TCY Kwok 郭志銳
J Woo 胡令芳
E Lau 劉明珠
D Lee 李子芬
C Tang 鄧素琴
SM McGhee 麥潔儀

Community nurse specialists and prevention of readmissions in older patients with chronic lung disease and cardiac failure

Key Messages

1. A post-discharge follow-up by community nurses significantly reduced length of stay in acute hospital and accident and emergency attendances in older cardiac failure patients.
2. Community nursing intervention also resulted in minor improvements in dyspnoea and handicap levels in older cardiac failure patients.
3. Total public health care costs tended to be reduced by community nursing for older cardiac failure patients.
4. Post-discharge follow-up by community nurses for older patients with chronic lung disease patients had no measurable benefit in terms of hospital readmission rates, length of hospital stay, or any functional and psychological outcomes.
5. The effectiveness of community nursing may vary according to the client groups. It is necessary for community nursing to define its target group, the intervention protocols and the expected outcomes, so that its effectiveness can be evaluated.

Hong Kong Med J 2007;13(Suppl 5):S8-12

The Chinese University of Hong Kong, Shatin, Hong Kong:
Department of Medicine
TCY Kwok, J Woo
Department of Community and Family Medicine
E Lau
Department of Nursing
D Lee
Department of Psychology
C Tang
Department of Community Medicine, The University of Hong Kong
SM McGhee

HSRF project number: 721007

Principal applicant and corresponding author:
Prof Timothy CY Kwok
Department of Medicine and Therapeutics, The Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, NT, Hong Kong SAR, China
Tel: (852) 2632 3126
Fax: (852) 2637 3852
E-mail: tkwok@cuhk.edu.hk

Introduction

Chronic lung disease (CLD) and chronic cardiac failure (CCF) are major health problems among older people. Despite medical interventions, many sufferers remain severely disabled and have recurrent hospital admissions. Close supervision by a nurse specialist after discharge may prevent the readmission of high-risk older patients. But effectiveness of such care may vary between diagnostic groups.[1,2] People with CLD and CCF were chosen for a trial of community nursing (CNS) interventions, because they have complex medical and psychosocial needs, complicated drug regimens, and very high rates of hospital readmission.

Methods

This study was conducted from March 1999 to October 2001. Patients with a principal diagnosis of either CLD or CCF were recruited from the medical wards at the Prince of Wales, Shatin, and Tai Po Nethersole hospitals. The inclusion criteria included age greater than 60 years and a hospital stay within the previous 6 months for CLD patients and 12 months for CCF patients. The exclusion criteria included communication problems and a lack of caregivers, old-age home residence, and terminal disease. The subjects were then randomly assigned to CNS and control groups. The CNS interventions included post-discharge home visits and access to a designated CNS via a telephone hotline. Medical support was provided by a designated physician in the respective hospitals. Urgent medical out-patient and clinical admissions were arranged if necessary.

The control subjects had their usual medical and social care. Both groups were followed up by the same small teams of physicians, not less than once every 3 months. The total trial period was 24 weeks. The primary outcome was the proportion of subjects free of unplanned hospital readmissions. Physical outcomes were measured by a 6-minute walking test and the dyspnoea index. Psychosocial outcomes included the London Handicap Scale (maximum=6, indicating maximal handicap), the General Health Questionnaire, and the multidimensional locus of control.

Sample size calculation

Based on previous admission data in the participating hospitals, it was calculated that for CLD, a sample size of 150 had a 0.8 chance of detecting a 25% reduction in readmission rates at a confidence level of 0.95. For CCF, a sample size of 100 had a 0.8 chance of detecting a 45% reduction in readmission rates at a confidence interval of 0.95.

