazareth@ucl.ac.uk

Abstract

Objectives: to investigate the effectiveness of a pharmacy discharge plan in elderly hospitalized patients.
Design: randomized controlled trial.
Subjects and settings: we randomized patients aged 75 years and older on four or more medicines who had been discharged from three acute general and one long-stay hospital to a pharmacy intervention or usual care.
Interventions: the hospital pharmacist developed discharge plans which gave details of medication and support required by the patient. A copy was given to the patient and to all relevant professionals and carers. This was followed by a domiciliary assessment by a community pharmacist. In the control group, patients were discharged from hospital following standard procedures that included a discharge letter to the general practitioner listing current medications.
Outcomes: the primary outcome was re-admission to hospital within 6 months. Secondary outcomes included the number of deaths, attendance at hospital outpatient clinics and general practice and proportion of days in hospital over the follow-up period, together with patients' general well-being, satisfaction with the service and knowledge of and adherence to prescribed medication.
Results: we recruited 362 patients, of whom 181 were randomized to each group. We collected hospital and general practice data on at least 91 and 72% of patients respectively at each follow-up point and interviewed between 43 and 90% of the study subjects. There were no significant differences between the groups in the proportion of patients re-admitted to hospital between baseline and 3 months or 3 and 6 months. There were no significant differences in any of the secondary outcomes.
Conclusions: we found no evidence to suggest that the co-ordinated hospital and community pharmacy care discharge plans in elderly patients in this study influence outcomes.

Keywords: *elderly patients, health services utilization, pharmacists, randomized trial*

Introduction

Up to one-quarter of all hospital admissions of old people are connected with medication-related problems [1–4]. In a study of 50 elderly patients, 6–14 days after discharge from hospital, one-fifth had stopped taking their drugs, one-fifth were using different doses and two-fifths were on new drugs, often started by their general practitioner [1]. Closer supervision by pharmacists and better communication between hospital and community health professionals might overcome this difficulty [5].

The role of the pharmacist is changing, with hospital and community pharmacists offering discharge planning [6, 7]. In a randomized trial of hospitalized elderly patients who received either pharmacy discharge plans or usual care, those who received the intervention were better informed about their medication and more adherent to drug treatments [8, 9]. No change was observed in use of health services. Two other randomized trials on pharmacists' interventions in elderly outpatients also showed increased adherence to medication and a drop in inappropriate prescribing and adverse side effects. However, these studies did not evaluate effects on the use of hospital services [10, 11].

Co-ordination of work by hospital and community pharmacists to improve patient care has been

recommended for elderly people but has not been evaluated in a randomized trial [12]. We hypothesized that elderly hospitalized patients taking four or more drugs are less likely to be re-admitted to hospital if they received a co-ordinated hospital and community pharmacy discharge plan. We investigated the effectiveness of such an intervention in a randomized trial.

Methods

The study received ethical approval in each centre. From June 1995 to March 1997 we recruited patients over 75 years who were taking four or more medicines at discharge from three acute general and one long-stay hospital in a health authority in central London and who were discharged to areas within the catchment areas of the participating hospitals. Patients discharged from elderly-care wards were asked by the hospital pharmacist to give informed consent. Patients who could not speak English or were too ill were excluded.

Randomization

After consent was given, patients were independently randomized by the health authority's central community pharmacy office using computer-generated random numbers. We used blocked randomization, stratified by trial centre, to ensure equal numbers of participants in each randomized group.

Intervention group

Five hospital pharmacists in four hospitals and 29 community pharmacists offered an integrated discharge plan to those in the experimental arm. A dedicated full-time pharmacist in one hospital and a dedicated part-time pharmacist in another hospital provided the pharmacy discharge service. In the remaining two hospitals, the pharmacists worked on the trial part time.

The hospital pharmacist intervention included an assessment of the patients' medication, rationalization of their drug treatment, assessment of patients' ability to manage their medication, provision of information on their current drugs and liaison with carers and community professionals when appropriate. Each discharge plan held key information on discharge medication and medication support required by the patient. A copy was given to the patient, the patient's chosen community pharmacist and general practitioner and any other professionals or carers involved.

