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# Short-stay in-patient rehabilitation of elderly patients with chronic obstructive pulmonary disease: prospective study

# 慢性阻塞性肺病老年患者的短期留院復康計劃：前瞻性研究

**Objectives.** To evaluate the effectiveness of a short-stay in-patient rehabilitation programme.

**Design.** Prospective case-control cohort study.

**Setting.** Regional medical centre, Hong Kong.

**Patients.** One hundred and thirty symptomatic elderly patients with chronic obstructive pulmonary disease who had been treated for an acute respiratory illness in 1998. They were divided into two groups: the conventional treatment group, which received no rehabilitation (n=65), and the rehabilitation group (n=65).

**Intervention.** A short-stay in-patient rehabilitation programme was implemented, which included assessment, patient and caregiver education, an exercise regimen, physiotherapy, occupational therapy, and case conference.

**Main outcome measures.** Length of stay, hospital re-admission rate, and admission-free interval.

**Results.** The mean length of stay in the rehabilitation ward was 6.2 days. The rate of hospital re-admission was significantly higher in the conventional treatment group than in the rehabilitation group, both within 28 days of discharge home (relative risk=3.33; 95% confidence interval, 2.32-4.56; P=0.019) and at 100 days after discharge (relative risk=2.47; 95% confidence interval, 1.78-3.48; P<0.001). The admission-free interval was significantly longer in the rehabilitation group than in the conventional treatment group (1.13 years vs 0.86 years; P<0.001).

**Conclusion.** A short-stay in-patient rehabilitation programme is effective in reducing hospital re-admission rates. This type of rehabilitation service may be important for elderly patients, as well as for patients with more advanced disease and more functional deficits than others.

**目的：**評估一個短期留院復康計劃的成效。

**設計：**前瞻性的病例對照群組研究。

**安排：**一家地區醫療中心，香港。

**患者：**130位在1998年因急性呼吸道疾病接受治療的無症狀慢性阻塞性肺病老年患者。本研究將這批研究對象劃分為兩組：傳統療法組(即病人沒有參加復康計劃)和復康計劃組，每組各有65人。

**療法：**醫療中心推行了一個短期留院復康計劃。計劃包括評估服務、病人和照顧人員的教育、運動療程、物理治療、職業治療和臨床病例會議。

**主要結果測量：**住院期、再入院比率，以及無需留院期。

**結果：**患者在復康病房的平均住院期為6.2天。不論出院28天內再入院比率(相對危險度=3.33；95%可信區間為2.32至4.56；P=0.019)，還是出院100天後的再入院比率(相對危險度=2.47；95%可信區間為1.78至3.48；P<0.001)，傳統療法組明顯較復康計劃組為高。此外，復康計劃組病人的無需留院期也明顯較傳統療法組的要長(分別為1.13年和0.86年；P<0.001)。

**結論：**短期留院復康計劃能有效降低病人的再入院比率。對老年病患者、重病患者，以及多種功能不便的病人來說，這類服務極為重要。

***Key words:***
*Inpatients;*
*Length of stay;*
*Lung disease, obstructive/rehabilitation;*
*Outcome assessment (health care);*
*Pulmonary disease, chronic obstructive*

***關鍵詞：***
*住院病人；*
*住院期；*
*肺病，阻塞性／復康；*
*結果評估(保健)；*
*肺病，慢性阻塞性*

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## Introduction

In its Workshop on Pulmonary Rehabilitation Research in 1994, the United States

National Institutes of Health developed a new definition of pulmonary rehabilitation: "a multidimensional continuum of services directed to persons with pulmonary disease and their families, usually by an interdisciplinary team of specialists, with the goal of achieving and maintaining the individual's maximum level of independence and functioning in the community."[1] It is thus important to develop pulmonary rehabilitation programmes that offer such services and to measure their effectiveness. The benefits of rehabilitation programmes for patients with chronic respiratory disease in the in-patient,[2-5] out-patient,[6-11] home,[12-17] and community[18] settings have been documented (Table 1). Past research, though each programme had individual differences in the components, intensities, and outcome measures, has commonly involved small samples and sometimes did not include control groups. Furthermore, the effectiveness of rehabilitation programmes among the elderly in Hong Kong has not been previously explored.

