

# Does home based medication review keep older people out of hospital? The HOMER randomised controlled trial

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## Abstract

**Objective** To determine whether home based medication review by pharmacists affects hospital readmission rates among older people.

**Design** Randomised controlled trial.

**Setting** Home based medication review after discharge from acute or community hospitals in Norfolk and Suffolk.

**Participants** 872 patients aged over 80 recruited during an emergency admission (any cause) if returning to own home or warden controlled accommodation and taking two or more drugs daily on discharge.

**Intervention** Two home visits by a pharmacist within two weeks and eight weeks of discharge to educate patients and carers about their drugs, remove out of date drugs, inform general practitioners of drug reactions or interactions, and inform the local pharmacist if a compliance aid is needed. Control arm received usual care.

**Main outcome measure** Total emergency readmissions to hospital at six months. Secondary outcomes included death and quality of life measured with the EQ-5D.

**Results** By six months 178 readmissions had occurred in the control group and 234 in the intervention group (rate ratio = 1.30, 95% confidence interval 1.07 to 1.58;  $P = 0.009$ , Poisson model). 49 deaths occurred in the intervention group compared with 63 in the control group (hazard ratio = 0.75, 0.52 to 1.10;  $P = 0.14$ ). EQ-5D scores decreased (worsened) by a mean of 0.14 in the control group and 0.13 in the intervention group (difference = 0.01, -0.05 to 0.06;  $P = 0.84$ ,  $t$  test).

**Conclusions** The intervention was associated with a significantly higher rate of hospital admissions and did not significantly improve quality of life or reduce deaths. Further research is needed to explain this counterintuitive finding and to identify more effective methods of medication review.

## Introduction

Adverse drug reactions, recently shown to cause more than 5% of hospital admissions, are significantly more likely in older patients.<sup>1</sup> Various factors contribute, including polypharmacy, age related physiological changes, and problems with adhering to drug regimens.

The national service framework for older people and the NHS plan recommend regular medication reviews for older patients.<sup>2,3</sup> An Australian study of a home based medication review-type intervention showed a 25% reduction in admissions and a reduction in deaths outside hospital.<sup>4</sup> We sought to investigate the impact on hospital admissions in the United Kingdom.

We chose home visits to ensure that the intervention could reach all very elderly participants and to allow pharmacists to gain insight into patients' methods of managing their drugs. The trial involved a large number of pharmacists delivering the intervention to ensure its generalisability.

## Methods

### Recruitment and assignment

Researchers recruited patients from 10 different hospitals if they were aged 80 or over, admitted as an emergency, intended to be discharged to their own home or warden controlled accommodation, and prescribed two or more drugs on discharge. We randomised patients to receive home based medication review or usual care. Randomisation was stratified by abbreviated mental test score and whether the patient was living alone.

Pharmacists could participate if they held a postgraduate qualification in pharmacy practice or had recent continuing professional development in therapeutics. All pharmacists participated in a two day training course.

### The intervention

A review pharmacist received a copy of the patient's discharge letter. At the home visit the pharmacist assessed patients' ability to self medicate and their drug adherence, completed a standardised visit form, educated the patient and carer, removed out of date drugs, reported possible drug reactions or interactions to the general practitioner, and reported the need for a compliance aid to the local pharmacist. One follow up visit occurred at six to eight weeks after recruitment to reinforce the original advice.

### Masking and the control group

Participants were told after randomisation which group they were in. The control group received "usual care." A small number of patients in both groups may have had their medication reviewed during the follow up period by their general practitioner or community pharmacist.

### Outcome data and analysis

The primary outcome was total number of emergency admissions to hospital over six months. Secondary outcomes included deaths, admissions to residential homes and nursing homes, and self assessed quality of life measured using the EQ-5D.<sup>5</sup>

We collected data on emergency admissions from hospital episode statistics. The Office for National Statistics provided mortality data. The project coordinator contacted all patients by telephone at three months

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and six months to collect data on admissions to nursing homes and residential homes and to maximise the response to mailed quality of life questionnaires. In addition, we collected data from practices containing more than 10 trial patients on contact with the general practitioners and items prescribed over the six month follow up.

We used Poisson regression to compare the number of admissions between groups and survival analysis to compare mortality between the two groups. In both analyses, we adjusted for the two stratification variables (living alone and confusion). We analysed the proportions admitted to nursing homes or residential homes by using the  $\chi^2$  test and changes in quality of life by using the two sample *t* test. We compared home visits by general practitioners and attendance at general practices by using Poisson regression, entering practice as a random effect.

**Sample size calculation**

A previous randomised controlled trial suggested that readmissions could be reduced by 25% in six months.<sup>4</sup> We aimed to show a reduction of 20%. Sample size calculations indicated that we needed to recruit 850 patients to have 90% power to show this reduction at the 5% significance level.

**Results**

*Participant flow and follow up*—We invited 1399 patients to participate after screening for eligibility between October 2000 and December 2002; 872 (62%) patients agreed and were randomised. After exclusions, primary outcome data were available for 829 (97%) patients. The two groups were very similar at baseline (see *bmj.com*).

*Review pharmacists and intervention visits*—We recruited 22 review pharmacists. Of 429 patients in the intervention group, 362 received first visits and 297 received second visits. Visits generated a total of 933 recommendations or comments to general practitioners (2.58/visited patient); 120 of these referred to possible drug reactions or interactions in 81 patients (22% of visited patients).

*Compliance aids and pharmacists' view of intervention*—Review pharmacists recommended compliance aids in 39 patients (11% of those receiving first visits). Overall, pharmacists felt visits were definitely or probably useful for 216 (73%) patients, and unlikely to be useful or not at all useful for 81 (27%) patients, generally when patients were found to be coping very well.

