

## Randomised controlled trial of home based care of patients with chronic obstructive pulmonary disease

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### Abstract

**Objectives** To evaluate usefulness of limited community based care for patients with chronic obstructive pulmonary disease after discharge from hospital.

**Design** Randomised controlled trial.

**Setting** Liverpool Health Service and Macarthur Health Service in outer metropolitan Sydney between September 1999 and July 2000.

**Participants** 177 patients randomised into an intervention group (84 patients) and a control group (93 patients) which received current usual care.

**Interventions** Home visits by community nurse at one and four weeks after discharge and preventive general practitioner care.

**Main outcome measures** Frequency of patients' presentation and admission to hospital; changes in patients' disease-specific quality of life, measured with St George's respiratory questionnaire, over three months after discharge; patients' knowledge of illness, self management, and satisfaction with care at discharge and three months later; frequency of general practitioner and nurse visits and their satisfaction with care.

**Results** Intervention and control groups showed no differences in presentation or admission to hospital or in overall functional status. However, the intervention group improved their activity scores and the control group worsened their symptom scores. While intervention group patients received more visits from community nurses and were more satisfied with their care, involvement of general practitioners was much less (with only 31% (22) remembering receiving a care plan). Patients in the intervention group had higher knowledge scores and were more satisfied. There were no differences in general practitioner visits or management.

**Conclusions** This brief intervention after acute care improved patients' knowledge and some aspects of quality of life. However, it failed to prevent presentation and readmission to hospital.

### Introduction

Chronic obstructive pulmonary disease is a degenerative disease featuring chronic airflow obstruction due to bronchitis, emphysema, or both.<sup>1</sup> The clinical course is punctuated by acute exacerbations that can be

reduced by stopping smoking and by influenza and pneumococcal vaccination. For patients, impaired quality of life is often the main reason for hospital presentation and admission.<sup>2</sup> Although admission offers effective treatment of acute exacerbations, management of the chronic problems of fatigue, poor exercise tolerance, and depression are often inadequately addressed.<sup>3</sup> The prognosis for patients aged over 50 years who require hospitalisation is poor, and mortality from chronic obstructive pulmonary disease has remained steady for the past 30 years.<sup>4</sup> Home based programmes offering nursing care<sup>5</sup> or pulmonary rehabilitation<sup>6</sup> provide viable alternatives to hospital admission for some patients. Supported discharge involving nurse visits is safe and achieved at lower cost than hospital admission.<sup>7</sup> Telephone and home visit support after hospital discharge has reduced subsequent hospital admissions.<sup>8</sup>

Chronic obstructive pulmonary disease is a serious problem for the South Western Sydney Area Health Service: during 1996 and 1997, 595 patients presented to one hospital in the region, 84% were admitted and 34% presented again within 12 months.<sup>9</sup> Coexisting morbidity and patient age influenced length of stay and risk of admission.<sup>10</sup> The aim of the present study was to examine the impact of limited home visiting by a community nurse on patients recently discharged from hospital. We hypothesised that home visiting would improve patients' knowledge about the disease, improve their quality of life, and reduce hospital representation. The intervention was simpler than those used in previous studies in this area and had potential to be sustainable.

### Method

We conducted the study at Liverpool Health Service, a tertiary teaching institution of 565 beds, and Macarthur Health Service, a district hospital of 254 beds, with the approval of the South Western Sydney Area Health Service Research Ethics Committee. All patients aged 30-80 years who attended the hospital emergency department or were admitted to the hospitals with chronic obstructive pulmonary disease between September 1999 and July 2000 were identified from their records and invited to participate in the study. Those who agreed were provided with written information about the study and gave written consent. Patients were excluded if they resided outside

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bmj.com 2002;325:938

the region, had insufficient English speaking skills, were resident in a nursing home, or were confused or demented.

The recruited patients were randomised to receive the intervention or usual care. We had intended to use randomised permuted blocks with a block size of four at both sites, but, because of the smaller number of cases at Macarthur Health Service, we used a simple randomisation at that site.