Between 7 and 14 days after discharge, the community pharmacists visited the patients at home. This visit allowed the pharmacist to check for discrepancies between the medicines the patient was taking and those prescribed on discharge. The pharmacist assessed the patient's understanding of and adherence to the medication regimen and intervened when appropriate. Interventions included counselling patients or carers on the purpose and appropriate doses of the medication; disposing of excess medicines and liaising with general practitioners. The pharmacists arranged further community visits at their discretion. All assessments and interventions were recorded on standard data sheets that were sent to the hospital-based liaison pharmacist. A revised care plan was issued if a patient was re-admitted to hospital during the 6-month study period.

The main pharmacist involved with this study (S.S.) trained the hospital and community pharmacists on all aspects of the care plan. A detailed manual was also given to each pharmacist and this served as a guide through the various stages of the care plan.

Control group

Patients randomized to the control group were discharged from hospital following standard procedures. These included a discharge letter to the general practitioner which indicated the diagnosis, investigations and current medications. The pharmacists did not provide a review of discharge medication or follow-up in the community.

Outcomes

The primary outcome was re-admission to hospital in the follow-up period. This outcome was a good measure of the health service utility of the intervention. Secondary outcomes were number of deaths, attendances at hospital outpatient clinics and general practice (at home or in the surgery) and days in hospital as a percentage of days of follow-up. Other secondary outcomes included global patient well-being, satisfaction with the service, adherence to and knowledge of prescribed medication, and hoarding of medication.

Data collection

Outcomes

The research assistant collected hospital outcome data for the preceding 3 months from the patient administration system at baseline and at 3 and 6 months. We calculated the proportions of those subjects who attended outpatient and/or general practice clinics. The research assistant posted to each patient's general practitioner a questionnaire at each follow-up point, requesting data on consultation rates at the practice or visits to the patient's home. General practitioners who did not respond were sent a second questionnaire within 1 month. Non-responders were then telephoned. Information on death was obtained from the patients' carers, their general practitioner and the health authority.

All patients were screened for cognitive impairment using the Mini-Mental State Exam questionnaire [13] and

those scoring ⩽15 were excluded from the interview process. (We used a lower cut-off than usual value of 23 so that we could interview as many subjects as possible.) The remaining patients were interviewed at recruitment, 3 months and 6 months using:

1. The British adaptation of the general well being questionnaire [14]: a valid and reliable 22-item instrument designed to assess the impact of pharmaceutical treatment on quality of life in elderly people. Each item was scored from 1 to 5, and total scores computed for each questionnaire then divided by the number of questions answered to obtain a mean score per item.
2. The client satisfaction questionnaire [15]: a validated seven-item measure designed to assess satisfaction with a health service. Each item was scored from 1 to 4; a mean score per item was again calculated.
3. The prescribed medicine interview [16]: a validated self-report semi-structured interview was used to collect data on the patients' knowledge and adherence to prescribed drugs in the previous week and their medication hoarding. These data were assessed by an independent blinded hospital pharmacist. Each item was rated 0 (none) or 1 (highest level) and mean scores calculated.

Delivery of the intervention

We extracted data from the discharge plans prepared by the hospital pharmacists and from data sheets completed by the community pharmacists. The latter received £20 after returning a completed data sheet giving details of the visit.

Self-reporting multi-dimensional work sampling methods were used to investigate the hospital pharmacists' use of time [17]. An electronic reminder beeper was set at a rate of 6.4 random beeps per hour, following which they recorded the type of activity being carried out. Sampling was carried out in proportion to the numbers of patients recruited in each hospital. One hospital was sampled three times over 1 year; one twice over 6 months and the third and fourth hospitals once each. We calculated the total time spent in hours on each discharge plan by estimating the total number of beeps for the study activities and dividing this by 6.4 to calculate the total number of hours spent. This was divided by the total number of care plans developed during the time of monitoring, in order to estimate the time spent on each care plan.

Community pharmacists had a variable patient load and thus similar monitoring was impractical. Instead, each was posted a questionnaire during the study in which they were asked to supply details on patients they had most recently visited for the first, second and the third time. The total time taken for these three types of community visits included journey time, duration of the visit and extra work carried out in pharmacy.

The research assistant remained blinded to the allocation of the patient. The allocation code held by the randomization centre was revealed only at the end of the study.

Power calculation

Figures available before the study from one of the three acute hospitals that participated suggested that up to 40% of patients aged 75 or older were re-admitted within 3 months of discharge. We estimated that a clinically significant change in re-admission rate would be a reduction to 25%. In order to detect such a difference at a power of 90% and the 5% level of significance, 195 patients were required in each group.

