Review Article

Delivering a home-based medication review, process measures from the HOMER randomised controlled trial

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REZUMAT

Obiectiv: Experimentul HOMER (HOme-based MEdication Review) a cercetat dacă tratamentul medicamentos ambulatoriu supravegheat de farmacişti ar putea să scadă numărul reinternărilor persoanelor în vârstă. Experimentul a demonstrat că intervenţia a crescut numărul internărilor cu 30% (P=0.009). Această descoperire neaşteptată a provocat un deosebit interes. Lucrarea de faţă descrie intervenţia în detaliu şi măsurătorile înregistrate de farmaciştii supraveghetori, investigând dacă rezultatele au variat în funcţie de caracteristicile farmacistului.

Metoda: 437 de pacienţi au participat la intervenţie, care a presupus câte două vizite la domiciliu ale farmaciştilor, pe parcursul a 2-8 săptămâni, iar 435 de pacienţi au fost îngrijiţi cu metodele obişnuite. A fost realizată o analiză a măsurătorilor procesului pentru a determina dacă rata internărilor diferă în grupul de intervenţie, în funcţie de farmacistul supraveghetor.

Ce a reieşit din acest studiu: Au participat 22 de farmacişti. Majoritatea (68%) aveau o experienţă îndelungată (media de vârstă = 42 de ani), iar 71% aveau studii postuniversitare. Farmaciştii au descoperit reacţii medicamentoase adverse la 33% dintre pacienţi şi au făcut o medie de recomandări/comentarii de 1.6 la fiecare vizită. Cel puţin 35% dintre acestea au fost puse în practică. Farmaciştii au redus modul inadecvat de păstrare a medicamentelor de la 7% la 2%, la pacienţii supravegheaţi, încă de la a doua vizită (P=0.04) şi depozitarea medicamentelor inutile de la 40% la 19% (P<0.001). În final, rata internărilor în grupul de intervenţie nu a variat semnificativ în funcţie de experienţa sau tipul farmacistului supraveghetor.

Concluzii: Experimentul HOMER a mai fost realizat într-un mod asemănător şi în cadrul altor studii asupra medicaţiei. Având în vedere concluziile HOMER, este clar că e nevoie de o rafinare de urgenţă a acestui tip de intervenţie, de identificarea celei mai potrivite locaţii pentru a fi pus în practică şi de implementarea unui training care să poată asigura executarea lui cu o eficienţă maximă.

ABSTRACT

Objectives: The HOme-based MEdication Review (HOMER) trial investigated whether home-based medication review by pharmacists could decrease hospital re-admission in older people. This trial demonstrated that the intervention increased admissions by 30% (*P*=0.009). This unexpected finding provoked significant interest. This paper describes the intervention in detail and the process measures recorded by review pharmacists, and investigates whether results differed according to pharmacist characteristics.

Method: 437 patients were randomised to the intervention, which involved two pharmacist home visits within two and eight weeks of discharge, and 435 were randomised to usual care. An analysis was undertaken of the process measures and to determine whether admission rates differed within the intervention group according to the type of pharmacist performing the review.

Setting: Norfolk or Suffolk patients aged over 80 years discharged to their own home after an emergency admission (any cause), and taking two or more medications daily.

Key findings: Twenty-two pharmacists participated. The majority (68%) were experienced community pharmacists (mean age=42 years), 71% had a postgraduate qualification. Pharmacists identified adverse drug reactions in 33% of patients and made a mean of 1.6 recommendations/comments per visit undertaken. At least 35% of these were enacted. Pharmacists reduced inappropriate drug storage from 7% to 2% of visited patients by their second visit (*P*=0.04), and reduced hoarding of unnecessary drugs from 40% of visited patients to 19% (*P* < 0.001). Finally, the rate of admission within the intervention group did not vary significantly according to experience or type of pharmacist delivering the intervention.

Conclusion: The HOMER intervention was conducted in a similar way to interventions in many other medication review studies. Given the HOMER trial's counter-intuitive findings it is clear that there is an urgent need to refine this intervention, identify the most suitable location for its delivery, and develop training that can ensure it is delivered to best effect.