Mahler[19] has recommended that any symptomatic individual (of any age) with stable chronic respiratory disease, who is motivated to participate in a self-care programme, be eligible for entry in a pulmonary programme. In this article, we studied the treatment and follow-up of high-risk, borderline self-care independent and elderly patients who received short-term in-patient pulmonary rehabilitation services in order to test whether Mahler's recommendation sustains. The outcomes of the patients were analysed to examine the effects of rehabilitation.

## Methods

This study included 130 elderly patients, who were older than 65 years, with a primary diagnosis of acute exacerbation of chronic obstructive pulmonary disease (COPD), as defined by the International Classification of Diseases (ICD code 490-496).[20] The patients had been transferred from the accident and emergency department after initial assessment and stabilisation to acute wards of the geriatric department for further management at Caritas Medical Centre from January to July 1998. All patients had had COPD diagnosed by their history and results of physical examination, chest radiography, and pulmonary function tests, and all patients displayed dyspnoea on exertion, which limited their daily activities. Some patients whose medical condition had stabilised were admitted into in-patient rehabilitation wards for continuing care by way of a short-stay in-patient rehabilitation programme. Otherwise, patients were discharged home from the acute wards.

The patients were divided into two groups: the in-patient rehabilitation group and the conventional treatment group.

The in-patient rehabilitation group comprised 65 patients who had been admitted to the rehabilitation wards between January 1998 and April 1998, and participated in the short-stay in-patient rehabilitation programme. Inclusion in this programme primarily depended on bed availability, regardless of advanced age, severity of illness, body mass index, coexisting medical conditions, functional level, social background, frequency of previous hospital admission, and mental status.

The conventional treatment group comprised patients who had been discharged directly to their place of residence from the geriatric acute wards. Patients in this group were recruited between January 1998 and July 1998 and were matched against those in the rehabilitation group by age (>65 years), gender (male), primary diagnosis (COPD), severity of illness by the forced expiratory volume in 1 second (<1.2 L), functional level as defined by the level of daily activities, smoking status, social support at home, and social environment (eg residence in an institution). In all, 65 patients matched criteria and acted as sequential controls.

All patients had not received any structured and well-defined pulmonary rehabilitation programme comparable to those exemplified in Table 1 before hospitalisation. They were followed up every 2 to 4 weeks during the rehabilitation programme. Both groups of patients were referred if they met the inclusion criteria as stated and consented to stay and participate in the programme.

A physician interviewed the patients to obtain prospective data on demographic, clinical, and social characteristics. Another physician independently followed up the patients to investigate their utilisation of health care resources—namely, their rate of hospital re-admission due to respiratory causes (ICD code, 480-492). It was an independent observational data collection protecting confidentiality of individual patient with patients' consent. As part of normal clinical practices, it was an exempted study with expedited review by an ordinary ethics committee at the time when the study was initiated in 1997.

The in-patient rehabilitation group received the following services[21-26]:

### *Initial assessment*

Patient assessment in the acute ward (performed by an attending physician) included arterial blood gas analysis after the patient had been in a supine position for 10 minutes, measurement of the forced expiratory volume in 1 second via spirometry, determination of the daily level of activity (the Barthel Index activities of daily living score), and determination of social status as described as the level of social support. The level of social support hinges on whether the patients live with a caregiver, who supervises or assists in caring for the patient in his or her daily activities and in administering the medical regimen at their place of residence. A physiotherapist and an occupational therapist visited the patients after their admission to the rehabilitation ward.