### Intervention

The intervention comprised two home visits by a community nurse. The first, within a week of a patient's discharge from hospital, included a detailed assessment of the patient's health status and respiratory function. The nurses provided verbal and written education on the disease and advised on stopping smoking (if applicable), management of activities of daily living and energy conservation, exercise, understanding and use of drugs, health maintenance, and early recognition of signs that require medical intervention. The nurses also identified problem areas and, if indicated, referred patients to other services, such as home care. After the visit a care plan documenting problem areas, education provided, and referral to other services was posted to each patient's general practitioner, and, if appropriate, the general practitioner was contacted by telephone. At the second home visit, one month later, the nurses reviewed patients' progress and need for further follow up. Patients were encouraged to continue to refer to the education booklet for guidance and to keep in contact with their general practitioner.

Usual care comprised discharge to general practitioner care with or without specialist follow up. Discharge did not include routine nurse or other community follow up.

### Evaluation

Evaluation comprised patient interviews at recruitment (baseline) and at three month follow up, conducted either face to face or by telephone by the project officer (OH). At the baseline interview he collected demographic information including country of birth, names of the patient's general practitioner and principal carer, number of people living in the household, main source of income, occupation, and level of education. At follow up, OH sought information on patient satisfaction with care, any readmissions or presentations to the hospital emergency department during the three months, current treatment, frequency of visits to general practitioner, contact with community nurse, smoking habits, immunisation history, knowledge and understanding of the medical condition, help seeking, and self rated health. OH also administered the St George's respiratory questionnaire, a 76 item questionnaire for measuring disease specific quality of life over the previous four weeks,<sup>11</sup> at baseline and follow up. It is scored, with the use of empirically derived weights, on a scale of 0-100, and higher scores represent worse impairment of quality life. As well as the total score, three subsidiary scores—symptoms, activity, and impact—can be derived from the questionnaire.<sup>12</sup>

OH also telephoned each patient's general practitioner at one and three months after hospital discharge and asked about the patient's frequency of consultations and contact with the nurse and the general

practitioner's satisfaction with the care provided by the nurse and arrangements for patient follow up. Information on patients' hospital admissions and presentations at the emergency department during the three months after the index admission was obtained from hospital records.

We assessed quality of patient care from the number of general practitioner consultations recorded and the care provided (such as immunisation), number of community nurse visits recorded by patients and the care provided, and patients' and doctors' satisfaction with care. Measures of patient outcome included frequency of presentation to hospital during the three months after the index presentation and quality of life as measured by the St George's respiratory questionnaire at follow up. Intermediate impact measures included patients' knowledge of chronic obstructive pulmonary disease and its management and satisfaction with care at three months after discharge.

### Statistical analysis

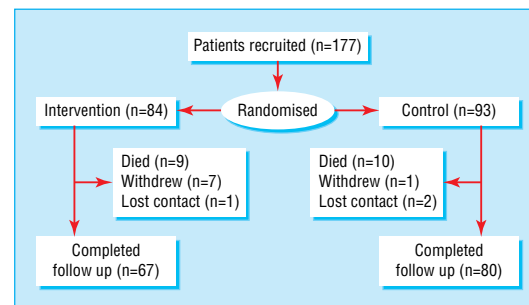
We analysed data using the statistical packages EPI INFO 6 and SPSS version 9. Patients' responses to the St George's respiratory questionnaire were summarised as the three subscores (activity, impact, and symptoms) as well as a total score. We used univariate statistical tests to compare the two groups with significance at  $P < 0.05$ .

We calculated mean scores (with standard deviation) and tested differences between the intervention and control groups using Student's *t* test. We summarised categorical data as proportions (with 95% confidence intervals) and examined differences between intervention and control groups using contingency tables and the  $\chi^2$  test.

Before starting the study, we performed a sample size calculation. Based on the assumption that the rate of presentation to hospital over the follow up period would be 30% and that a clinically significant change would halve this rate to 15% or less, we calculated that 120 patients in each group were required to provide a power of 80% to detect a difference of this size at a significance of 5%. As we were unable to recruit sufficient patients, we revised the power of the study and estimated the power to detect a reduction by half was 47.6%. We also estimated that the revised power to detect a 10% change in the total score for the St George's respiratory questionnaire was 50%.

## Results

Of the 177 patients we recruited (143 from Liverpool and 34 from Macarthur Health Service), 84 were



Flowchart showing patient participation in study

assigned to the intervention group and 93 to the control group (see figure). Follow up was completed with 67 patients in the intervention group and 80 control patients.