INTRODUCTION

Drug treatment in the elderly is often complicated by multiple medications, age-related physiological changes and adherence difficulties. These may increase hospitalisation and mortality, and decrease quality of life. Medication review in the elderly has been recommended as a routine part of care within the 'National Service Framework [NSF] for older people'. (1)

The case for pharmacists to perform home-based medication review visits was suggested formally in the Nuffield Committee of Inquiry into Pharmacy

in 1986. (2) Over the course of the next ten years a number of uncontrolled studies reported the effects of home-based medication review. These suggested that such interventions may improve adherence, (3) reduce drug hoarding, (4) improve drug storage, (5) and reduce drug discrepancies between general practitioners (GPs) and their patients. (5)

One UK study published in 1999 demonstrated that, among a sample of over 1000 patients aged over 75 years, who were on four or more repeat medications, 58% could not collect their prescriptions in person. (6) This suggests that, for older patients on multiple repeat drugs, offering a medication review in their own home is likely to be more acceptable than offering it in either the local pharmacy or GP surgery. Equally, it is possible that the increased privacy afforded by reviewing patients in their own home encourages more open discussions about adherence issues. (3)

At the time that the HOMER trial (HOme-based Medication Review trial) was conceived, only three randomised controlled trials (RCTs) of home-based pharmacist interventions had been performed. One, carried out in the UK, (7) confirmed previous findings of impacts on drug hoarding and storage, and demonstrated a reduction in primary care visits, but did not measure hospital admissions. A study from New York (USA) was limited by its differential follow-up between groups, but suggested a potential for decreased health service utilisation, although it did not measure hospital admission. (8) Finally, a large, well-conducted study by Stewart and coworkers, undertaken in Australia, demonstrated important reductions in numbers of hospital re-admissions (25% reduction), though in this case the intervention involved a nurse and a pharmacist. (9)

Given the limited RCT evidence on the effectiveness of a pharmacist home-based medication review, we wished to investigate whether such an intervention could decrease hospital admission in the elderly and improve quality of life. The HOMER trial recruited 872 participants (437 intervention and 435 control) aged over 80 years, during an emergency admission (any cause). Eligible participants needed to be taking two or more medications daily and be returning to their own home or warden-controlled accommodation. The primary outcome was total number of emergency hospital admissions occurring over the six-month follow-up period. As previously reported, this trial demonstrated that the intervention actually increased hospital admissions by 30% (P=0.009). (10) This unexpected finding provoked significant interest in the intervention undertaken and the training of the review pharmacists. (11–14) This paper describes in more detail the intervention, the process measures recorded by the review pharmacists, and investigates whether the results differed according to specific pharmacist characteristics.

METHODS

The HOMER trial received ethical approval from Norwich Local Research Ethics Committee. Full details of trial methods have been published elsewhere. (10)

Selection of review pharmacists

Pharmacists were recruited from Norfolk and Suffolk through advertising in the local pharmaceutical committee (LPC) newsletters and the Norfolk Prescriber bulletin (distributed by Norfolk Health authority to Norfolk GPs and pharmacists). Interested pharmacists completed an application form detailing qualifications, postgraduate training, continuing professional development, and experience of medication reviews; and a single reference was sought.

Training of review pharmacists

Participating pharmacists were given further training in medication review, which involved an intensive two-day training course. Academic input was provided by pharmacy educators from The University of East Anglia's (UEA's) Academic Pharmacy Practice Unit, a lecturer from the University of Brighton supported by patient actors, and a pharmacy continuing professional development (CPD) trainer. Panel 1 lists the sessions provided.

Panel 1 Seminars provided during two-day intensive review pharmacist training course

Day 1

- Common adherence problems in the elderly
- Compliance/adherence/concordance – what's the difference?
- Intentional non-adherence (advances in health psychology, understanding the patients' perspective, perceptions of illness, beliefs about medicines)
- Unintentional non-adherence and adherence aids
- Drug history taking
- Role-play of adherence problems

Day 2

- The journey of a TTO ('to take out' drugs i.e. hospital discharge medication)
- Adverse drug reactions (ADRs)
- Drug interactions
- Drugs and the elderly
- Medication review
- Psychiatric medication in the elderly
- An overview of the trial: 'What happens when . . . ?'