**Table 1. Characteristics of patients receiving pulmonary rehabilitation services in previous studies**

| Study | Age (years) (Mean [SD]) | No. of participants completing the programme | Setting | Severity of illness/$FEV_1$* (Mean [SD]) | Programme duration | Programme frequency |
|---|---|---|---|---|---|---|
| Agle et al,[2] 1973 | 50.5 | 21 | In-patient | - | 4 weeks | - |
| Cockcroft et al,[3] 1981 | 61.2 (5.0) | 17 (rehabilitation group), 12 (control group) | In-patient | 1.5 (0.7) | 6 weeks | Daily |
| Swerts et al,[6] 1990 | 61.4 (6.0) | 25 | Out-patient | 33.8% (8.7%) [severe] | 8 weeks, then a 12-week additional programme | Initial 8 weeks, 3 times per week, 30 minutes per day |
| Niederman et al,[7] 1991 | 65.8 (8.1) | 33 | Out-patient | 1.2 (0.8) | 9 weeks | 3 days per week, 2.5 hours per day |
| Emery et al,[8] 1991 | 67.4 (7.0) | 61 | Out-patient | 1.1 (0.6) [male], 0.78 (0.21) [female] | 30 days | 5 days per week |
| Haggerty et al,[12] 1991 | 66 | 17 | Home | 0.68 | 6-37 months | One nursing visit per week, two respiratory therapy and social service visits per month |
| Casaburi et al,[5] 1991 | 49 (11) | 19 | In-patient | 56% (12%) [moderate] | 8 months | 5 days per week; high work rate: 45 minutes per day; low work rate: longer time |
| Cox et al,[9] 1993 | 43.2 (13.1) | 34 (rehabilitation group), 42 (control group) | Out-patient | 68.3% (20.1%) [not severely impaired] | 3 months | 38 hours per week, 4-5 hours per day |
| Vale et al,[10] 1993 | 64.2 (10.6) | 71 (rehabilitation group), 19 (exercise maintenance group), 32 (control group) | Out-patient | 1.08 (0.56) | 6 weeks, then 3-21 months of maintenance programme (mean, 11 months) | Rehabilitation programme: 2 days per week, maintenance programme: 1 day per week |
| Wijkstra et al,[13] 1994 | 64 (5) | 43 (rehabilitation group), 15 (control group) | Out-patient and home | 44% (11%) [severe] | 12 weeks | 1-hour exercise per day at home |
| Strijbos et al,[14] 1996 | 61.2 (5.5) [out-patient], 60 (7.8) [home] | 15 (out-patient group), 15 (home-care group), 15 (control group) | Out-patient and home | 45.5% (6.9%) in home-care group, 40.4% (19.6%) in out-patient group (severe to moderate) | 12 weeks | 2 days per week (followed up for 18 months) |
| Votto et al,[4] 1996 | 70.6 (6.4) | 38 | In-patient | 31.4% (13.9%) [severe] | Mean, 9.9 days (range, 4-21 days) | 3 hours per day |
| Maltais et al,[11] 1996 | 65 (7) | 11 | Out-patient | 36% (11%) [moderate to severe] | 12 weeks | 3 times per week, 30 minutes per session |
| Cambach et al,[18] 1997 | 52 (15) | 66 | Community-based local physiotherapy practices | 77% (22%) | 3 months | 3 days a week for 90 minutes |

* $FEV_1$ forced expiratory volume in 1 second; in % of predicted. If % predicted not given in the study, then $FEV_1$ in litre was used
† CRDQ Chronic Respiratory Disease Questionnaire