Analysis

We analysed the data using SPSS for Windows. We calculated the proportional difference and the 95% confidence intervals for all categorical variables and the difference between the means and the 95% confidence intervals for continuous variables. The distribution of the days in hospital as a percentage of days of follow-up for each patient was heavily skewed and could not be normalized through data transformation. We therefore used the Mann–Whitney U test statistic to test for differences between the groups at each follow-up point.

Results

Of the 500 patients approached, we recruited 362 to the study. The main reason for failure to recruit was patient refusal (117 of those approached); the remaining 21 either had communication difficulties (14), could not consent (four) or were terminally ill (three).

Half of the patients (181) were allocated to intervention and half to the control group. The mean age of participants was 84 years (SD 5.2) in the intervention group and 84 years (5.4) in the control group. Women made up 62 and 66% of the intervention and control groups respectively. Ninety-seven percent were white. Occupation at retirement was predominantly of social class III (63% in intervention and 57% in the control group). Only one subject was of social class I, and 11 and 9% were of social class II in the intervention and control groups respectively. Each patient had a mean of three chronic medical conditions and was on a mean of six drugs (SD = 2) on discharge from hospital. All subjects were on oral medication only. There was no significant baseline difference between the intervention and control group on age, sex, ethnicity, social class and mean number of chronic illnesses, drugs prescribed on discharge and cognitive impairment on discharge.

Outcomes and numbers of patients at baseline and 3 and 6 months are shown in the trial flow chart in Figure 1. At each time point we recorded data on hospital outpatient attendance, days in hospital, re-admissions and the number of deaths on at least 91% of patients. Data on general practice attendance were less complete, but at least 72% of follow-up data were collected.

Fewer patients were eligible for interview on account of the Mini-Mental State Exam score requirement (see interview flow chart; Figure 2). Of those eligible, the participation to interview was between 43 and 90% at each follow-up point.

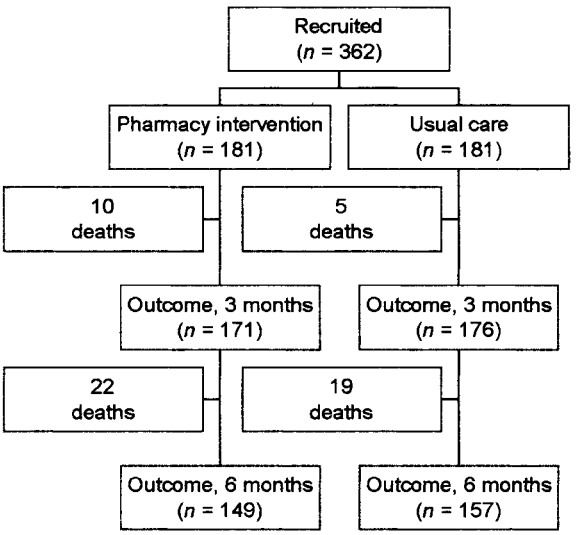

Figure 1. Trial flow chart.

Pharmacy intervention

Hospital

One hundred and eighty-nine hospital pharmacy discharge plans were available on 145 patients. Discharge plans on the remaining 36 patients (20%) were misplaced and not available for analysis.

Of the 145 patients for whom plans were available, 118 (81%) received only one discharge plan over 6 months. Special labels, bottles or dosette packs were required for 113 (78%) of the patients. Other interventions provided are listed in Table 1. The pharmacists required a mean of 5.5 h (SD 1.4) to prepare and administer each care plan.

Community

One hundred and twenty-nine (71%) of the 181 patients were assessed at home by the community pharmacist

