

DTF Lee 李子芬  
 AE Mackenzie 麥建思  
 IFK Lee 李鳳琴  
 ASF Lai  
 TLF Lo

# A care protocol to reduce hospital readmissions of elderly residential care home patients with chronic obstructive pulmonary disease

## Key Messages

1. Provision of community nursing support to residential care home staff has significantly improved the psychological well-being of elderly residents.
2. Psychological aspects of care should be emphasised in the care of older people with chronic illness.

## Introduction

The quality of private residential care provision has been the subject of widespread concern and criticism in Hong Kong. A recent study in a geriatric unit of a regional (New Territories South) hospital in Hong Kong found that readmission rates were significantly higher among these patients than those who lived at home.<sup>1</sup> Chronic obstructive pulmonary disease (COPD) alone accounted for 37.8% of these readmissions. The adverse psychological effects and the associated loss of physical capacity significantly contributed to the morbidity and readmissions of these patients.<sup>2</sup>

In addition to cost, repeated hospitalisations have been found to produce a negative impact on the morale and quality of life of elderly patients.<sup>3</sup> Developing an efficacious and practical approach to reduce or prevent readmissions is, therefore, desirable both economically and psychologically. The positive benefits of using nurses as advisors to residential care home staff have been documented. The use of nurses has been found to reduce both admissions to hospitals and emergency room usage and to improve patients' activities of daily living. Nursing therapies such as hydration and nutritional care have also been beneficial.<sup>4</sup>

With the dramatic increase in the elderly population of Hong Kong, the need for residential care is not likely to diminish in the near future. Although there is evidence of high rates of readmission among elderly residents with chronic airway problems, little has been done to improve the health outcomes of this high-risk patient group. The common risk factors for hospital readmissions in COPD patients have been shown to be amenable to nursing interventions of education and psychological support.<sup>5</sup> There is a need to consider ways in which nursing care can be augmented in the private residential care homes to improve patient care outcomes.

The aim of this study was to evaluate the effectiveness of a care protocol used by community nurses to support private residential home staff taking care of patients with COPD.

## Methods

### Study design

This study was conducted from November 1998 to November 2000. A matched, randomised pre-test–post-test case control design was used. Forty-five of the 56 private residential care homes in the New Territories South region participated. These homes were matched according to the number of readmissions of their residents during the previous year identified from the admission records of the study hospitals. Three strata of high, medium, and low readmission homes were identified. Homes in the same stratum were randomly assigned to control or experimental groups. This sampling assignment was chosen to avoid having both experimental and control group subjects within the same residential care home, thereby contaminating the intervention; and to secure legitimate comparisons of cases and controls.

*Hong Kong Med J* 2006;12 (Suppl 2):S10-4

Department of Nursing, Faculty of  
 Medicine, The Chinese University of Hong  
 Kong

DTF Lee, AE Mackenzie, IFK Lee

Department of Nursing, Princess Margaret  
 Hospital

ASF Lai, TLF Lo

HSRF project number: 811009

Principal applicant and corresponding author:  
 Prof Diana TF Lee

The Nethersole School of Nursing  
 The Chinese University of Hong Kong  
 Shatin, NT

Tel: (852) 2609 6227

Fax: (852) 2603 5269

E-mail: tzefanlee@cuhk.edu.hk

### Sample

Subjects were recruited into the study from the geriatric units of the two hospitals in the New Territories South region. Inclusion criteria were patients who were 65 years or older, were present residents of a residential care home being studied, had a main diagnosis of COPD, had at least one hospital admission in the previous 6 months, and were soon to be discharged to the care home. Patients with terminal illness (not expected to survive more than 6 months) and/or communication problems (eg deafness, cognitive impairment) were excluded.

Once baseline data were collected, patients were assigned to the experimental or control group depending on the residential care homes that they were discharged to. A total of 128 subjects were needed for the study to have 80% power ( $\alpha=5\%$ ) to detect a medium effect size. Taking into account an attrition rate of 8% identified from the earlier re-admission study,<sup>1</sup> the total sample required was calculated as 138, ie 69 in each group.

### Interventions

Before the study began, three full-day training sessions were provided to community nurses from the New Territories South region. Community nurses were introduced to the care protocol and their knowledge and skills pertaining to the care of elderly patients with COPD were updated.

