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RESEARCH ARTICLE

Patient-centred advice is effective in improving adherence to medicines

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Abstract
Objective To assess the effects of pharmacists giving advice to meet patients' needs after starting a new medicine for a chronic condition.
Method A prospective health technology assessment including a randomised controlled trial of a pharmacist-delivered intervention to improve adherence using a centralised telephone service to patients at home in England. Patients were eligible for recruitment if they were receiving the first prescription for a newly prescribed medication for a chronic condition and were 75 or older or suffering from stroke, cardiovascular disease, asthma, diabetes or rheumatoid arthritis.
Main outcome measures Incidence of non-adherence, problems with the new medicine, beliefs about the new medicine, safety and usefulness of the interventions.
Results Five hundred patients consented and were randomised. At 4-week follow-up, non-adherence was significantly lower in the intervention group compared to control (9% vs. 16%, $P = 0.032$). The number of patients reporting medicine-related problems was significantly lower in the intervention group compared to the control (23% vs. 34%, $P = 0.021$). Intervention group patients also had more positive beliefs about their new medicine, as shown by their higher score on the ''necessity-concerns differential'' (5.0 vs. 3.5, $P = 0.007$). The phone calls took a median of 12 min each. Most advice was judged by experts to be safe and helpful, and patients found it useful.
Conclusion Overall, these findings show benefits from pharmacists meeting patients' needs for information and advice on medicines, soon after starting treatment. While a substantially larger trial would be needed to confirm that the effect is real and sustained, these initial findings suggest the service may be safe and useful to patients.

Keywords Chronic disease · England · Patient adherence · Patient needs · Pharmacist · Randomized controlled trial · Telephone service

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Introduction

Around a third to a half of patients on chronic medicines fail to take their medicine as directed, with potentially serious sequelae [1, 2]. The economic consequences of non-adherence have been estimated at $100 bn annually in the USA [3]. However, solutions to the problems of non-adherence have been elusive—a review by the Cochrane Collaboration discovered only 18 satisfactorily designed studies of interventions that improved adherence; these were

complex and multifaceted [4]. Simpler solutions are needed that are deliverable within the UK National Health Service (NHS). Furthermore, unlike many previous studies, interventions need to be grounded in theory about the reasons why people are non-adherent.

We decided to develop an intervention that had a theoretical basis and was grounded in the patients' perspective. The theory used to guide the development of the intervention was the self-regulatory model (SRM), proposed by Leventhal and Cameron in 1987 [5]. The SRM was chosen as it recognises that adherence to medication is frequently influenced by symptoms or beliefs about the illness that are unique to each patient. The theory was recently extended to incorporate the consistent finding that adherence is also influenced by patients' beliefs about the treatment [6, 7]. The theory was used in training the pharmacists to adopt a patient-centred approach. The intervention was designed to elicit patients' experiences with, and concerns about, their new medicine; this was then used as a starting point for the pharmacists to meet each individual's specific needs with information and advice. An advantage of this individualised approach is that the intervention can be applied to a wide range of conditions and medicines.

Non-adherence to new medicines for chronic conditions develops rapidly [8], so we developed a service in which a pharmacist telephoned patients two weeks after they had started a new medicine for a chronic condition. The pharmacist listened to the patient's problems and gave advice or information if needed. In this study we assess the effectiveness, safety, utility and the patient acceptability of the service.

Method

Design

The assessment consisted of three parts. First, a randomised controlled trial assessed the effect of the service on adherence, patients' medicine-related problems and their beliefs about medicines. Second, a sample of interventions was assessed for safety and utility by an expert panel. Finally, patients were asked their views of the service. The study was approved by the London Multi-Centre Research Ethics Committee.

Selection criteria and randomisation

Patients were recruited using a convenience sample of 40 Moss community pharmacies across England. Moss Pharmacy (now Alliance) is one of the largest UK pharmacy chains.

Patients were eligible if they were receiving the first prescription for a new drug (one they had not previously received) for a chronic condition and were 75 or older *or* suffering from stroke, cardiovascular disease, asthma, diabetes, or rheumatoid arthritis, as reported by the patient. These criteria were chosen because they were priorities for the National Health Service (NHS) in the United Kingdom at the time the study was conducted. Exclusion criteria were an inability to understand written or spoken English or not having a telephone. Patients were recruited opportunistically when they presented a prescription in one of the pharmacies. The pharmacists gave a full explanation of what the study involved and written informed consent was obtained from each patient wanting to take part. Randomisation was by the pharmacist giving a sealed envelope to the patients, this contained their treatment group; the pharmacist was blind to the contents and took no further part in proceedings.