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The intervention

The intervention was based on a format previously used during a pilot on 48 Norfolk patients. (15) At the time this trial was planned (1999), there were few UK examples of home-based medication review interventions and the document 'Room for review', which describes medication reviews in detail, was not published for a further three years. (16)

Once a patient had been randomised to the intervention group the trial co-ordinator allocated them to a review pharmacist according to the pharmacists' availability, which pharmacist lived or worked closest to the patient, and the number of previous visits performed by that pharmacist. Where two pharmacists lived equidistant from a patient, the pharmacist who had performed least visits was offered the new patient first. Visits were expected to occur within 14 days of discharge. The review was planned to occur before patients exhausted their supply of hospital drugs, so that the patient's GP could institute recommendations made as a result of the visit. Review pharmacists were faxed the patients' drug discharge letter containing a list of medications prescribed at the time of discharge, and a patient information sheet. This gave contact details for the patient, their carer/next of kin and GP, details of what assistance they currently received with their medication and their abbreviated mental test score (a measure of confusion). (17)

Once a review pharmacist had agreed a visit, they were expected to arrange their first visit with the patient (plus carer if appropriate) and review the discharge medication, considering the dose, frequency, length of time it would be prescribed for, likely side-effects and special considerations (e.g. drugs to be taken with food). The review pharmacists were expected to consider the regimen as a whole, with regard to drug interactions and the potential for interactions with common over-the-counter (OTC) preparations. Where necessary, the review pharmacist was advised to contact the discharging medical team if questions remained about the treatment or management of the patient.

During the first home visit, pharmacists were expected to make a simple assessment of the patient's physical ability in terms of sight (good, glasses/ partially sighted, blind), hearing (good, hard of hearing/hearing aid, deaf), speech (good, slow, difficult to understand), manual dexterity (good, small non-clic-loc top, large non-clic-loc top), swallowing (good, small tablets only, liquids only), and literacy (good, fair understanding, illiterate). This basic assessment was to assist them when considering suitable forms of medication support where that was necessary. In addition, the pharmacists ascertained the patient's alcohol consumption, whether the patient was a smoker and known allergies.

Pharmacists then asked to see all prescribed medications currently taken, checking this by probing with appropriate questions, and ensuring that they were aware of all OTC medications that a patient took. Pharmacists were asked to probe OTC use with questions such as: 'What do you normally take if you have a headache?'

At that stage pharmacists were asked to ascertain for each drug:

- does the patient know why they take this drug?
- does the patient know how often they should take this drug?
- is the patient aware of special considerations about this drug?
- does the patient know how long they will take this drug for?
- does the patient think that they are suffering any
- side-effects?
- does the patient have any practical difficulties taking this
- drug?

Review pharmacists were then expected to reconsider the medication regimen as a whole and check for risk of important adverse drug reactions (ADRs) or drug interactions, and note these on the medication review form. If so, these were also to be reported to the GP as part of their feedback.

Finally, the pharmacist was expected to check medication storage. Given that the patient had recently been in hospital it was also important to check that the patient was aware of drugs that had recently been discontinued and to check whether patients were 'hoarding' medication that they no longer required or was out of date. If so, they sought the patient's (and carer's) permission to remove these drugs.

Having completed the review, it was intended that the pharmacist should have an understanding of any adherence problems. They were expected to enquire if the patient or carer thought they needed help with their medications, and to consider what might help. Interventions could include a wide variety of aids, such as large-print labels for sight problems, non-childproof lids for grip problems, and ensuring the time schedule of drugs coincided where possible and fitted a patient's routine. Pharmacists could also provide an adherence aid if they thought

it would help. They carried Medidos (standard and maxi), Dosett (standard and maxi) and NOMAD systems with them during the visit. Pharmacists judged whether an aid should be filled by the patient or carer, or whether the local pharmacist should be asked to fill it. Local pharmacists were paid a fee (of £3/patient/week) to fill an aid where this was recommended.

It was emphasised in the trial medication review manual (provided to each review pharmacist) that the visit was a chance to 'genuinely probe a patient for their knowledge, understanding and attitudes to taking their medication'. (18) Pharmacists were also reminded that 'many [patients] may have good reasons for avoiding taking certain tablets and this should, if possible, be explored'. (18)

At the end of the first visit, pharmacists:

- summarised the patient's medication problems and course of action to be taken
- left a letter stating who they were and that they had visited
- checked that the patient (and carer) understood and was happy with the advice given.

Review pharmacists were expected to provide feedback to the patient's GP and local pharmacist following their first visit, using template letters provided, and to telephone the GP if they had important concerns. Equally, they were expected to telephone the local pharmacist if they wanted an adherence aid filled, and to deliver two aids to that pharmacist.

Prior to the follow-up visit, which occurred between six and eight weeks post-discharge, review pharmacists were asked to contact the patient's GP to establish if the drug regimen had changed. This was also an opportunity to check if any major events had occurred during the preceding six-week period. Again, they were asked to review the current drug regimen as a whole.