*Number of hospital readmissions*—A total of 178 emergency readmissions occurred in the control group and 234 in the intervention group (table). The Poisson model indicated a 30% greater rate of readmission in the intervention group (rate ratio=1.30, 95% confidence interval 1.07 to 1.58; P=0.009).

*Secondary outcomes*—Mortality data were available for 829 (97%) patients. Fewer deaths occurred in the intervention group (49 v 63). The hazard ratio for the intervention group compared with the control group was 0.75 (0.52 to 1.10; P=0.14). Data on residential or nursing home admissions were available on fewer patients, as these were collected by telephone (585, 68%). Fewer control patients than intervention patients were admitted to residential or nursing homes. These differences were not statistically significant (see *bmj.com*).

*Quality of life data*—Change in utility scores could be calculated for 308/380 (81%) surviving intervention patients and 284/362 (78%) surviving control patients. Both groups' scores decreased over the six month follow up period, but the changes were not significantly different between the groups. Scores on the visual analogue health scale (a separate part of the EQ-5D) also fell; the difference of 4.1 (95% confidence interval 0.15 to 8.09) units in favour of the control group was statistically significant (P=0.042).

*Primary care data*—We included 165 patients from 12 practices in this analysis (84 intervention, 81 control). General practitioners carried out 204 home visits in the intervention group and 125 in the control group, a difference of 43% (rate ratio=1.43, 1.14 to 1.80; P=0.002). No statistically significant differences occurred between the groups in attendance at general practices or prescription items received.

**Discussion**

Home based medication review by a pharmacist did not reduce emergency hospital admissions. Indeed, the intervention seemed to increase admissions by 30% and home visits by general practitioners by 43%. This finding was not balanced by improvements in quality of life. Although the overall EQ-5D utility score decreased in both groups, with no between group difference, scores on the visual analogue health scale decreased less in the control group than in the intervention group. In terms of numbers of deaths, results were not statistically significant but favoured the intervention group, with a hazard ratio of 0.75 but a wide confidence interval (0.52 to 1.10).

**Validity of the trial**

This trial was large, involving more than 850 patients. The entry criteria ensured a broad sample of elderly people discharged from hospital, which, together with the relatively high participation rate and the large number of pharmacists involved, means that the generalisability of these results should be high. Follow up of the main outcome was good—only 3% of participants withdrew or were lost to follow up. Hospital admission data, obtained from hospital episode statistics, are unlikely to have introduced bias. Quality

Number of emergency hospital readmissions by group during six months of follow up

Group	No of readmissions							Total admissions	Person years of follow up
	0	1	2	3	4	5	6		
Intervention	253	113	34	10	3	1	1	234	195.0
Control	281	99	26	5	3	0	0	178	191.6

### What is already known on this topic

Adverse drug reactions are an important cause of admission to hospital in elderly people

Patients have problems adhering to complex drug regimens

Medication review is recommended as a technique to reduce these problems

### What this study adds

Home based medication review by pharmacists may increase hospital admissions

More effective forms of medication review need to be established, considering patients' quality of life and effects on both hospital and general practice, as well as prescribing outcomes

of life data were provided by almost 80% of patients. Slightly more intervention patients than controls provided these at six months (81% *v* 78%), which could have introduced a bias. At three months, however, when response was almost equal, no between group differences were apparent. Overall, the internal validity of this study seems high, although it should be noted that follow up was only for six months. However, we can envisage no theoretical grounds for a delayed benefit emerging long after the intervention had ceased.

### Possible explanations for counterintuitive results

Given the high internal validity of this study, its results are unlikely to be explained by bias or confounding. We cannot exclude the possibility of a type I error (chance). If, however, we consider the findings to be causally related, three possible explanations should be considered. The first is that pharmacists did help patients to understand their conditions better. This could have promoted better help seeking behaviour, leading to more hospital admissions. This positive view is weakly supported by the non-significant decrease in deaths observed.

Two less favourable interpretations are possible. Previous studies have shown that interventions of this type by pharmacists tend to increase adherence to prescribed drugs.<sup>6-9</sup> Our patients were prescribed large numbers of daily drugs (mean = 5.9/day). By encouraging better adherence, our pharmacists may have precipitated iatrogenic illness that previously had been avoided. Finally, by visiting our patients at home and spending reasonably long periods of time there, we may simply have added to the complexity of their care, and increased anxiety and confusion or dependence on health services.

### Evidence from other trials

Since this trial started, three large UK studies of community based medication review in elderly people have been published.<sup>10-12</sup> Two showed non-significant decreases in admissions,<sup>10 11</sup> whereas the other showed a non-significant increase in admissions.<sup>12</sup> These results, in combination with ours, indicate that it cannot be assumed that community based medication

review necessarily reduces admissions, despite evidence from overseas.<sup>4</sup> Although our finding on mortality is potentially encouraging, UK results on this outcome are equivocal, with mixed, non-significant results.<sup>10-12</sup>

### Conclusion

Our trial suggests that home based medication review for older people recently discharged from hospital increased hospital admissions. It also seemed to worsen patients' quality of life compared with controls. Further research is necessary to elucidate the most effective form and detailed effects of medication review.

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Competing interests: AL works for a primary care trust, an organisation that pays for healthcare services and would be interested in an intervention that has been shown to reduce unnecessary readmissions to hospital. The trust's predecessor, Norfolk Health Authority, contributed some funding towards this study.

Ethical approval: The protocol for this study received ethical approval from Norwich District, King's Lynn, Great Yarmouth and Waveney, and Ipswich local district ethics committees.

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