Intervention

The intervention group received a telephone call from a pharmacist, located at the head office of the Moss group of community pharmacies, two weeks after the patient was recruited. Two community pharmacists delivered the service. They had been trained for half a day in theory regarding the types and causes of non-adherence, telephone communication skills, and the types of medicine-related problems and adherence issues that patients had experienced in a previous study [8]. The first few interviews were recorded and feedback given, occasionally the pharmacists were recorded thereafter to monitor quality.

The intervention phone call was based on a semi-structured interview schedule developed previously [8]. The pharmacist started by asking patients 'How are you getting on with your medicines?', then went on to enquire about their medicine-related problems, adherence to the new medicine and whether they required any further information. The pharmacist followed the flow of the patient's conversation, using the interview schedule as a checklist if the patient spoke of issues in a different order. The pharmacist gave information, advice or reassurance in response to the patients' expressed needs.

Outcome measures

Patients in both intervention and control group received a telephone interview from a researcher at four weeks after recruitment and a postal question-

naire was sent immediately after. The interview schedule was the same as that used by the pharmacists delivering the intervention, with additional questions for patients in the intervention group about their experiences. The postal questionnaire contained demographic questions, a measure of health (the question on general health from SF36) [9] and a measure of beliefs about the new medicine [10].

The primary outcome measure was self-reported adherence, as measured in the 4-week follow-up interview. Non-adherence was defined as a self report of at least one dose of the new medicine having been missed in the last seven days. We chose this definition and method of detecting non-adherence for several reasons: it has been suggested to be the best method of detection in this sort of study [11], it provides valid reports of non-adherence [12], it is thought to indicate patients with low adherence [11]. Additionally, understanding non-adherence is a crucial part of the intervention and we have learnt from human error theory that any deviations from prescribed behaviour can help us understand non-adherence [13].

Secondary outcome measures were number of medicine-related problems and beliefs about the medicine. Patients were asked if they had any problems with, or concerns about, their medicine; responses were all classed as 'problems'. Beliefs about the medicine were assessed in the postal questionnaire sent immediately after the interview, using a valid and reliable scale called the Beliefs about Medicines Questionnaire (BMQ). The scale gauges the strength of their beliefs about the necessity of that medicine, and the strength of their concerns about the medicine—the differential between these two scales can be calculated (the ''necessity-concerns differential'') and is related to the patient's intention to adhere.

Patients' perspectives of the intervention were sought in the researcher interview when they were asked whether they thought the intervention had been useful. Their answer was recorded and scored blind as 'useful', 'not useful', or 'negative' by two assessors (SC, NB), disagreements were resolved by discussion.

The safety and helpfulness of the pharmacists' interventions were assessed by taking a sample of 100 intervention phone calls—this included all those in which information and advice had been given, and a random sample of those in which no information or advice had been given. The expert assessors were two academic general practitioners, two academic pharmacists and a clinical pharmacologist. The assessments were performed individually and a mean score taken for safety and helpfulness regarding each case. Safety was assessed on a validated, reliable scale, ranging from 0–10 (no harm—death) [14] and helpfulness assessed on a five point Likert scale from 1 = 'very unlikely to help' to 5 = 'very likely to help'. In the analysis 1 and 2 were compressed to 'unhelpful' and 4 and 5 to 'helpful'.

Statistical analysis

Sample size was calculated from the primary outcome measure and taken as a reduction in self reported non-adherence from 22% to 12%, based on an alpha of 0.05 (two-sided) and a power of 80%. Assuming 10% of patients dropped out, 490 patients were needed. Analysis of the main outcome measure would be per protocol, using as the starting point all patients left after the consent process and available at follow-up. Data analysis was carried out according to a pre-established analysis plan. Proportions were tested using the Chi Squared test with continuity correction. Scales were treated as ordinal and tested using the Mann–Whitney test.

Results

Five hundred patients were recruited and consented from 40 Moss community pharmacies in eight areas of England, from Cornwall to Yorkshire. Eight patients were ineligible, leaving 255 patients in the intervention group and 237 in the control group. The response rates to the 4-week questionnaire were 72% (intervention) and 66% (control). The randomisation and reasons for exclusion are shown in Fig. 1 and the demographics are shown in Table 1.