The follow-up visit was to establish:

- whether the recommendations from the first visit had been implemented by the patient, GP, or pharmacist
- whether the recommendations had helped the patient
- whether new problems now existed for the patient.

The pharmacist was expected to recheck what drugs the patient was taking and the patient's knowledge of their drug regimen, and again check for ADRs, drug storage problems and drug hoarding. Again, the pharmacist was expected to agree with the patient any new recommendations. As before, the pharmacist sent letters to the patient's GP and pharmacist. Shortly after the trial commenced recruitment, the document 'Implementing the medications related aspects of the NSF for older people' was published. This included a format for a detailed medication review. (19) Table 1 compares this to the HOMER intervention, and highlights that the trial intervention closely mirrored national recommendations with two exceptions. The review pharmacists could not necessarily check whether drugs were appropriate, as they did not have access to clinical notes. Furthermore, lack of access to clinical notes meant it was not possible for the pharmacists to check whether drugs were being monitored. Instead, review pharmacists were expected to recommend drug monitoring where appropriate.

Table 1 Comparison of the National Service Framework (NSF) for Older People's recommended format for a detailed medication review and the HOMER trial intervention

Component described in NSF for older people	Trial intervention
Explanation of the purpose of the review	✓
Compilation of list of drugs being taken, including over the counter medicines	✓
Comparison of list of drugs taken with the list of drugs prescribed	✓
The patient's perception of the purpose of the drug	✓
The patient's understanding of how much, how often and when drugs should be taken	✓
Application of prescribing appropriateness indicators	×
Are any side-effects being experienced?	✓
Review of relevant monitoring tests	×
Review of practical aspects of drugs	✓
Ordering and receiving repeats	✓
Removing drugs from containers	✓
Swallowing tablets	✓
Reading labels	✓
Forgetting to take drugs	✓
Concordance discussion	✓
How is the client actually taking medicines?	✓
Do they have any concerns, or questions?	✓
Does the patient understand and accept the reason for their medicine?	?[a]
What support is needed?	✓

[a]Pharmacists were not always in a position to know the reason for a drug being prescribed (as they did not have access to the GP notes), although in general this would have been clear to them.

Trial data recorded

Review pharmacists completed a detailed medication review form when they visited a patient (available from the authors on request). Second-visit forms were similar to the first form but also detailed recommendations from the first visit so that these could be confirmed as enacted or not. Review pharmacists recorded travel times, and time in the patient's home, and time spent on administration. They also sent letters to GPs and local pharmacists,

copies of which were held by the trial so that data on comments and recommendations could be extracted.

Review pharmacist fee

Review pharmacists received a fee of £110 per patient reviewed, inclusive of all components described above and travel undertaken. This fee had been negotiated between the trial team and both Norfolk and Suffolk LPCs.

Data management and analyses undertaken

The findings of this study with regard to hospital admission, quality of life and primary care activity are described elsewhere. (10) Hospital admission data were also used in the analyses conducted for this paper (as described below). These admission data were collected from hospital episode statistics (HES data). Where HES data were unavailable the relevant hospital patient administration system (PAS) was checked. In addition, all admissions occurring within seven days of a previous discharge were checked on PAS to ensure second admissions were genuinely new admissions and not part of the previous stay. Where any ambiguity remained, patient notes were checked.

In this paper, data are presented on the length of the interventions, the number of ADRs noted by the review pharmacists, and the recommendations made by the review pharmacists to the patients' GPs and community pharmacists. The effects of the review pharmacists in terms of improving drug storage and reducing drug hoarding were compared between the two visits, using a test of paired proportions. These data were all recorded by the review pharmacists on the medication review forms.

An observational analysis was performed using hospital admission data on intervention group participants only. This investigated whether rates of admission differed within the intervention group, according to different characteristics of the review pharmacist. For this analysis review pharmacists were grouped into the following categories: period since first registration (above versus below or equal to median); numbers of interventions performed (above versus below or equal to median); higher degree obtained (diploma/master's/PhD) versus no higher degree; previous experience of medication review versus no previous experience; and hospital pharmacist versus other. This analysis was conducted using STATA version 8.0.20 As this was an observational analysis, attempts were made to adjust for important potential confounders. The following patient baseline characteristics had been found to increase admission rates: use of an adherence aid at baseline, male sex, above median (> 5) numbers of discharge medications, abbreviated mental test score (a measure of confusion), and discharge from an acute as opposed to a community hospital. The analysis was conducted twice, initially comparing admission rates within the intervention group by pharmacist characteristic alone, and then adjusting for the potential confounders described above.