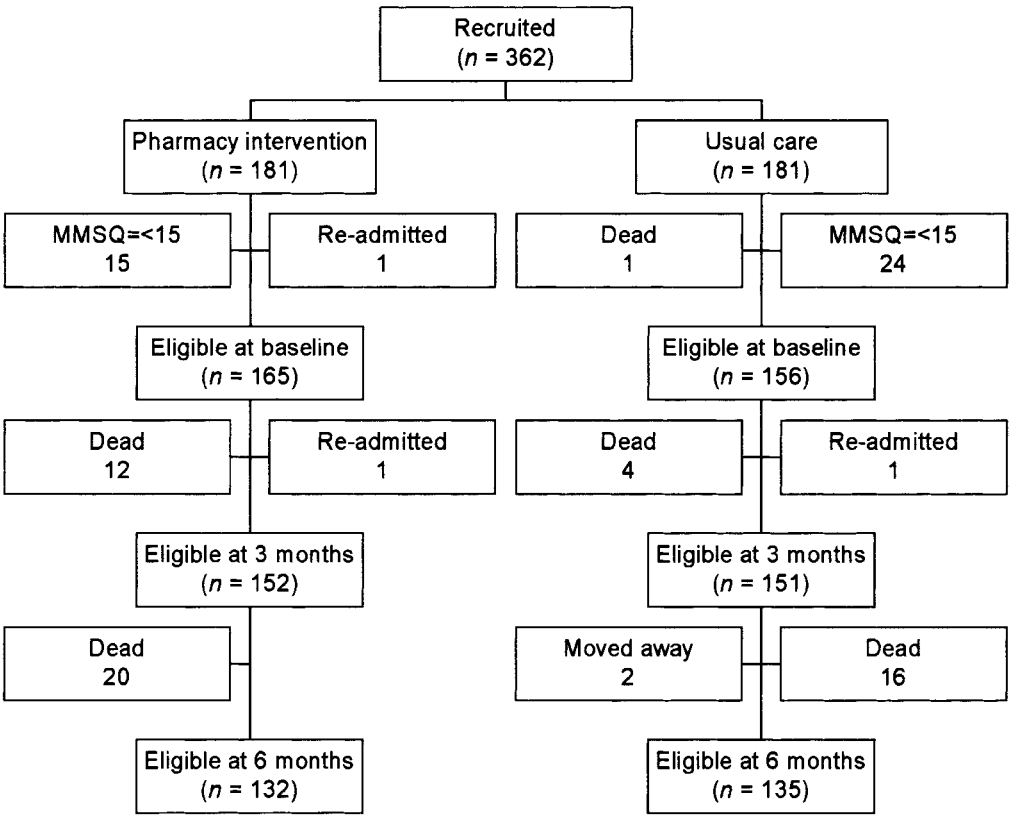

Figure 2. Flow chart for subjects interviewed.

Table 1. Interventions by hospital and community pharmacists

Intervention by hospital pharmacist ($n=145$)[a]	
1. Assessment of patient	
2. Documentation of current medication and support required	
3. Sending of copy of discharge plan to professional/carer	
4. Specific interventions ($n=272$) provided to 145 patients:	
Non-child-resistant containers	113 (42%)
Large-print and special labels	85 (31%)
Large bottles	22 (8%)
Alternatives to blister packs	11 (4%)
Medicine reminder devices	41 (15%)
Intervention by community pharmacist ($n=129$)	
1. Review of discharge plan	
2. Specific interventions ($n=277$) provided to 98 patients:	
Counselling/advice on medicines	103 (37%)
Disposal of old medicines	58 (21%)
Practical assistance with medicines	42 (15%)
Contact with general practitioner	39 (14%)
Counselling carers on medication	21 (8%)
Contact with other professionals/carers	14 (5%)

[a]No. of assessments for which data are available (covering 80% of study subjects).
[a]No. of visits for which data are available (covering 71% of study subjects).

Table 2. Outcome measures (service use) recorded over previous 3 months for patients in intervention and control groups at baseline and at 3 and 6 months

	No. (%), by group				
	Intervention		Control		
	Total[a]	With event	Total[b]	With event	Difference in proportions between groups (95% CI)
Primary outcome: hospital re-admission[c]					
3 months	164 (96%)	64 (39%)	176 (100%)	69 (39.2%)	0.18 (−10.6 to 10.2%)
6 months	136 (91%)	38 (27.9%)	151 (96%)	43 (28.4%)	0.54 (−11 to 9.9%)
Secondary outcomes					
Deaths[c]					
3 months	164 (96%)	10 (6.1%)	176 (100%)	5 (2.8%)	3.26 (−1.5 to 7.7%)
6 months	137 (92%)	22 (16.1%)	151 (96%)	19 (12.6%)	3.5 (−4.7 to 11.6%)
Outpatient department attendance					
Baseline	179 (99%)	52 (29%)	181 (100%)	60 (33.1%)	4.1 (−13.6 to 5.4%)
3 months	164 (96%)	75 (45.7%)	176 (100%)	84 (47.7%)	2 (−12.6 to 8.6%)
6 months	137 (92%)	39 (28.5%)	151 (96%)	40 (26.5%)	2 (−8.3 to 12.3%)
General practitioner attendance					
Baseline	147 (81%)	124 (84.3%)	156 (86%)	134 (85.9%)	1.5 (−9.6 to 6.5%)
3 months	130 (76%)	101 (77.7%)	144 (82%)	108 (75%)	2.7 (−7.4 to 12.7%)
6 months	107 (72%)	76 (71%)	116 (74%)	82 (70.7%)	0.3 (−11.6 to 12.3%)