Results

A total of 157 CLD and 106 CCF subjects were randomised (Fig). The subjects who died were included in the analysis of hospital usage and cost analysis. The clinical characteristics of the subject groups are shown in Table 1. At the 6-month follow-up, readmission rates and hospital service usage by all CLD and

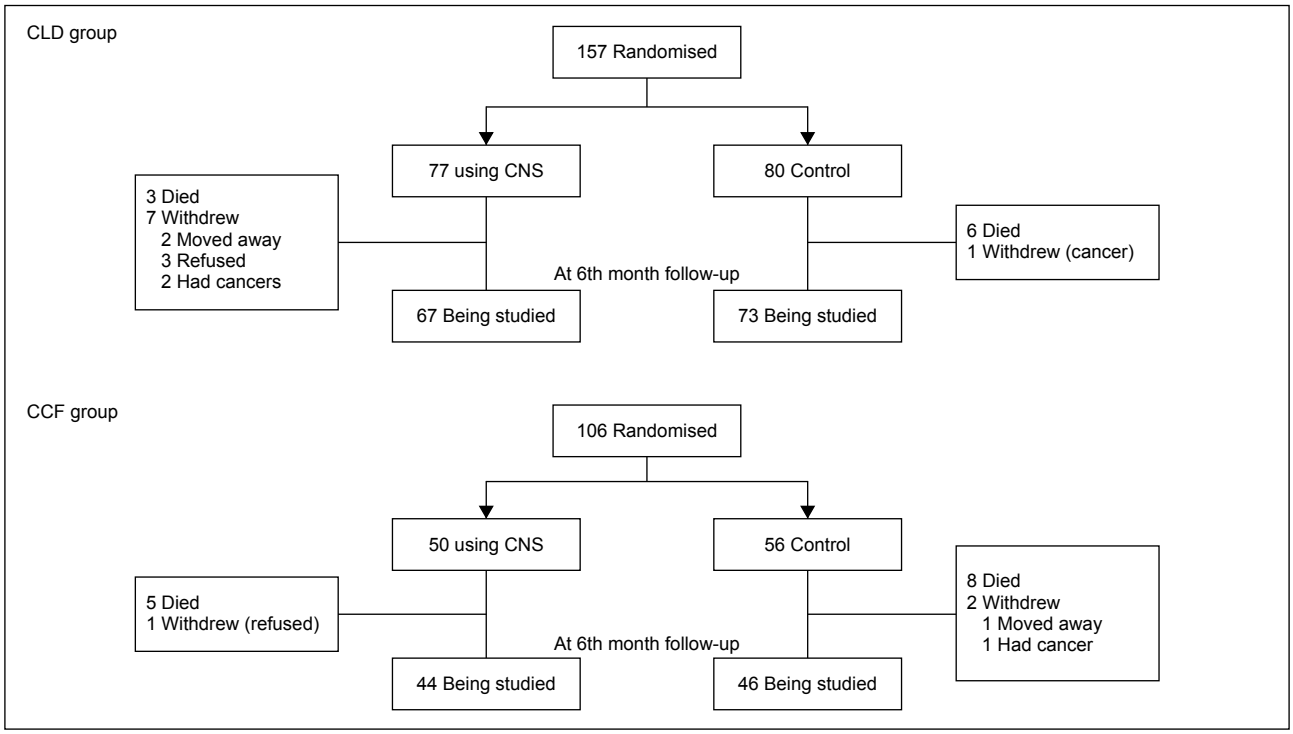

Fig. Randomisation of older subjects with chronic lung disease (CLD) and cardiac failure (CCF)
CNS denotes community nursing

Table 1. Subject characteristics*

Characteristic	Chronic lung disease†		Cardiac failure†	
	Control (n=80)	CNS (n=77)	Control (n=56)	CNS (n=50)
Sex (M/F)	55/25	56/21	25/31	22/28
Age (years)	74.2 (5.7)	75.3 (7.0)	76.8 (7.0)	79.3 (6.6)
No. living alone	10 (12.5%)	17 (22%)	10 (18%)	15 (30%)
Dyspnoea (max=4)	0.38 (0.75)	0.32 (0.75)	0.53 (0.77)	0.48 (0.65)
AMT (/10)	9.2 (1.3)	9.0 (1.2)	8.7 (1.3)	8.5 (1.4)
SaO_2 (%)	92.4 (4.9)	93.1 (3.7)	96.2 (2.1)	95.7 (2.5)
LTOT (%)	43.7	42.9	-	-
PEFR (L/min)	151 (58)	155 (64)	-	-
6MWT (m)	145 (71)	162 (79)	118 (63)	118 (64)
GHQ (max=30)	22.5 (4.8)	22.5 (4.5)	23.9 (3.3)	24.3 (3.8)