RESULTS

A total of 22 review pharmacists took part in this trial, visiting 362 patients. The level of experience was high (a mean of 17 years post-qualification). Table 2 describes the pharmacists' background and experience. On average pharmacists spent just over 4.5 h delivering each intervention, drove 38 miles, and made four telephone calls. Only 33% of the total intervention time was spent with patients (mean, 95 min; standard deviation, 38 min). Thirty-one per cent of a review time involved some form of administration (e.g. contacting a GP or pharmacist). Furthermore, despite having over 22 pharmacists across Norfolk and Suffolk, many still traveled appreciable distances to reach patients; thus travel took up a further 36% of review time.

Figure 1 shows the variation in total visit length between pharmacists. There was no association found between length of visits and number of visits performed (Spearman=0.17, P=0.47), nor was there any apparent change in the length of visits as the trial progressed (Spearman =-0.06, P=0.24).

Table 2 Demographic details of HOMER pharmacists

Characteristic	
Female, n (%)	13 (59.1)
Age, years (SD)	41.8 (7.4) range: 31 to 59
Years (SD) since first registration	17.4 (8.2) range: 4 to 36
Higher qualification after registration n (%)	
Diploma/master's/PhD	7 (31.8)
Postgraduate certificate	9 (40.9)
Main employment, n (%)	
Community pharmacist	12 (54.5)
Locum community work	3 (13.6)
Hospital pharmacist	5 (22.7)
Other	2 (9.1)
Courses taken, n (%)	
Domiciliary visiting	3 (13.6)
Medication review (or similar)	11 (50)
Adherence/adherence aids	6 (27.3)
Previous experience of medication review, n (%)[a]	13 (76.5)
Previous experience of domiciliary visiting, n (%)[a,b]	5 (29.4)
Previous experience of supplying adherence aids, n (%)[a]	16 (94.1)

SD: standard deviation.
[a]Data on only 17 pharmacists.
[b]Not including delivery of drugs or supply of oxygen.

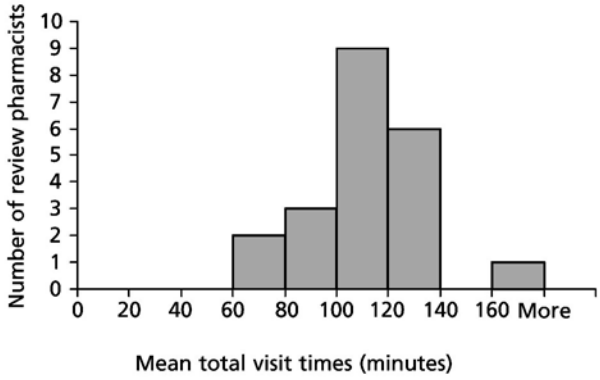

Figure 1 Variation between pharmacists in length of visits (first plus second visit).

Adverse drug reactions

Pharmacists noted 63 likely ADRs/drug interactions after their first visit (17% of visited patients), and 24 after their second visit (8%) within the medication review forms. Half of the second visit cases (12 patients) had been noted during their first visit. Thus, across both visits, review pharmacists noted ADRs in 75 patients (21%).

Pharmacists were also asked to make comments and recommendations to GPs in a feedback letter. Reviewing these letters revealed that pharmacists clearly reported 60 ADRs/drug interactions, and a further 60 could be inferred from their comments. These 120 problems occurred in 80 patients. However, not all 75 patients where an ADR had been recorded on the medication review form (described above) led to a comment or recommendation in the GP letter. Equally, pharmacists made recommendations and comments about ADRs to GPs without recording these on the medication review form. Overall, ADRs were noted in some way in the review pharmacists' documentation on 119 patients (33% of visited patients).

Storage of medications

At the first visit, 26 patients were found to be storing drugs inappropriately (7% of visited patients), while only six patients were found to be storing drugs inappropriately (2%) at their second visit. The difference in paired proportions (allowing for missing data) was 3.5% (95% confidence interval (CI) 0.3 to 7.0%, P =0.04), suggesting that pharmacists improved drug storage.

Medication hoarding

Review pharmacists investigated whether patients held medication that was out of date, duplicated or no longer required. At the first visit pharmacists identified such drugs in 146 patients (40%); 129 of these patients agreed to allow the pharmacist to dispose of these drugs (88%). At their second visit pharmacists found only 55 patients (19%) were storing duplicate, out-of-date or no longer required medication, and 50 agreed to have these drugs removed (91%). The difference in paired proportions for 'hoarding' was 24.1% (95% CI 17.7 to 30.3%, $P < 0.001$, McNemar's test), suggesting that pharmacists successfully reduced this.