Following their discharge to residential care homes, elderly patients in the experimental group were followed up for 6 months by community nurses using a care protocol. The protocol was a clearly defined plan outlining the type of patient care and frequency, length, type, and support provided by the community nurses to residential care home staff. Participants in the control group did not receive the care protocol after discharge to residential care homes. For control participants who were referred to community nursing services by a physician, the usual community nursing care was provided. The only difference was that these participants had not received the study interventions as outlined in the care protocol.

### Main outcome measures and study instruments

The main outcome measures used in this study were the functional, respiratory, and psychological status of the elderly patients; hospital service utilisation; and the satisfaction of residential home staff and patients with the use of the care protocol. Baseline patient data for both experimental and control groups were collected in the geriatric units of the study hospitals before discharge. Post-intervention data on all outcome measures were collected at 6 months from the time of enrolment into the study, with the exception of data on home staff satisfaction which were collected at 1 month from the time of patient enrolment into the study. A cost-effectiveness analysis was also conducted.

The Barthel Index (BI) was used to assess participants' functional outcomes. A higher score indicates greater inde-

**Table 1. Characteristics of the subjects**

Characteristics	Experimental group, n=48	Control group, n=41
Mean age (SD) [years]	81.08 (6.03)	79.68 (6.53)
Sex		
Male	27 (56%)	20 (49%)
Female	21 (44%)	21 (51%)
Social allowance		
Yes	46 (96%)	35 (85%)
No	2 (4%)	6 (15%)
Mean duration of COPD* (SD) [years]	9.70 (10.33)	8.81 (7.29)
Severity of COPD		
Mild	3 (6%)	4 (10%)
Moderate	12 (25%)	11 (27%)
Severe	33 (69%)	26 (63%)
Mean No. of readmission in the past 6 months (SD)	1.50 (1.83)	0.93 (1.49)

\* COPD denotes chronic obstructive pulmonary disease

pendence in performance of activities of daily living. Forced expiratory volume at 1 second ( $FEV_1$ ), as measured by a portable spirometer, was used to assess elderly patients' respiratory outcomes. A higher level of % predicted  $FEV_1$  indicates a better respiratory status. The 28-item General Health Questionnaire (GHQ) was used to assess patients' psychological well-being. It has four subscales measuring somatic symptoms, anxiety and insomnia, social dysfunction, and depression. A total score (0-84) is obtained from summation of all item scores, with a lower score indicating better psychological well-being.

The total number of COPD-related emergency room visits, hospital readmissions, and hospital days during the study period were recorded for both control and experimental groups. Two questionnaires were developed to measure residential care home staff's and elderly residents' satisfaction with the care protocol. The staff questionnaire contains 11 items with a higher score indicating greater satisfaction with the care protocol. The patient questionnaire has 13 items, with 10 items evaluating respondents' satisfaction with the care provided by the home staff and three items evaluating their satisfaction with the community nurse visits. A higher score indicates a higher level of satisfaction.

The mean cost for the experimental and control groups was also calculated and compared to determine the cost-effectiveness of the care protocol.

## Results

### Demographic characteristics

As the number of COPD elderly patients who were readmitted into the geriatric units of the study hospitals was smaller than that estimated from the earlier readmission study,<sup>1</sup> 112 participants were actually recruited, assessed at baseline and assigned to experimental or control groups. Of these 112 patients, 89 (48 in the experimental group and 41 in the control group) completed the study. Death was a major cause of attrition.

**Table 2. Comparisons of Barthel Index (BI), forced expiratory volume at 1 second (FEV<sub>1</sub>), General Health Questionnaire (GHQ), and its subscale measurements between experimental and control groups at 6 months**