* CNS deontes community nursing, AMT abbreviated mental test, SaO_2 oxygen saturation, LTOT long-term oxygen therapy, PEFR peak expiratory flow rate, 6MWT 6-minute walking test, GHQ General Health Questionnaire (higher scores indicating better mental health)
† Data are shown as mean (standard deviation) unless otherwise stated

Table 2. Comparison of readmission rates and hospital usage between groups

Readmission rate/hospital usage	Chronic lung disease		Cardiac failure	
	Control, n=79	CNS*, n=70	Control, n=54	CNS, n=49
No. ever readmitted	49 (62%)	53 (76%)	32 (59%)	23 (47%)
No. ever readmitted early	29 (37%)	33 (47%)	23 (43%)	17 (35%)
No. of unplanned readmissions†	1 (0, 2)	1 (0, 2)	1 (0, 2)	0 (0, 1)
No. of accident and emergency attendances†	2 (0, 3)	2 (0, 3)	2 (1, 3)	1 (0, 2)‡
Total hospital stay (days)†	12.0 (0.0, 28.0)	12.5 (3.8, 26.8)	6.0 (0.0, 29.8)	2.0 (0.0, 14.0)
Acute hospital bed†	1 (0, 2)	1 (0, 2)	4.5 (0, 16.3)	0 (0, 7.0)‡
Non-acute hospital bed†	0 (0, 18.0)	6 (0, 18.3)	0 (0, 10.5)	0 (0, 5.0)

* CNS denotes community nursing
† Data are shown as median (25th, 75th percentile)
‡ P<0.05, Mann-Whitney test

CCF subjects were measured and a comparison was made between the CNS and control groups (Table 2). Among the CLD subjects, the proportion of subjects ever readmitted in the 6-month trial period was greater in the CNS group, though the difference was not quite significant (P=0.074). In the CCF subjects, the CNS group had significantly fewer

Table 3. Comparison of medical costs incurred per person*

Cost item	Control	CNS†
Subjects with chronic lung disease	n=79	n=70
Accident and emergency attendances	1068 (0, 1602)	1068 (400, 1602)
General Out-patient Clinic	0 (0, 0)	0 (0, 0)
Specialist Out-patient Clinic	1365 (910, 1479)	1365 (910, 1365)
Acute hospital bed	12 520 (0, 37 560)	15 650 (0, 28 953)
Non-acute hospital bed	0 (0, 33 102)	11 034 (0, 33 562)
CNS	0 (0, 0)	1837 (1362, 2326)
Total	27 761 (1899, 77 417)	35 760 (13 334, 67 233)
Subjects with cardiac failure	n=54	n=49
Accident and emergency attendances	801 (534, 1602)	534 (0, 1068)‡
General Out-patient Clinic	0 (0, 0)	0 (0)
Specialist Out-patient Clinic	1365 (455, 1365)	1365 (910, 1365)
Acute hospital bed	14 085 (0, 50 863)	0 (0, 21 910)‡
Non-acute hospital bed	0 (0, 17 011)	0 (0, 9195)
CNS	0 (0, 0)	2272 (1589, 3025)
Total	21 599 (1958, 73 449)	9195 (3970, 36 041)

* Data, including totals, are the median cost (25th, 75th percentile) in HK$
† CNS denotes community nursing
‡ P<0.05, Mann-Whitney test

Table 4. Causes of readmission for chronic lung disease (CLD) and cardiac failure (CCF) subjects

Reason*	CLD (165 episodes)		CCF (61 episodes)	
	Primary	Secondary	Primary	Secondary
Exacerbation	105 (64%)	8 (4.9%)	30 (49%)	4 (7%)
New but related	6 (3.7%)	7 (4.3%)	8 (13%)	2 (3%)
New, unrelated	25 (15.2%)	3 (1.8%)	11 (18%)	0
Elective	14 (8.5%)	3 (1.8%)	2 (3%)	1 (2%)
Psychosocial	8 (4.9)	8 (4.9%)	3 (5%)	5 (8%)
Drug-related	4 (2.4%)	1 (0.6%)	4 (7%)	2 (3%)
Dietary incompliance	1 (0.6%)	0	2 (3%)	4 (7%)
No deterioration	9 (5.5%)	2 (1.2%)	1 (2%)	2 (3%)

* Reasons are not mutually exclusive

accident and emergency department (A&E) attendances and shorter stays in acute hospitals. The difference in total hospital stay was, however, not significant (P=0.15, using the Mann-Whitney test).