Pharmacist recommendations to GPs

First visits generated a total of 654 recommendations or comments (1.80 per visited patient). Second visits generated 317 recommendations or comments (1.1 per second visit); 38 of these had also been made after the first visit. No comments or recommendations were made at either visit for 71 patients (20% of visited patients). Table 3 summarises all 933 recommendations or comments made; 75% (n=701) of recommendations and comments referred to medication or medication monitoring, which was clearly the focus of the intervention.

Table 3 Summary of recommendations/comments made to GPs

Recommendations/comments to GP	Number of recommendations/ comments	%
Specific drug-related recommendation	401	43.0
General comment about medication	219	23.5
Request for GP to monitor patient	81	8.7
Comment about patient's physical state	78	8.4
Comment about patient education	58	6.2
Comment about social circumstances	44	4.7
GP to arrange care or visit patient/carer	22	2.4
Other comment	30	3.2
Total	933	

Action following recommendations

Altogether, 577 recommendations required some form of action on the part of the GP (62%) with reference to a patient's drug regimen. Pharmacists were only in a position to find out if certain of their recommendations had been implemented (e.g. a change in dose, or discontinuing a drug). Implementation was generally inferred from the patient's current drug regimen at the time of the second visit, as pharmacists did not have access to GP notes. Of the 415 drug recommendations made after the first visit, 153 (35%) were recorded by the pharmacists as implemented, 83 (20%) were recorded as not implemented, and there was no record for 181 (44%).

Recommendations to local pharmacists

Review pharmacists recommended an adherence aid in 10.8% of those receiving first visits (39

patients; 23 filled by the community pharmacist, 16 by the patient or carer). In addition, review pharmacists made a total of 87 other recommendations or comments to the local pharmacists after their first visit, and 25 after their second visit (of which 15 were repeated from their first visit). The total of 97 recommendations applied to 60 intervention patients (17% of visited patients), and are described in Table 4. Of the recommendations made, 86 required that the local pharmacist took some form of action (e.g. providing bottle tops with wing caps, or cutting a tablet in half). Review pharmacists could only provide data on recommendations from their first visit. Of the 78 such recommendations which required action, 30 (38%) were implemented, 8 (10%) were recorded as not implemented and there was no record for 40 (51%).

Table 4 Summary of recommendations/comments made to local pharmacists

Recommendations/comments to local pharmacist	Number of recommendations/ comments	%
Non-childproof tops	36	37.1
Large-print labels	10	10.3
Delivery of medications or collection of prescription	8	8.2
Supply large bottle or wing caps	8	8.2
Request to halve tablets or remove from blister pack	7	7.2
Advice about monitored dosage system	5	5.2
Other drug-related request (for action)	12	12.4
General comment about drugs	4	4.1
General comment about social circumstances	7	7.2
Total	97	

Effect of review pharmacist characteristics on the intervention

Table 5 describes the observational analyses performed within the intervention group, investigating the effect of different pharmacist characteristics. This demonstrated no significant differences between the pharmacists grouped using any of the variables specified. Furthermore, adjusting results for potential confounding factors made little difference to the results. Within Table 5 it should be noted that having a higher degree was not associated with being a hospital pharmacist (as the rate ratios appear similar). Equally, having had a longer period since registration was not related to having previous experience of domiciliary visits (again the rate ratios appear similar).

DISCUSSION

Main study findings

Pharmacists involved in the HOMER trial tended to be experienced community-based pharmacists, with over 70% having some form of postgraduate qualification. These pharmacists appeared conscientious in their approach to delivering the trial intervention. While patients were visited for an average of over 90 min, the pharmacists spent 4.5 h delivering the whole intervention when administration and travel times were included.

Review pharmacists identified ADRs or drug interactions in approximately 33% of visited patients. The intervention appeared to improve storage of medications and to decrease drug hoarding. Pharmacists made an average of 1.6 recommendations or comments per visit undertaken, with the majority referring to drug-related issues. Finally, this study found no evidence that the admission rate within the intervention group varied according to different characteristics of pharmacists.