[a]No. of patients for whom data were collected (and % of eligible patients at that point of data collection—181, 171 and 149 at baseline, 3 months and 6 months respectively).
[b]No. of patients for whom data were collected (and % of eligible patients at that point of data collection—181, 176 and 157 at baseline, 3 months and 6 months respectively).
[c]At baseline all patients were alive and recruited at the hospital.

after 254 attempts to visit them. The pharmacists did not record having offered any interventions to 31 (24%) of these patients, except for monitoring the discharge plans. The remaining 98 patients (76%) received 149 visits (58 received one, 32 received two, five received three and three received four) and 277 interventions (see Table 1). The mean number of interventions per visit was 1.9 (SD 0.5) and the mean number of interventions per patient 2.8 (SD 0.9).

Nineteen (65%) of the 29 community pharmacists responded to the questionnaire about their work. The mean journey time for all home visits was 17 min (SD 11). The mean duration of the first home visit was 38 min (SD 12.5). Fifteen of the 19 pharmacists made

Table 3. Secondary outcome measure (service use): median number of days in hospital as % of days of follow-up over previous 3 months

	Group						
	Intervention			Control			
		% of days in hospital			% of days in hospital		
	n[a]	Median	IQR	*n*[a]	Median	IQR	Mann–Whitney *U* test; *P* value
Baseline	181	11.25	(5.5, 21.7)	181	11.7	(6.7, 22.9)	Z = 30692; *P* = 0.1
3 months	171	0	(0, 14.4)	176	0	(0, 11)	Z = 29456; *P* = 0.8
6 months	149	0	(0, 3.1)	157	0	(0, 4.4)	Z = 19969; *P* = 0.9

[a]Data were collected for all eligible patients at each time point.
IQR, interquartile range.

Table 4. Secondary outcome measures (results from patient interviews)

	Group				
	Intervention		Control		
Measure	*n*[a](%)	Mean value (SD)	*n*[b] (%)	Mean value (SD)	Mean difference (95% CI)
General well being questionnaire score[c]					
Baseline	112 (68%)	2.6 (0.8)	120 (77%)	2.6 (0.7)	0
3 months	76 (50%)	2.4 (0.7)	73 (48%)	2.4 (0.6)	0
6 months	62 (47%)	2.5 (0.6)	61 (45%)	2.4 (0.7)	0.1 (−0.135 to 0.335)
Client satisfaction questionnaire score[d]					
Baseline	113 (68%)	3.3 (0.6)	118 (76%)	3.3 (0.6)	0
3 months	76 (50%)	3.3 (0.6)	73 (48%)	3.3 (0.6)	0
6 months	62 (47%)	3.4 (0.6)	61 (45%)	3.2 (0.6)	0.2 (−0.56 to 0.96)
Adherence to medicines[e]					
Baseline	123 (75%)	0.8 (0.31)	122 (78%)	0.77 (0.3)	0.03 (−0.046 to 0.106)
3 months	79 (52%)	0.75 (0.3)	72 (48%)	0.75 (0.28)	0
6 months	60 (45%)	0.78 (0.3)	58 (43%)	0.78 (0.3)	0
Knowledge about medicines[e]					
Baseline	131 (79%)	0.68 (0.34)	139 (89%)	0.60 (0.31)	0.08 (0.0051 to 0.154)
3 months	86 (57%)	0.69 (0.33)	83 (55%)	0.62 (0.34)	0.07 (−0.032 to 0.173)
6 months	65 (49%)	0.69 (0.35)	68 (50%)	0.68 (0.32)	0.01 (−0.106 to 0.126)
Hoarding of medicines[e]					
Baseline	129 (78%)	0.025 (0.09)	132 (85%)	0.017 (0.06)	0.008 (−0.016 to 0.028)
3 months	87 (57%)	0.006 (0.04)	82 (54%)	0.005 (0.03)	0.001 (−0.01 to 0.012)
6 months	70 (53%)	0.02 (0.13)	69 (51%)	0.013 (0.06)	0.007 (−0.013 to 0.27)