Drop-outs were much more frequent than expected, leaving the study under powered. The commonest cause of drop-out was that the patient had been taken off the new medicine by their doctor; this was more frequent in the intervention group, happening to 48 (19%) of the intervention group and 29 (12%) of the control group.

Of those still prescribed their medication at 4-week follow-up, non-adherence was less frequent in the intervention group (9%, 16/185) compared to the control group (16%, 31/194), $P = 0.032$. Similarly, the number of patients reporting problems at 4 weeks was fewer in the intervention group (23%, 43/185) compared to the control group (34%, 66/194), $P = 0.021$. Examples of interventions are given in Table 2.

The difference between patients' beliefs about the necessity of their medicine and their concerns about taking it ('necessity-concerns differential') was significantly higher in the intervention group (median

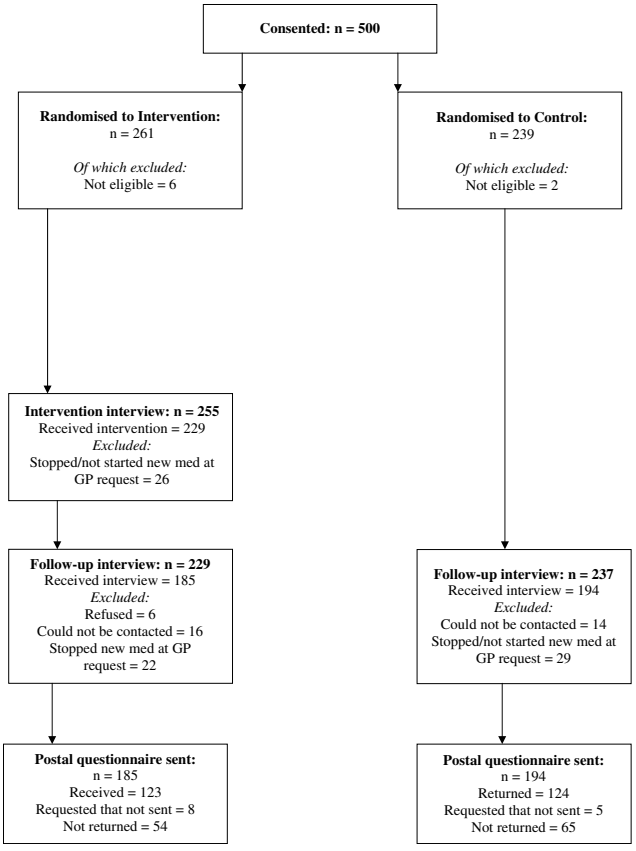

Fig. 1 Flow chart of participants in the study

score = 5) than the control group (median score = 3.5) ($P = 0.007$). This indicates that the intervention group were significantly more likely to have more positive beliefs about their medicines, with a greater tendency to rate their personal need for the new medicine as high, relative to their concerns. This balance of beliefs has been shown to be related to higher rates of adherence [15].

The expert assessors reviewed 100 phone calls for the helpfulness and safety of the advice. Fifty five percent of the pharmacists' interventions were classed as 'likely to be helpful', 32% were classed as 'uncertain' and 13% as 'unlikely to be helpful'. Safety was calculated on a 0–10 scale (no harm—death); 99% of cases scored below 1, only one scored above this (1.1), illustrating that the advice was deemed safe. One hundred and eighty of the 185 patients in the intervention group expressed views about the intervention, 138 (77%) of which were classified as 'useful' and 42 (23%) expressed views that were classified as 'neutral'; no patients expressed negative views.

The intervention pharmacists made a median of one call (1st, 3rd quartiles: 1, 2) when trying to contact each patient, and spent a median of 12 (1st, 3rd quartiles: 8, 18) min per patient to deliver the intervention. Associated administration took a further median of 6 (1st, 3rd quartiles: 4, 10) min per patient.

Discussion

These findings provide evidence that a telephone call from a pharmacist can significantly reduce patients' non-adherence, reduce their medicine-related problems and alter their balance of beliefs about medicines. Experts deemed the service to be safe and helpful, and patients reported it to be useful. Our findings provide support for the concept of pharmacists helping patients who are started on a new medicine for a chronic condition.