Strengths and limitations of the study

This study was a large pragmatic RCT of a medication review intervention. When devised it appeared to test an appropriate intervention for a

Table 5 Observational analyses investigating the effect of review pharmacist characteristics on outcome

	Admission rate ratio between groups of pharmacists (adjusted rate ratio[a])	*P* value	95% CI
Longer period since registration versus shorter (above versus below/equal to median)	0.88 (0.89)	0.36	0.67–1.18
More visits performed versus fewer visits (above versus below/equal to median)	0.96 (1.01)	0.81	0.71–1.31
Higher degree versus no higher degree	1.21 (1.24)	0.23	0.89–1.64
Previous experience of medication review versus no previous experience	1.02 (1.06)	0.89	0.76–1.36
Previous experience of domiciliary visits versus no previous experience	0.78 (0.77)	0.15	0.56–1.09
Hospital pharmacist versus other	1.20 (1.03)	0.41	0.78–1.86

[a]Adjusted for patients' baseline abbreviated mental test score, sex, number of drugs, use of an adherence aid and site of baseline discharge (acute hospital versus community hospital).

number of reasons. First, it targeted a group at high risk of hospital admission (patients aged over 80 years, discharged home after an emergency admission). Second, patients on discharge are vulnerable to confusion over the medication changes that occur as a result of their hospital stay. Thus, this intervention was intended to resolve such problems. Third, by visiting patients at home it was hoped pharmacists would have a privileged insight into the techniques patients used to manage their medication, as well as potentially having a more open discussion about adherence. Fourth, by involving a variety of pharmacists, we generated a sufficiently large team to deliver such an intervention over two counties.

A large pragmatic trial such as the HOMER trial had limitations. The training provided encompassed two full days of relevant seminars, but its length was necessarily limited by the pharmacists' availability, and was additional to their normal work routine. An alternative would have been to use smaller numbers of highly trained clinical pharmacists. However, results from such a study would have been less generalisable. Equally, it could be argued that the patient's usual pharmacist would have been best placed to perform the review. Negotiating such a model in 1999 and providing training to such a large number of pharmacists across two counties would have been very difficult.

The information provided to review pharmacists was designed to be very similar to that routinely produced on discharge, and provided limited clinical information on which to base their medication review. Ideally, the level of detail would have been standardised, but inevitably this varied by discharging doctor. Again, as this trial was attempting to test whether this service would be successful alongside the current discharge process, we did not wish to interfere with standard practice. Equally, it would have been ideal if the pharmacists had access to either hospital or GP patient records. Providing access to such notes would have been difficult, requiring negotiations with over 150 practices, while accessing hospital records would have been an enormously time-consuming task.

An additional problem was pharmacists' lack of direct access to GPs to discuss recommendations. It is possible that a closer pharmacist–GP relationship would have assisted in ensuring recommendations were enacted. Again, negotiating such access would have been complex.

It should be acknowledged that the data collected on the medication review forms was only collected on intervention patients, and was not collected 'blind'. Thus, it is possible that pharmacists were biased when reporting storage or hoarding problems. Equally, after an interval of only 6–8 weeks between the two visits, there was probably insufficient time for significant medication hoarding to have re-occurred. Furthermore, reporting of ADRs varied between pharmacists. While some noted ADRs on their GP letters, others recorded these on the trial forms. It is possible that the latter occurred where the ADR was considered trivial, or unavoidable.

A further criticism of the data reported is that it was very difficult to be sure whether recommendations had been implemented by GPs, as no contact was necessarily made with GPs. Thus, we have assumed that the pharmacists' record of action was correct, and that these occurred as a result of their recommendations. Equally, review pharmacists themselves only commented on GP action in just over half (56%) of those that received a first visit.

The analysis of the effect of different pharmacist characteristics on the rate of readmission was an observational analysis. As such it is possible that results were affected by confounders that were not adjusted for in the analysis. Furthermore, as the analysis was conducted solely among patients who received the intervention, the numbers involved were smaller than in the main study. Thus, it is possible that the analyses had insufficient power to detect differences between pharmacists. Nevertheless, none of the analyses approached statistical significance (e.g. $P<0.1$).

Finally, it should be noted that a qualitative study was embedded within the HOMER trial. This aimed to elucidate in depth what occurred between review pharmacists and patients during the home visits. We plan to publish data from this study in due course. (21)

Findings in the context of other medication review trials

In comparison to other home visiting studies, this trial's first visit tended to be longer than those reported elsewhere. Four UK home visiting studies delivered first visit interventions of between 38 and 56 min. (5,22–24) Three of these also visited on a second occasion. Second visits lasted between 27 and 37 min; again this was generally shorter than HOMER second visits. (5,22 23)

The proportion of patients with an ADR noted by HOMER pharmacists is similar to that found in five previous studies of medication review. These found ADRs in between 25% and 40% of patients. (5,22,25–27) Two studies have found quite different prevalences of ADRs. Zermansky and coworkers, in a large UK RCT involving over 1000 patients,

recorded ADRs in only 4% of patients, but these were serious adverse reactions. (28) In contrast, Grymonpre and colleagues, in a small study from Canada, found ADRs in 85% of 20 reviewed patients. (29) Whether, those patients were in some way different to those recruited by the other studies is not clear.