SD, standard deviation; CI, confidence interval.
[a]No. of patients for whom data were collected (and % of eligible patients at that point of data collection—165, 152 and 132 at baseline, 3 months and 6 months respectively).
[b]No. of patients for whom data were collected (and % of eligible patients at that point of data collection—156, 151 and 136 at baseline, 3 months and 6 months respectively).
[c]1 = ill health, 5 = good health.
[d]1 = dissatisfied, 4 = satisfied.
[e]0 = none, 1 = total/highest level.

a second visit, the mean duration of which was 27 min (SD 8.4). Two pharmacists had conducted a third visit that had taken 20 and 30 min respectively. The median time for extra administrative work in the pharmacy was 32 min (interquartile range 22–39).

Patient outcomes

With the exception of patient knowledge of their medication, no significant differences were observed in any of the baseline scores for all outcomes (Tables 2–4). There were no differences in re-admission rates between the two groups after 3 or 6 months (Table 2), and nor were there any significant differences in any of the secondary service use or patient outcomes (Tables 2 and 3, and Table 4, respectively). There was no significant difference in the mean adherence scores of those re-admitted to hospital and the rest of the subjects at 3 and 6 months.

Discussion

This study is one of the first randomized trials of the effectiveness of co-ordinated discharge planning by the hospital and community pharmacists. All patients received a discharge plan from the hospital pharmacist and 71% were visited at least once by the community pharmacist, of whom three-quarters received a detailed intervention. The pharmacy discharge plan was intended to optimize communication between primary- and secondary-care professionals. Despite its comprehensive and time-consuming nature, we found no significant effect for pharmacy interventions on any of the outcomes measured.

Little is known about the role of pharmacy services in the care of elderly people [7]. Most trials have focused on elderly outpatients. A systematic review on the effectiveness of outpatient pharmacy services [6] identified one randomized trial that targeted high-risk elderly patients [18]. This study of 284 patients demonstrated a significant decrease in outpatients' attendance in the intervention group without any differences in the patients' knowledge of or attitudes to drug therapy. Another trial in the USA of 208 elderly patients attending the Veteran Affairs medical [10] registered a significant decline in inappropriate prescribing by the physician without any adverse effects on the patients' quality of life. No information was provided on service use.

The only randomized trial in the UK of domiciliary pharmacy visits was conducted on 190 elderly subjects in the community. This study reported improved compliance and a reduction in general practice consultations in the intervention group [11]. The patients in all these studies were younger and less severely incapacitated than those recruited to our trial. The average age of the patients recruited to our study was 84 years, most had at least three chronic medical conditions and all were on complex medication regimens (i.e. at least four or more medicines). Moreover, the baseline level of adherence to medication in the study sample was high, allowing little room for further improvement. No changes in service use have been previously reported in one other study [8, 9]. A more intensive intervention might have produced benefits, but patients' participation would have been affected and such intervention is unlikely to be feasible in the National Health Service.

Other studies have also reported significant differences in patients' knowledge of and adherence to medication [8–11]. No such observation was made from the data reported in our study. Our data, however, were limited by the fact that information was collected only from subjects without cognitive impairment and by the response rates of those patients who were included.

We cannot generalize our findings to other groups of patients. The participants in our trial were very elderly and with chronic medical problems. However, this vulnerable group who are on multiple drug regimens are arguably most in need of guidance of this sort. Recommendations for co-ordination of the activities of hospital doctors and pharmacists to reduce patients' medicines to a maximum of three drugs where possible have been provided [8] in keeping with previous guidelines [12]. This approach was not adopted in our study, as it would have involved making major organizational changes.

A recent survey of 152 hospitals in the UK reported that, although only 4% used structured checklists for improved communications between hospital and community pharmacist, 89% provided medicine discharge information to the patients' general practitioners and 21% selectively provided this information for the community pharmacists [19]. It was suggested that measures to improve accurate recording and co-ordination of information on medicines between professionals would reduce re-admission to hospital and improve use of services.

Several calls have been made for more organized discharge planning with co-ordination of hospital and community pharmacist services. To date, no evaluation of the effect of such a service on re-admission rate, length of stay in hospital, outpatient admission rate or death rate has been made. Our study showed no effect on use of hospital or general practice services or mortality rates or any of the other secondary outcomes. Further research is essential before the routine funding of a co-ordinated primary- and secondary-care pharmacy discharge service for elderly hospitalized patients is considered.