| Main benefits | Remarks |
|---|---|
| (1) Improvement in function (treadmill performance)<br>(2) Desensitisation of the fear of dyspnoea<br>(3) Increased patient autonomy in the control of symptoms | Improvement in performance correlated positively with psychological factors but not with physiological measures |
| Improvement in the 12-minute walking distance | Patients older than 70 years were excluded |
| (1) Increased exercise tolerance (2- and 12-minute walking distance)<br>(2) After an initial programme, a supervised training programme stabilised the effects already achieved | (1) No change in spirometric data<br>(2) No increased tolerance for the sensation of dyspnoea |
| (1) Increased endurance (bicycle ergometer test and 12-minute walk distance)<br>(2) The magnitude of change was not directly related to baseline lung function | The benefits extended to all patients, regardless of the severity of pre-existing lung function |
| (1) Improvement in physical endurance (bicycle ergometer test and 12-minute walk)<br>(2) Improvement in pulmonary function test results<br>(3) Reduction in symptoms of depression and anxiety<br>(4) Improvement in measures of general well-being and neuropsychological functioning | Older patients |
| Reduced consumption of medical resources (hospitalisations, hospital days, emergency room visits, and costs) | (1) Willingness to participate as specified as an admission criteria to the programme<br>(2) A hospital-based home-care programme to provide a link between the hospital and the community, increased coordination of services, better use of existing resources, and more extensive home-care services |
| (1) Achievement of a physiological training effect: reduction in arterial lactate concentration and minute ventilation for an identical exercise workload after training<br>(2) Increased endurance time | (1) Participants were volunteers<br>(2) Exercise training programme on a bicycle ergometer<br>(3) Training at a high work rate was more effective than training at a low work rate |
| Improvement in endurance (bicycle ergometer test and the Cooper test), psychological parameters, and consumption of medical care | Patients who had many complaints were included and assessed with several questionnaires, for example, a sum score composition sheet on dyspnoea |
| (1) Improvement in exercise endurance (12-minute walk distance) and quality of life are long-lasting<br>(2) Post-rehabilitation structured exercise maintenance did not seem to provide long-term benefit | Access of the long-term benefits (followed upon 12-minute walk and quality of life for an average of 11 months [range, 3-21 months]) |
| (1) Improvement in quality of life (dyspnoea, emotion, and mastery)<br>(2) Improvement in exercise tolerance (bicycle ergometer test) | (1) Nursing visit per month at home<br>(2) Out-patient physical therapy visits per week |
| (1) Both out-patient and home-care programmes together improved exercise capacity (bicycle ergometer and 4-minute walk distance) and dyspnoea score at 3 to 6 months<br>(2) After the home-care programme, improvements were maintained longer<br>(3) After the out-patient programme, values returned to baseline level | Comparison between an out-patient rehabilitation programme and a home-care rehabilitation programme |
| (1) Increased 12-minute walk distance<br>(2) Improved dyspnoea during the walking test<br>(3) Improvement in Pulmonary Function Status Scale (functional activities, dyspnoea, psychosocial) | (1) Short-term improvement in multiple measures<br>(2) It was a short-stay comprehensive in-patient pulmonary rehabilitation<br>(3) Sufficient motivation and endurance to participate as one of the admission criteria |
| (1) Significant reduction in minute ventilation and in arterial lactate concentration<br>(2) Increased lactate threshold<br>(3) Increased skeletal muscle oxidative capacity<br>(eg increased activity of two oxidative enzymes: citrate synthase and 3-hydroxy-acyl-coenzyme A dehydrogenase) | (1) Comprehensive programme<br>(2) Exercise sessions on a calibrated ergocycle<br>(3) Endurance training |
| (1) Improved exercise tolerance: endurance time (421 seconds), cardiac frequency (6 beats per minute) and walking distance (39 m)<br>(2) Improvement in quality of life: total CRDQ† score of an average of 17 points | (1) Cross-over design<br>(2) Age: 18-75 years<br>(3) Motivation to improve self-care as one of the admission criteria |

### *The programme*

Patients spent a mean of more than 15 hours a week in the programme. Patient and caregiver education involved both general and personalised instruction from team members and booklets; individual question-and-answer sessions; and assessment of the effectiveness of methods used by caregivers to assist their patients and of how patients self-monitored lung function. A staff nurse reviewed patients' drug compliance and storage methods, and educated them about the correct use of inhaler devices, the minimisation of the number of drugs taken together, and the way to gradually decrease the dosage of corticosteroids. Technical support was also given to patients and their caregivers on the use of nebulisers, low-flow home oxygen concentrators, and other aids.

In addition, patients were taught about diaphragmatic and pursed lips breathing and relaxation techniques; caregivers (if present) were taught about bronchial hygiene (postural drainage, chest percussion, removal of irritants, control of infection with early detection, and antimicrobial treatment).

The rehabilitation also included an exercise programme, which entailed supervised walking—at first, to increase the intensity to heart rate by 60% of the resting rate; then, to gradually increase the exercise duration to a maximum of not more than 90 minutes a day. The patients were encouraged to practise unsupervised for at least 15 minutes daily in the rehabilitation ward. Some patients were assessed periodically using the 6-minute walking test.[27]

An occupational therapist recommended home modifications to ensure optimal home safety and accessibility, and ways to conserve patients' energy (ie planning and pacing of daily activities to improve performance within the limitations of individuals), which, given the age of the patients, may have required repeated demonstrations to illustrate the benefits of behaviour change.[28] Finally, psychological and emotional support was provided by all team members.

A case conference was held weekly with the physician as the team leader, together with the nurses and the therapists. The assessment findings and rehabilitation progress of the patients were presented during the conference. The aim was to define the treatment goals, to agree on the pace of increment of the level of exercise and education, and to achieve a sense of team cohesiveness. Referrals to the community nurses were made if required.