The strengths of this intervention are its patient centeredness, its origins in theory about why patients are non-adherent, its use of the pharmacists' knowledge

Table 1 Demographic details of intervention and control group

	Intervention	Control
Gender	49% (113) female 51% (116) male	56% (108) female 44% (86) male
Condition:		
Angina	4% (9)	2% (4)
Arthritis	7% (17)	10% (20)
Asthma	4% (10)	6% (12)
High blood pressure/heart	52% (120)	47% (91)
High cholesterol	8% (18)	8% (16)
Diabetes	11% (24)	8% (16)
Stroke	0	2% (3)
Other	13% (30)	14% (26)
Don't know	1% (1)	3% (6)
*Age**	Mean: 67, range 34–85, 24% (30) 75 years or over	Mean: 67, range 28–88, 26% (33) 75 years or over
*Employment status:**		
Working	19% (23)	20% (25)
Retired	73% (87)	71% (90)
Not in paid employment	8% (9)	9% (11)
Collect own prescription?*	96% (118)—yes 4% (5)—no	95% (120)—yes 5% (7)—no
Pay for own prescription?*	16% (20)—yes 84% (103)—no	17% (21)—yes 83% (106)—no
General Health: *		
Excellent	3% (4)	1% (1)
Very good	20% (24)	18% (23)
Good	47% (57)	38% (48)
Fair	29% (35)	35% (44)
Poor	1% (2)	8% (10)

(All information was obtained from the first telephone interview, unless marked * which was obtained from the first questionnaire.)

of drugs, its general applicability across a wide range of patients and in the way we have applied it across a wide geographical area. Patients in the UK are increasingly used to health care advice being delivered by telephone; they are encouraged to use a telephone service, 'NHS Direct' before seeing a general practitioner (GP).

We had originally intended that the patient's own community pharmacist would deliver the service. However, it became clear that this could not be achieved at the time without changing the way in which the pharmacists were working. The centralised method of service delivery evaluated in this study could be delivered in practice. Community pharmacy chains could deliver the intervention from their head office and the independent pharmacies could join together to provide the intervention on a rotational basis. Alternatively, the new pharmacy contract in the UK may allow pharmacists to deliver the intervention in their own pharmacies to their own patients. Depending on how community pharmacy is organised in other countries, it may be possible for this pharmacy-based approach to be put in practice elsewhere.

There are alternative methods for delivering the intervention and health policy in the UK is expanding the role of the pharmacist into a greater involvement in medicines management and prescribing, which will allow funding of new services [16, 17]. In the future the service could be even more effective if run by a pharmacist known to the patient and in collaboration with the local GP; this could be from the patient's pharmacy, or by the pharmacist running a clinic at the GP surgery. Other studies have shown that pharmacists' advice can improve adherence and the control of blood pressure [18] and heart failure [19].

The drop-outs were far greater than expected, although most of these were as a result of patients seeing their general practitioner and having the prescription changed. This behaviour was 66% more frequent in the intervention group and this difference may well be an effect of the intervention. More thought needs to be given about how these cases should be handled in future studies. An additional anomaly was that the incidence of non-adherence was lower than expected from a previous study [8]. However, the figure was still within the range of non-adherence reported in other studies [20].

A review of adherence interventions by the Cochrane collaboration stipulated strict inclusion criteria [4]. Two criteria stated that studies had to have used both an adherence and treatment outcome and provided at least 6-months follow-up. Future studies testing an intervention like the one in this study should take these criteria into account. However, as in this study, there are problems with including treatment outcome in studies that cover many disease states.

The intervention increased the proportion of adherent patients and shifted their risk/benefit beliefs about their medicine towards benefit. However, these should not be seen as ends in themselves. We wanted informed patients, supported in their decision making. The pharmacists were not instructed to improve adherence or shift beliefs, but to use their knowledge to help patients with the problems they expressed. There are many models of interaction between prescriber and patient, such as shared decision making, as well as broader models based on a balance of ethical principles [21]. We did not choose an informed choice model, for example, partly because of the practical and

Table 2 Examples of interventions

Patient-reported issue	Advice from pharmacist	Outcome at 4 weeks
Patient had stopped taking his new BP medicine (and all his others) because of headaches. Also, he didn't like taking any tablets and he wanted to clean his system of the medicines.	In-depth discussion with the patient revealed a previous bad experience with the medical profession and very strong beliefs against taking any medication. The pharmacist explained why the medication was important to help his condition, especially in light of the fact that the patient had had a heart bypass. Recommended that the patient start taking the medication again and to return to the GP to discuss side effects.	Patient had started taking his medication again and had been back to his GP. The patient reported that they found speaking to the pharmacist very useful as ''it was the right information at the right time'' and it helped him understand why the medication was necessary. He also commented that he found it good to talk to the pharmacist as he lives alone and does not have anybody to discuss these issues with.
Patient had concerns about taking his preventative inhaler if he was going out drinking for the evening, so on these occasions he missed a dose.	The pharmacist advised him that it was fine to take the inhaler before he went out drinking and discussed the necessity of the preventative inhaler.	Patient remembered the advice given and had used it on several occasions. He found the service very useful and remarked that it was ''10 out of 10''. He commented that it had made him think more about the importance of taking his medication.