Key points

- A system of co-ordination between hospital and community pharmacists was developed for patients aged 75 and over discharged from acute general and long-stay hospitals.
- The average age of patients was 84 years and all had at least three chronic medical conditions and had been prescribed at least four medicines, but both intervention and control groups had a high level of adherence to medication.
- Co-ordinated discharge plans did not reduce hospital re-admissions at 3 or 6 months. Neither did they affect numbers of deaths or outpatient or general practitioner attendance over 3 or 6 months. The only effect revealed by patient interviews was increased knowledge about their medication.

Acknowledgements

We thank the hospital and community pharmacists and the care of the elderly teams at the four hospitals who took part in the study, Nick Barber and John Farrell (active members on the steering group) and Stephanie Goubet who provided statistical advice on the project.

This study was funded by the National Health Service research and development programme on the primary/secondary care interface.

References

1. Cochrane R, Mandal A, Ledger Scott M, Walker R. Changes in drug treatment after discharge from hospital in geriatric patients. Br Med J 1992; 305: 694–6.

2. Cunningham G, Dodd T, Grant D *et al*. Drug related problems in elderly patients admitted to Tayside hospitals. Methods for prevention and subsequent reassessment. Age Ageing 1997; 26: 375–82.

3. Gray S, Dager M, Lestico M, Jalaluddin M. Adverse drug events in hospitalized elderly. J Gerontol A Biol Sci Med Sci 1998; 53: 59–63.

4. Manesse C, Derkx F, Ridder M *et al*. Adverse drug reactions in elderly patients as contributing factor for hospital admission: cross sectional study. Br Med J 1997; 315: 1057–8.

5. Coombes J, Horne R. A checklist for medication discharge planning. Pharm J 1994; 253: 161–3.

6. Bero LA, Mays NB, Barjesteh K, Bond C. Expanding outpatient pharmacists' roles and health services utilisation, costs and patient outcomes. In: Bero L, Grilli R, Grimshaw J, Oxman A eds. Collaboration of Effective Professional Practice Module of The Cochrane Database of Systematic Reviews. The Cochrane Library, Issue 1. Oxford: Update Software, 1998.

7. Barber N. Drugs: from prescription only to pharmacy only. Br Med J 1993; 307: 640.

8. Lipton Hl, Bero LA, Bird JA, McPhee SJ. The impact of clinical pharmacists' consultations on physicians' geriatric drug prescribing: a randomised controlled trial. Med Care 1992; 30: 646–58.

9. Lipton HL, Bird JA. The impact of clinical pharmacist's consultations on geriatric patients' compliance and medical care use: a randomised controlled trial. Gerontologist 1994; 34: 307–15.

10. Hanlon J, Weinberger M, Samsa G *et al*. A randomised controlled trial of a clinical pharmacist intervention to improve inappropriate prescribing in elderly outpatients with polypharmacy. Am J Med 1996; 100: 428–37.

11. Begley S, Livingstone C, Hodges N, Williamson V. Impact of domiciliary pharmacy visits on medication management in an elderly population. Int J Pharm Practice 1997; 5: 111–21.

12. Anon. Pharmacy discharge planning for the elderly. Pharm J 1994; 253: 23.

13. Folstein MF, Folstein SE, McHugh PR. The mini-mental state—a practical method for grading the cognitive state of patients for clinicians. J Psychiatr Res 1977; 12: 189–98.

14. Hunt SM, McKenna SP. A British adaptation of general well being index: a new tool for clinical research. Br J Med Economics 1992; 2: 197–207.

15. Larsen DL, Attkisson CC, Hargreaves WA, Nguyen TD. Assessment of client/patient satisfaction: development of a general scale. Eval Prog Planning 1979; 2: 197–207.

16. Dunel K, Cartwright A. Medicines—Takers, Prescribers and Hoarders. London: Routledge & Kegan Paul, 1972.

17. Beech E, Barber N. The development of a self reporting multidimensional work sampling measure to study ward pharmacy in the United Kingdom. J Soc Administr Pharm 1993; 18: 563.

18. Sidel MA, Beizer JL, Lisi-Fazio D *et al*. Controlled study of the impact of educational visits by pharmacists to high risk older patients. J Community Health 1990; 15: 163–74.

19. Argylle M, Newman C. An assessment of pharmacy discharge procedures and hospital communications with general practitioners. Pharm J 1996; 256: 569–661.

Received 9 May 2000; accepted in revised form 9 October 2000