### Baseline data

The intervention and control groups were similar in terms of sex ratio, age, and ethnicity (table 1). They also had similar scores on the St George's respiratory questionnaire and length of hospital stay. A substantial proportion of both groups reported needing others to care for them (30/67 (45%) and 31/80 (39%) respectively). There were no significant differences between the two groups regarding patients' satisfaction with hospital care, rating of own health, level of education, and main source of income.

### Outcome data

**Nurse follow up**—Most of the patients receiving the intervention (85%) recalled the nurse visits after hospital discharge, compared with only 10% of the controls ( $P=0.001$ ) (table 2). The general practitioners of the intervention patients were significantly more likely to have been contacted by the nurses and to report receiving the care plan (table 2), and most of those who had received the care plan rated them as useful.

**Patients' knowledge**—At follow up, patients in the intervention group displayed greater knowledge of chronic obstructive pulmonary disease than those in the control group. This included greater awareness of the name of the condition, of the role of vaccination, and of factors that prevent worsening of the condition (table 3). There was no significant difference between the two groups on knowing when to seek help.

**General practitioner contact**—Information on patients' contact with their general practitioner was obtained from both general practitioners and patients at follow up (table 4). Most patients had visited their general practitioner during the follow up period and had visited regularly. There were no significant differences between the intervention and control patients in the average number of visits reported by general practitioners or patients. However, patients reported making more visits than the general practitioners reported.

**General practitioner action**—Most patients in the intervention and control groups were satisfied with the care provided by their general practitioner (56/60 (93%) and 72/75 (96%) respectively) and reported that their general practitioner explained their treatment well (55 (92%) and 70 (93%)). General practitioners reported similar treatment for patients in both groups (table 4). Of those who responded, most general practitioners prescribed drugs for their patients (74% in intervention group, 83% in control group). These usually consisted of inhaled salbutamol or ipratropium bromide, inhaled and oral corticosteroids, and antibiotics. The general practitioners provided education to patients in both intervention and control groups (68% and 69% respectively) and to carers (25% and 17% respectively). Follow up arrangements did not differ between the two groups.

**Patients' behaviour**—There were no significant differences between the intervention and control groups in the proportions of patients who smoked (15/67 (22%) v 26/80 (33%),  $P=0.17$ ), who received an influenza vaccination (48 (72%) v 60 (75%),  $P=0.65$ ), and who

**Table 1** Demographic characteristics of patients with chronic obstructive pulmonary disease who received home visits by nurse or standard care. Values are numbers (percentages) unless stated otherwise

	Intervention (n=84)	Control (n=93)
Men	41 (48.8)	43 (46.2)
Women	43 (51.2)	50 (53.8)
Mean age (years)	67.1	66.7
Speak language other than English	9 (11)	13 (14)
Born in non-English speaking country	13 (16)	22 (23)
Mean (SD) St George's respiratory questionnaire score	63.7 (18.0)	60.7 (17.8)
Mean (SD) length of hospital stay (days)	7.1 (6.2)	6.2 (5.3)

**Table 2** Receipt of intervention by patients with chronic obstructive pulmonary disease who received home visits by nurse or standard care. Values are numbers (percentages) unless stated otherwise

	Intervention (n=67)	Control (n=80)	$\chi^2$ , test of difference (P value)
Patients visited by nurse	57 (85)	8 (10)	80.3 (0.03)
Patients' GP contacted by nurse	8 (12)	1 (1)	9.4 (0.008)
Patients' GP received care plan	22 (33)	0	31.9 (<0.001)

GP=general practitioner.

**Table 3** Knowledge of aspects of management of disease among patients with chronic obstructive pulmonary disease who received home visits by nurse or standard care. Values are numbers (percentages) unless stated otherwise

Patients' knowledge	Intervention (n=67)	Control (n=80)	$\chi^2$ , test of difference (P value)
Name of disease	36 (54)	26 (33)	5.9 (0.04)
Role of vaccination	41 (61)	16 (20)	26.1 (<0.01)
Factors that prevent condition worsening	26 (39)	10 (13)	21.9 (<0.01)
When to seek help	57 (85)	55 (69)	7.8 (0.07)

**Table 4** Contact with general practitioners by patients with chronic obstructive pulmonary disease who received home visits by nurse or standard care, and details of care provided by general practitioners. Values are numbers (percentages) unless stated otherwise