ethical difficulties of doing this separately from the general practitioner, and partly because we just wanted to help at that most basic level: encouraging the patient to express their needs, and for the pharmacist to meet those needs.

Conclusion

While we recognise the limitations of this study, we have demonstrated the promise of a new, patient-centred way for pharmacists to support patients who are newly started on a medicine for a chronic condition.

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References

1. Smith M. The cost of non-compliance and the capacity of improved compliance to reduce health care expenditures. In: Improving medication compliance. Proceedings of a Symposium held in Washington DC, November 1984. Reston, Virginia: National Pharmaceutical Council, 1985;35–44.
2. Horne R. Adherence to medication: a review of the existing literature. In: Myers L, Midence K, editors. Adherence to treatment in medical conditions. Amsterdam: Harwood Academic Press; 1998. p 285–310. ISBN: 9057022656.
3. Lewis A. Noncompliance: A $100 billion problem. Remington Report. 1997;5(4):14–5.
4. McDonald HP, Garg AX, Haynes RB. Interventions to enhance patient adherence to medication prescriptions: scientific review. JAMA 2002;288:2868–79.
5. Leventhal H, Cameron LD. Behavioral theories and the problem of compliance. Patient Educ Couns 1987;10:117–38.
6. Horne R, Weinman J. Patients' beliefs about medicines and their role in adherence to treatment in chronic physical illness. J Psychosom Res 1999;47(6):555–67.
7. Horne R. Treatment perceptions and self-regulation. In: Cameron LD, Leventhal H, editors. The self-regulation of health and illness behaviour. London: Routledge Taylor & Francis Group, 2003. p 138–53. ISBN: 0415297001.
8. Barber N, Parsons J, Clifford S, Darracott R, Horne R. Patients' problems with new medication for chronic conditions. Qual Saf Health Care 2004;13(3):172–5.
9. Ware JE, Sherbourne CD. The MOS 36 item short form health survey (SF-36): Conceptual framework and item selection. Med Care 1992;30:473.
10. Horne R, Weinman J, Hankins M. The beliefs about medicines questionnaire: the development of a new method for assessing the cognitive representation of medication. Psychol Health 1999;14:1–24.
11. Haynes RB, McDonald HP, Garg AX. Helping patients follow prescribed treatment: clinical applications. JAMA 2002;288:2880–3.
12. Haynes RB, Taylor DW, Sackett DL, Gibson ES, Bernholtz CD, Mukherjee J. Can simple clinical measures detect patient non-compliance? Hypertension 1980;2:757–64.
13. Barber N. Should we consider non-compliance a medical error? Qual Saf Health Care 2002;11:81–4.
14. Dean B, Barber N. Validity and reliability of observational methods for studying medication administration errors. Am J Health-Syst Pharm 2001;58:54–9.
15. Horne R, Weinman J. Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. J Psychosom Res 1999;47:555–67.
16. Department of Health. Pharmacy in the future. 2000. Available at: http://www.dh.gov.uk/assetRoot/04/06/82/04/04068204.pdf. (Accessed March 13th 2005).
17. Department of Health. A Vision for Pharmacy in the New NHS. 2003. [26 pages]. Available at: http://www.dh.gov.uk/assetRoot/04/06/83/56/04068356.pdf. (Accessed March 13th 2005).
18. Blenkinsopp A, Phelan M, Bourne J, Dakhil N. Extended adherence support by community pharmacists for patients with hypertension: a randomised controlled trial. Int J Pharm Pract 2000;8:165–75.
19. Goodyer LI, Miskelly F, Milligan P. Does encouraging good compliance improve patients' clinical condition in heart failure? Br J Clin Pharmacol 1995;49(4):173–6.
20. Kaplan RM, Simon HJ. Compliance in medical care: reconsideration of self-predictions. Ann Behav Med 1990;12:66–71.
21. Emanuel EJ, Emanuel LL. Four models of the physician-patient relationship. JAMA 1992;267:2221–6.