Variable	Experimental group, n=48		Control group, n=41		F from ANCOVA	Degrees of freedom	Adjusted P value (2-tailed)
	Adjusted mean	SD	Adjusted mean	SD			
BI	16.42	2.84	16.62	2.82	0.106	1	0.750 <sup>†</sup>
FEV <sub>1</sub>	33.70	11.92	30.98	11.91	1.149	1	0.287 <sup>†</sup>
Total GHQ*	18.45	5.75	22.53	5.76	10.953	1	0.001 <sup>§</sup>
Subscale A: somatic symptoms	4.97	2.36	6.16	2.31	5.792	1	0.018 <sup>  </sup>
Subscale B: anxiety & insomnia	2.86	1.87	4.31	1.92	12.600	1	0.001 <sup>¶</sup>
Subscale C: social dysfunction	7.23	1.11	7.79	1.15	5.439	1	0.022 <sup>**</sup>
Subscale D: depression	3.30	2.15	4.36	2.18	5.411	1	0.022 <sup>††</sup>

\* For GHQ and its subscales, lower score represents better psychological status

<sup>†</sup> Adjusted for duration of COPD (P=0.045) and BI pre-test (P<0.001)

<sup>§</sup> Adjusted for age (P=0.003) and FEV<sub>1</sub> pre-test (P<0.001)

<sup>§</sup> Adjusted for age (P=0.006), sex (P=0.029), and total GHQ pre-test (P<0.001)

<sup>||</sup> Adjusted for age (P=0.048) and GHQ subscale A pre-test (P<0.001)

<sup>¶</sup> Adjusted for age (P=0.016), sex (P=0.045), and GHQ subscale B pre-test (P=0.005)

<sup>\*\*</sup> Adjusted for GHQ subscale C pre-test (P=0.508)

<sup>††</sup> Adjusted for GHQ subscale D pre-test (P=0.002)

Table 1 shows the characteristics of the final sample by group allocation. The elderly subjects ranged in age from 65 to 99 years, with a mean age of 80.4 (standard deviation [SD], 6.27) years. Of these 89 subjects, 47 were male and 42 were female. The majority (91%) were receiving social allowances. The mean duration of COPD was 9.29 years (SD, 9.02) and the mean number of readmissions in the 6 months before the study was 1.24 (SD, 1.70). The majority (66%) had a severe level of COPD.

The Chi squared test and independent *t*-test indicated no significant difference between the experimental and control groups on measures of age, sex, social allowance, duration of COPD, number of readmissions in the past 6 months, severity of COPD, and baseline measures of functional, respiratory and psychological indicators.

### Outcome measurements

#### Functional status

The coefficient alpha estimate for the BI was 0.89. After adjusting for the duration of COPD and the BI pre-test, analysis of covariance (ANCOVA) revealed that the BI post-test did not differ significantly between the experimental and control groups (Table 2).

#### Respiratory status

After adjusting for age and FEV<sub>1</sub> pre-test, ANCOVA showed no significant differences in FEV<sub>1</sub> post-test scores between the experimental and control groups (Table 2).

#### Psychological status

Alpha coefficients for internal consistency of the GHQ were 0.73 for somatic symptoms, 0.73 for anxiety and insomnia, 0.79 for social dysfunction, 0.80 for depression, and 0.88 for total GHQ. After adjusting for age, sex, and total GHQ pre-test, ANCOVA revealed that the experimental group had a significantly lower total GHQ post-test score than the control group (P=0.001), indicating better psychological status.

In addition, the experimental group subjects differed significantly from the control group subjects in all the post-tests of GHQ subscales.

After adjusting for age and subscale A pre-test, the GHQ subscale A post-test was significantly different between the two groups with the experimental group subjects reporting fewer somatic symptoms (P=0.018). After adjusting for age, sex, and subscale B pre-test, the GHQ subscale B post-test was significantly different between the two groups with the experimental group subjects reporting less anxiety and insomnia (P=0.001). Experimental group subjects also had significantly less social dysfunction (P=0.022) and significantly less depression (P=0.022) than control group subjects, after an adjustment were made for the respective subscale pre-test scores. These results are summarised in Table 2.

#### Hospital service utilisation

Health services used by the groups are summarised in Table 3. An independent samples *t*-test revealed no significant differences in the total number of COPD-related readmissions, hospital days, and emergency room visits. While the mean number of days between discharge and the first hospital readmission and emergency room attendance was longer in the experimental group than the control group, the difference was not significant.

#### Satisfaction of home staff and elderly residents

The alpha coefficient for internal consistency of the staff satisfaction questionnaire was 0.82. A total of 48 residential home staff responded to the questionnaire. The mean age was 41.9 (SD, 9.34) years and most of these staff were female (92%). Scores ranged from 30 to 51 (out of a possible range of 11 to 55), with a mean of 42.85 (SD, 5.22), reflecting a high level of satisfaction with the use of the protocol. The areas of greatest satisfaction reported by care home staff are summarised in Table 4.