Inappropriate storage was only found in 7% of patients at the first visit, far less often than that found by Begley and coworkers in a similar group of patients (26%), (7) or by Naylor and Oxley (41%). (22) Others have not recorded the prevalence of storage problems. In both Begley's trial and the HOMER trial, storage problems remained in only 1 in 4 of those initially found to have storage problems.

Excess drugs were found in a very high proportion of patients visited (40%). Nevertheless this was a lower proportion than that found by Begley et al. (85%), (7) or that found by Schneider and Barber (51%), (5) but was in line with the prevalence found by Grymonpre and colleagues (33%). (29) Again, irrespective of baseline prevalence, the HOMER trial confirmed previous evidence that hoarding could be reduced. (7) Begley's intervention effectively removed hoarding altogether, while the HOMER intervention found hoarding still present in 19% of intervention patients who received a second visit.

It is difficult to directly compare the numbers of problems identified by pharmacists in this study with those reported by others. Previous studies have reported markedly differing numbers of drug-related problems within their patient populations, as each had different techniques for recording problems or recommendations. In addition, while some medication review studies have only included one intervention visit, (28–31) others have included repeated interventions. (5,7,22,25,32,33) When estimates are made of recommendations per visit, as opposed to per patient, these vary from 0.2 recommendations/visit to 14.4 recommendations/visit.7,30 Across 16 pharmacist- led medication review studies that have reported data on numbers of recommendations made, the median number of recommendations per visit was found to be 1.9, compared to HOMER trial pharmacists who identified 1.6 recommendations per visit. (5,10,22,24–26,28–37)

In terms of the proportion of recommendations enacted, this is also likely to have been calculated in differing ways. Most researchers either questioned GPs/physicians to establish whether recommendations were enacted, or sought evidence in patient records. The method adopted in HOMER (pharmacist report) is likely to have under-recorded recommendations enacted, particularly given that no comment was made in a high proportion (56%) of second visits. Questioning GPs directly may lead to inaccurate assessment, as they may not remember all actions they perform. Equally, patient records may be incomplete. Nevertheless, the trials identified seemed to fall into two groups: those where between 30% and 50% of recommendations were enacted, and those where over 70% of recommendations were enacted. All trials with a higher proportion of recommendations enacted involved either a single pharmacist able to communicate in person with physicians/GPs, or pharmacists able to enact their own recommendations. (26,32)

The HOMER trial produced results similar to studies involving multiple pharmacists (i.e. between 30% and 50% of recommendations enacted). (5,25,31) The results of two Canadian home visit studies should also be noted. These used a single pharmacist consultant, but noted a poor uptake of recommendations (29% and 31% uptake). (29,30) Recommendations weremade by letter to the patients' physicians. This is a similar, rather impersonal approach, to that followed within the HOMER trial, although HOMER review pharmacists were encouraged to telephone GPs when making important clinical recommendations.

CONCLUSIONS

The HOMER intervention was conducted in a similar way to interventions in many other medication review studies. The intervention was as long as, or longer, than other home visit interventions. The review pharmacists identified a similar prevalence of ADRs to those identified by other studies. Comparison of the proportion of recommendations enacted between this study and other medication review studies reveals that while HOMER findings were in line with studies involving multiple pharmacists, far fewer recommendations were enacted than in those studies involving single pharmacists in close liaison with prescribers, or those where pharmacists could make their own changes. It is therefore of concern that the NHS is about to adopt a similar approach, involving community pharmacists reviewing patients at a distance from the GPs who make the patient's treatment decisions, and without giving pharmacists full access to patients' clinical information. (38) Finally, the increased rate of admission observed in the intervention group of this trial appears not to have been related simply to the experience or type of pharmacists involved.

Given the HOMER trial's counter-intuitive findings of an increase in hospital admissions in those receiving home-based medication review, it is clear that there is an urgent need to further refine this intervention, investigate its effect from the patients' perspective, identify the most suitable location for its delivery, and develop training that can ensure it is delivered to best effect.

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