	Intervention (n=67)	Control (n=80)	$\chi^2$ , test of difference (P value)
Patient visited GP	60 (90)	75 (94)	0.8 (0.4)
Mean No of visits to GP:			
Patients' report	6.06 (n=60)	5.54 (n=74)	1.0 (0.3)
GPs' report	5.21 (n=57)	5.11 (n=64)	0.2 (0.9)
GP prescribed drugs	42/57 (74)	53/64 (83)	1.5 (0.2)
GP arranged follow up	37/57 (65)	41/64 (64)	3.6 (0.4)
GP provided patient with education	39/57 (68)	44/64 (69)	0.01 (0.9)
GP provided carer with education	14/57 (25)	11/64 (17)	1.1 (0.3)

GP=general practitioner.

reported having pneumococcal vaccination (42 (63%) v 42 (53%),  $P=0.28$ ).

**Function**—Table 5 shows the results of the St George's questionnaire. There were no significant differences between the two groups in their scores at follow up. For the intervention group, there were significant improvements in activity and impact scores but not the symptom score. For the control group, there was no change in the activity score, improvement in the impact score, and worsening of the symptom score.

**Hospitalisation**—There were no significant differences between the two groups in hospitalisation of patients during the three month follow up: 16 (24%) of intervention patients and 14 (18%) of controls presented to hospital and were admitted on one or more occasions. Of the 25 readmissions in the intervention group, 12 were for acute respiratory con-

**Table 5** Change in St George's respiratory questionnaire score among patients with chronic obstructive pulmonary disease who received home visits by nurse or standard care (after excluding patients not completing the study (n=147))

Questionnaire subscale	Questionnaire score		Change from baseline to follow up (95% CI)	Difference in change (95% CI)
	Baseline	Follow up		
Activity subscale:				
Intervention (n=67)	79.29	74.83	4.46 (0.42 to 8.50)	2.97 (-2.72 to 8.66)
Control (n=80)	75.54	74.05	1.49 (-2.42 to 5.39)	
Impact subscale:				
Intervention (n=67)	54.57	48.48	6.09 (1.91 to 10.27)	-0.21 (-5.57 to 5.16)
Control (n=80)	51.52	45.22	6.30 (2.91 to 9.68)	
Symptoms subscale:				
Intervention (n=67)	64.50	66.05	-1.54 (-5.64 to 2.56)	3.18 (-1.83 to 8.18)
Control (n=80)	62.97	67.65	-4.72 (-7.69 to 1.74)	
Total score:				
Intervention (n=67)	63.71	59.39	4.33 (1.05 to 7.61)	1.32 (-2.97 to 5.62)
Control (n=80)	60.69	57.68	3.00 (0.24 to 5.77)	

ditions, while 14 of 19 readmissions in the control group were for acute respiratory conditions. Two intervention patients and eight controls presented to the emergency department for respiratory conditions but were not admitted.

## Discussion

This study shows that home follow up by a community nurse of patients discharged from hospital after an acute exacerbation of chronic obstructive pulmonary disease improved the patients' knowledge of the disease and some aspects of functional status. However, satisfaction with care and use of general practitioners were similar for intervention and control groups. We found no change in patients' subsequent hospital admission or presentation to an emergency department or in total functional status. This may not have been surprising. The high mortality of patients (19/147) indicated that these patients experienced severe morbidity, and the poor prognosis for patients requiring hospitalisation is well recognised.<sup>4</sup>

The strength of this brief intervention, which was administered by a community nurse, was its sustainability within current health service resources. The home visit at one and five weeks after discharge involved providing education to patients and was supplemented by assessment and referral to other community based services where needed. Education and the opportunity to discuss symptoms within the home did benefit patients in terms of their knowledge of the disease and some aspects of functional status. It did not significantly change total functional status as measured by the St George's respiratory questionnaire. This result is similar to those of some previous reports<sup>13 14</sup> and in contrast with those of other studies that showed no impact of education on functional status.<sup>15 16</sup> Our study did not include specific intensive interventions shown to improve functional status, such as exercise training or continuous positive airways pressure.<sup>17 18</sup>