**Table 3. Comparison of health service utilisation between experimental and control groups**

Variable	Experimental group, n=48		Control group, n=41		t from independent samples t-test	Degrees of freedom	P value (2-tailed)
	Mean	SD	Mean	SD			
Total No. of hospital readmissions related to COPD*	1.54	1.75	1.39	1.51	0.433	87	0.666
Total No. of hospital days related to COPD	14.35	19.27	14.98	20.18	-0.148	87	0.882
Total No. of emergency room visits related to COPD	1.58	1.75	1.59	1.73	-0.005	87	0.996
No. of days between discharge and first hospital readmission	33.85	42.58	25.49	36.14	0.990	87	0.325
No. of days between discharge and first emergency room visit	33.85	42.58	24.27	35.67	1.140	87	0.251

\* COPD denotes chronic obstructive pulmonary disease

The alpha coefficient for internal consistency of the patient satisfaction questionnaire was 0.86. An independent samples *t*-test showed that there was no significant difference ( $P=0.129$ ) between the experimental and control groups with regard to their satisfaction with care provided by the residential home staff (items 1-10) before implementation of the care protocol. However, a paired samples *t*-test revealed a significantly increased level of satisfaction in the experimental group after implementation of the care protocol ( $P=0.000$ , Table 5). Experimental group patients were also highly satisfied with the community nursing visits (items 11-13), with a mean score of 14.1 (SD, 1.57) out of a maximum of 15.

### Cost-effectiveness analysis

A mean cost for each group was calculated based on the estimated cost of each type of service utilised, for example, number of hours of Community Nursing Service visits, number of visits to emergency room, and number of days per in-patient hospital usage. The mean cost for the experimental group was HK\$46 487 and for the control group was HK\$47 704, thus use of the protocol reduced the cost by HK\$1217. This difference was not statistically significant ( $P=0.927$ ), however, when costs were compared with outcomes, the reduction in cost was also associated with greater improvements in COPD patients' psychological well-being, and in staff and patient satisfaction.

### Discussion

Although there was no reduction in hospital service utilisation, a possible effect of the protocol used by nurses was a significant improvement in the patients' psychological well-being. In addition, residential home staff were highly satisfied with the use of the protocol and the resi-

**Table 4. Residential home staff's satisfaction with the care protocol**

Sample item	Scores	
	Mean	SD
Question 1: frequency of CNS* visit	4.04	0.54
Question 6: better understanding of my patient's condition	4.08	0.74
Question 9: more confident to take care of my patient	4.15	0.71
Question 10: satisfied with the CNS	4.19	0.49
Question 11: would like to receive the CNS again	4.08	0.54

\* CNS denotes Community Nursing Service

dents were also highly satisfied with the care they received from the residential home staff.

Psychological well-being is an important factor in the management of chronic illness. Poor psychological well-being adversely affects the physical capacity and functioning of COPD patients.<sup>2</sup> Therefore the finding that psychological well-being may be improved is important in the overall rehabilitation of elderly people with COPD. Community nurses have been able to improve the care given by residential home staff even though the staff members are not qualified health professionals. The high level of satisfaction with the protocol reported by residential care home staff is also encouraging, suggesting that they have a positive attitude to improving their knowledge and to changes designed to improve residents' care. They also found the protocol appropriate.

The lack of significance in changes in respiratory status may be explained by the lack of sensitivity of the measures and the level of COPD severity. Previous research has shown

**Table 5. Comparison of experimental group patient satisfaction at baseline and 6 months**

Patient satisfaction questionnaire	At baseline, n=48		At 6 months, n=41		t from paired-samples t-test	Degrees of freedom	P value (2-tailed)
	Mean	SD	Mean	SD			
Total score	30.15	3.97	33.58	4.45	-7.134	87	0.000

the difficulties of assessing changes in respiratory status using measures of FEV<sub>1</sub> and that patient education has not increased FEV<sub>1</sub>.<sup>6</sup> Exercise tolerance using measures such as timed walking would be more appropriate. Their FEV<sub>1</sub> readings indicate that the majority of people in this study (66%) are severe COPD patients. There is some evidence that COPD patients classified as being at a severe stage do not benefit from nursing outreach programmes.<sup>7</sup>