There was no significant difference between baseline and the 6-month follow-up in all subject groups. The only group difference was a small but significant reduction in the dyspnoea index score in the CCF subjects who received CNS, compared with those who did not (mean±standard deviation: -0.2±0.7 vs 0.07±0.72).

In the London handicap scores, CCF subjects receiving CNS had a reduction in the domains of independence (-0.11±1.26 vs 0.54±0.66 in the controls, P<0.05, Student's *t* test) and occupation (-0.30±1.21 vs 0.24±1.02 in controls, P<0.05). In CLD subjects, the CNS group had relative stability in the social handicap domain (0.01±0.89 vs 0.38±1.11, P<0.05). There was no significant change in any of the domains of the multidimensional locus of control questionnaire in any of the trial groups.

The comparison of total medical costs incurred by trial subjects in the 6-month trial period is shown in Table 3. Among the CCF subjects, the costs of acute hospital bed usage incurred by the CNS group were significantly less than those of the control group (P=0.008, Mann-Whitney test). There was no significant group difference in the costs incurred by the subjects themselves.

Of all 224 re-admissions of CLD patients and all 126 readmissions of CCF patients, 165 (74%) and 61 (48%) respectively were assessed by research physicians. The reasons for readmission are shown in Table 4.

Discussion

Community nursing intervention

The CNS intervention was designed to provide continuity of care. Only one designated community nurse was allocated to each disease group. These nurses were experienced community nurses who had received training in the management of the disease group by attending geriatric case conferences. A specific nursing protocol was finalised for each disease group after consultation with geriatricians interested in these areas. Finally, these nurses liaised closely with designated physicians in the relevant hospitals. To standardise medical out-patient care, all study subjects were followed up by the same medical or geriatric specialist staff member of the research team.

Ineffectiveness at reducing admissions of chronic obstructive pulmonary disease patients

Community nursing intervention did not reduce the amount of hospital admissions or A&E attendances. Moreover, it did not improve any of the measured outcomes—physical health status, psychological status, self-efficacy, and handicap. The great majority of our subjects had chronic obstructive pulmonary disease (COPD). Overseas reports on CNS intervention in COPD patients have been similarly discouraging.[3] Also consistent with overseas reports, there was a non-significant trend toward reduced mortality in CLD patients who received CNS.[3] Alternative CNS programmes for this high-risk group need to be found and tested. A well-trained CNS able to administer antibiotics, oral steroids, and nebulisers for pre-defined mild exacerbations, under the close supervision of a specialist could possibly prevent admissions from the A&E or shorten the length of hospital stays.[4]

Benefits of exercise in chronic obstructive pulmonary disease patients

Physical exercise can improve endurance in CLD patients. But simple encouragement to exercise at home by the CNS is probably inadequate and ineffective. Supervised exercise programmes may be more effective.[5] The short-term gain in exercise tolerance may be prolonged by CNS follow-up. Supervised exercise programmes may not be practical for homebound CLD patients with very limited lung function.

Role of primary health care in chronic obstructive pulmonary disease patients

Chronic lung disease is a chronic disease with exacerbations. Successful health education should lead to increase awareness of early exacerbations and the need to seek medical care at the primary level. Unfortunately, it is more convenient for homebound CLD patients to attend the A&E for minor complaints than to seek primary health care. Our CNS intervention did attempt to address this problem by providing a telephone hotline. On average, each subject made 10 calls to our CNS. Some of these calls resulted in medical out-patient clinic attendances within a few days. This hotline was only operational during normal working hours so was not responsive enough to deal with acute deterioration in CLD patients.

Psychosocial needs of chronic obstructive pulmonary disease patients

Nearly 10% of the CLD patient readmissions were directly or indirectly caused by psychosocial issues. One randomised trial of CNS intervention in Care and Attention Homes in Hong Kong showed that psychological well-being, not physical status, was improved.[6] The only measure of psychological well-being in this study was the General Health Questionnaire and it did not appear to have been improved by our CNS intervention. It remains to be seen whether more intensive psychosocial interventions can lead to changes in health-seeking behaviour.