Our results indicated a high rate of readmission to hospital. The lack of impact of home care on hospitalisation has previously been observed among patients with severe chronic obstructive pulmonary disease.<sup>15</sup> Nurse visits alone are unlikely to decrease the anxiety of patients and their carers when considering if they should present to hospital.<sup>14</sup> Additional interventions or interventions earlier in the disease process may be

required to reduce hospitalisations and to reassure patients and their families that home care is a safe alternative to hospitalisation.<sup>18</sup>

## Study limitations

Patients were drawn from two hospitals in one region of Sydney. While few eligible patients refused to participate, the recruitment rate into the study was lower than expected. Also the rate of patients' reattendance at hospital was lower than anticipated in our sample size calculation. Hence, the recruitment was stopped when 83 intervention patients and 94 controls had been recruited. With a reattendance rate of 18% in the control group, we would have had 80% power to detect an absolute reduction of 13% in the reattendance rate to 5%.

The intervention did not have a significant effect on general practice care. The community nurses initiated patients' care plans and sent these to their general practitioners. The nurses contacted a general practitioner only if there was a particular issue with a patient. Thus, the general practitioners were not actively involved in the development of the nurse care plans, and these plans did not seem to affect patient management. Consequently, many general practitioners could not recall receiving them. However, all patients were in frequent contact with their general practitioner. The study did not attempt to evaluate the equality of general practitioner care. It provides further evidence that a nurse and general practitioner alone make little difference to the outcomes of care. It is possible that other disciplines such as physiotherapy (pulmonary rehabilitation) and occupational therapy (environmental factors) may need to be involved to reduce admissions. The concept of a multidisciplinary team, which has been proved in treating complex conditions such as stroke, has not been tested by this study.

## Study implications

This study should be a caution for new initiatives for chronic and complex care in Australia. The introduction of general practice remuneration under the Enhanced Primary Care (EPC) for care planning and case conferencing in south west Sydney provides incentives for general practitioners to engage in such activity in the future.<sup>19</sup> General practitioner remuneration depends on the involvement of at least two other health professionals such as nurses or other health workers. It will be interesting to see if the extension of care planning and case conferencing by EPC can affect

### What is already known on this topic

Patients with chronic obstructive pulmonary disease often require hospital care and have impaired quality of life

Home based care programmes provide viable alternatives to hospital admission for some patients at lower cost

### What this study adds

A brief, home based nurse intervention after acute care improved patients' knowledge but failed to reduce subsequent presentations or admissions to hospital

Additional interventions or interventions earlier in the disease process may be required to reduce hospitalisations

the quality of care received by patients with severe chronic obstructive pulmonary disease and prevent hospitalisation.

Chronic obstructive pulmonary disease is an important problem in general practice.<sup>20</sup> However, there is evidence that general practitioners may treat severe exacerbations less intensively than do hospital staff, especially with respect to use of antibiotics and corticosteroids.<sup>21</sup> Effective management strategies for general practitioners include immunisation and early treatment of exacerbations. These were already at a fairly high level in both groups, suggesting that additional systems, including care planning and prompts, may be required to further increase the proportion of patients receiving optimal care.

### Conclusion

This brief intervention after acute care was associated with some changes in patients' knowledge and some aspects of function, but the intervention failed to engage general practitioners adequately or to prevent patients' readmission to hospital. Further studies are needed to evaluate the role of general practitioners as well as specific management interventions. Strategies that work for diseases such as heart failure or diabetes may not be transferable to patients with severe irreversible airflow reduction. We need to re-examine the part that general practitioners and specialist physicians can most effectively play in managing such patients.

We thank Marina Edmond and Beverly Gibbs, the staff of the Liverpool Hospital Division of Medicine and Macarthur Health Service Ambulatory Care Unit, EDIS and Clinical Information South Western Sydney Area Health Service, and the staff of the Simpson Centre.

Contributors: MH, GM, and KD conceived and designed the original project design, and OH and SW helped develop it. OH

provided evaluation data. Marina Edmond and Beverly Gibbs provided follow up nursing care for the patients and collected data on the intervention provided. OH and EC conducted the data analysis, with input from all the authors on its interpretation. OH, EC, and MH drafted the paper, with critical input from all the other authors, who approved the final version. MH is guarantor for the paper.

Funding: The project was funded by grants from the General Practice Evaluation Program, Commonwealth Department of Health and Aged Care.

Competing interests: None declared.

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(Accepted 25 February 2002)