The functional ability measured by the BI showed no significant change between the control and experimental groups. Other studies using care attendants<sup>8</sup> and advanced practice nurses<sup>9</sup> to give support to home staff also found no difference in physical independence. The BI may not have been sensitive enough to detect small changes in physical activity. Instruments that measure activities of daily living may be more sensitive to changes relating to physical aspects of rehabilitation and also of more practical use in a residential care home setting and more appropriate to elderly people with COPD.

The number of days between discharge and first hospital readmission and emergency room use was longer in the experimental group than the control group although the difference was not significant. In fact, a feature of the care protocol was that the community nurses visited the residential care homes every week in the first month after a patient's discharge from hospital. The frequency of visits was then reduced to monthly in the subsequent 5 months. It may be that this intensive support for the home care staff during the first month has made a difference. Reinforcement of the education given to home staff after the first month could have been increased by other means such as the provision of a video to provide details of appropriate interventions (eg use of inhalers and breathing exercise). Multiple methods of support could be considered in future work to augment care in the residential care homes.

There was no attempt to measure the community nurses' intervention with the care home staff in this study. There was also no attempt to monitor how the residential care home staff implemented the nursing interventions prescribed by community nurses. It would be useful to examine this process in future similar studies using methods such as observations or keeping of log books or diaries by home staff. Besides, it was difficult to control community nurses' unconscious communication of the study expectations to home staff. It was also important to note that this study did not recruit the number of subjects originally proposed. Moreover, the group from which the study sample was cho-

sen was COPD patients in private residential care homes only. The influence of these factors on the generalisability of the findings is critical. As a result, conclusions drawn in this report can only be regarded as tentative.

## Conclusion

Although there was no reduction in hospital service utilisation, the protocol used by community nurses to augment care provided in private residential care homes led to significant improvement in the patients' psychological well-being. This study has demonstrated how the role of community nurses can be further developed to address the changing health care needs of Hong Kong.

## Acknowledgements

This study was supported by the Health Services Research Fund (#811009). The authors would like to thank the Community Nursing Team of the Princess Margaret Hospital for their support in this study, and the residential care homes and elderly patients who participated in this study.

## References

1. Lee DT, Mackenzie AE, Lee IF, Chan CW. Hospital readmissions among elderly patients in Hong Kong: a preliminary study. *J Clin Nurs* 1999;8:478-9.
2. Lacasse Y, Wong E, Guyatt GH, King D, Cook DJ, Goldstein RS. Meta-analysis of respiratory rehabilitation in chronic obstructive pulmonary disease. *Lancet* 1996;348:1115-9.
3. Alexy BB, Elnitsky CA, Nichols BS. Hospital readmissions for rural elderly 1992-1993. *J Nurs Adm* 1996;26:10-6.
4. Dennis LI, Blue CL, Stahl SM, Bengt ME, Shaw CJ. The relationship between hospital readmissions of medicare beneficiaries with chronic illnesses and home care nursing interventions. *Home Healthc Nurse* 1996;14:303-9.
5. Devine EC, Percy J. Meta-analysis of the effects of psychoeducational care in adults with chronic obstructive pulmonary disease. *Patient Educ Couns* 1996;29:167-78.
6. Smith B, Appleton S, Adams R, Southcott A, Ruffin R. Home care by outreach nursing for chronic obstructive pulmonary disease. *Cochrane Database of Syst Rev* 2001;3:CD000994.
7. Townsend J, Piper M, Frank AO, Dyer S, North WR, Meade TW. Reduction in hospital readmission stay of elderly patients by a community based hospital discharge scheme: a randomised controlled trial. *BMJ* 1988;297:544-7.
8. Naylor MD, Broton D, Campbell R, et al. Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. *JAMA* 1999;281:613-20.
9. Roth E, Davidoff G, Haughton J, Ardner M. Functional assessment in spinal cord injury: a comparison of the Modified Barthel Index and the "adapted" Functional Independence Measure. *Clin Rehabil* 1990;4:277-85.