Benefits of community nursing for cardiac failure patients

In CCF patients, CNS provided a convincing benefit. There was a trend toward a reduction in the proportion of readmissions. There was a significant reduction in the number of A&E attendances and the length of stay in acute hospital beds. These improved outcomes were associated with a slight improvement in dyspnoea levels, and a reduction in some aspects of handicap (independence and occupation). These findings are consistent with previous reported trials.[1]

These benefits appeared to have resulted from the better clinical status of the CCF patients. The shorter length of stay in acute hospitals could either be caused by better clinical condition on admission or earlier discharge, because of the availability of home monitoring by CNS. Now that evidence is available, every effort should therefore be made to ensure that CCF in-patients are referred to CNS, and to ensure adherence to service protocols. It is essential for the CNS to team with designated hospital physicians who are interested in providing medical support for this group of patients.

Cost-effectiveness of community nursing in chronic lung disease and cardiac failure patients

In the cost analysis, the greatest health care costs were caused by acute hospital stays. The cost of CNS was relatively small, but greater than that of the specialist out-patient department. In CLD subjects, the total medical costs from the public sector tended to be higher in the CNS group, mainly because of increased hospital stays. In the CCF subjects, there were significant savings from A&E and acute hospital bed usage, but the overall reduction in health care costs did not reach statistical significance. These data suggested that CNS intervention in the present form was not cost-effective for CLD patients but might be so for CCF patients.

Why was community nursing more effective in cardiac failure than in chronic lung disease patients?

There were notable differences between the two disease groups. Firstly, CCF patients had much shorter lengths of stay, suggesting that medical treatment for CCF is more effective than that for CLD. In the last decade, there have been major advances in the medical treatment for CCF, eg angiotensin-converting enzyme inhibitors, beta-blockers, etc. Secondly, the role of dietary and drug non-compliance was much more prominent in CCF, accounting directly or indirectly for 20% of readmissions, versus 4% in CLD readmissions. High salt intake and drug non-compliance are common among older people in Hong Kong. Community nursing intervention might have been particularly effective for ensuring dietary and drug compliance. The close liaison with hospital doctors also meant that side-effects from cardiac drugs could be rectified, and drug dosages could be adjusted according to the clinical status of the patients.

Conclusion

Post-discharge CNS follow-up was effective for reducing the length of hospital stays and A&E attendances in CCF patients. This was probably due to improvement in clinical status and handicap, and to the facilitation of earlier hospital discharge. Overall health care costs were reduced. On the other hand, CNS intervention tended to increase the risk of re-admission and overall health care costs in CLD patients, though the mortality rate was reduced. Community nursing is an effective bridge between the hospital and the community. While it aims to provide holistic care, its efforts should be focused and targeted at the right clients.

Acknowledgements

This study was supported by the Health Services Research Fund (#721007). We would like to express our gratitude to the community nursing teams in Shatin and Tai Po. Dr HS Chan and Dr CK Chan at the Tai Po Nethersole Hospital assisted with the recruitment and follow-up of chronic lung disease and cardiac failure patients respectively. Geriatric nurse specialist, Ms Eliza Lau, at the Prince of Wales Hospital assisted with recruitment also.

References

1. Naylor M, Brooten D, Jones R, Lavizzo-Mourey R, Mezey M, Pauly M. Comprehensive discharge planning for the hospitalized elderly. A randomized clinical trial. Ann Intern Med 1994;120:999-1006.
2. Vetter NJ, Lewis PA, Ford D. Can health visitors prevent fractures in elderly people? BMJ 1992;304:888-90.
3. Littlejohns P, Baveystock CM, Parnell H, Jones PW. Randomised controlled trial of the effectiveness of a respiratory health worker in reducing impairment, disability, and handicap due to chronic airflow limitation. Thorax 1991;46:559-64.
4. Davis L, Wilkinson M, Bonner S, Calverley PM, Angus RM. "Hospital at home" versus hospital care in patients with exacerbations of chronic obstructive pulmonary disease: prospective randomised controlled trial. BMJ 2000;321:1265-8.
5. Griffiths TL, Burr ML, Campbell IA, et al. Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial. Lancet 2000;355:362-8.
6. Lee DT, Lee IF, Mackenzie AE, Ho RN. Effects of a care protocol on care outcomes in older nursing home patients with chronic obstructive pulmonary disease. J Am Geriatr Soc 2002;50:870-6.