### *Statistical analysis*

All values are presented as means (standard deviation [SD]). The Student's *t* test (two-tailed), or Wilcoxon rank-sum test when applicable, was used to compare characteristics of the two patient groups for continuous variables, whereas the Chi squared test was used for discrete variables. Because the data were censored, the Kaplan-Meier product limit method was used, with hospital re-admission as the end-point event; two curves of estimated proportions of patients remaining admission-free were plotted and the log-rank test was used to compare the two curves. A P value of less than 0.05 was considered significant.

**Table 2. Patient characteristics at baseline**

| | Conventional treatment group, n=65 | Rehabilitation group, n=65 | P value |
|---|---|---|---|
| Age (years) [mean (SD)] | 79.4 (6.0) | 81.5 (7.0) | NS[‡§] |
| Diagnosis (No. [%]) | | | |
| COPD[*] | 65 (100) | 65 (100) | - |
| Sex (No. [%]) | | | |
| Male | 65 (100) | 65 (100) | - |
| Best $FEV_1$[†] (mean [% of predicted value]) | 0.57 (40.7) | 0.55 (39.0) | NS[¶‖] |
| Functional status (No. [%]) | | | |
| Independence in basic activities of daily living (ie Barthel Index >60/100) | 53 (82) | 53 (82) | - |
| Smoking status (No. [%]) | | | |
| Current smoker | 2 (3) | 2 (3) | - |
| Ex-smoker | 63 (97) | 63 (97) | - |
| Social environment (No. [%]) | | | |
| In institution | 18 (28) | 18 (28) | - |
| Nutritional status (No. [%]) | | | |
| Underweight (ie body mass index <18.5 $kg/m^2$) | 46 (71) | 43 (66) | NS[‖] |
| Co-morbidities (No. [%]) | | | |
| Present | 65 (100) | 65 (100) | - |
| Social support (No. [%]) | | | |
| Living without a caregiver | 17 (26) | 17 (26) | - |
| Community nurse care | 0 | 1 (1.5) | NS[**] |
| Previous hospitalisation | | | |
| No. of admissions in the past year related to COPD | 5 | 7 | NS[**] |

* COPD chronic obstructive pulmonary disease
† $FEV_1$ forced expiratory volume in 1 second
‡ NS not significant
§ Student's *t* test
¶ Only 21% of patients were able to complete spirometry successfully
‖ Wilcoxon rank-sum test
** Chi squared test

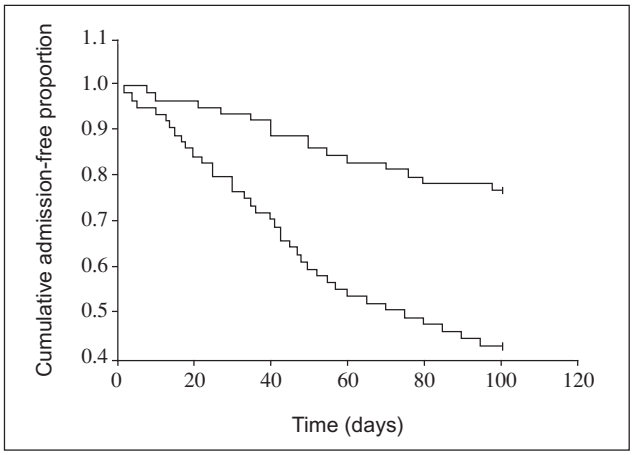
## Results

Fifty percent of all patients admitted to the geriatric wards who were recovering from an acute exacerbation of COPD had received rehabilitation services between January 1998 and April 1998. The baseline characteristics of patients in the two study groups are shown in Table 2. There were no statistically significant differences between the groups. The mean length of stay in the rehabilitation ward was 6.2 days (Table 3). As expected, the rehabilitation group spent longer than the conventional treatment group in the hospital overall. The rate of hospital re-admission was significantly higher in the conventional treatment group than in the rehabilitation group: within 28 days of discharge home, the relative risk of re-admission was 3.33; 95% confidence interval (CI), 2.32 to 4.56. One hundred days after discharge, the relative risk was 2.47; 95% CI, 1.78 to 3.48. At the 100-day follow-up visit, the admission-free interval was significantly longer in the rehabilitation group than that in the conventional treatment group (1.13 years vs 0.86 years, P<0.001) [Fig].

**Table 3. Use of health care resources**

| | Conventional treatment group, n=65 | Rehabilitation group, n=65 | P value |
|---|---|---|---|
| Length of stay (days) | | | |
| Acute ward | 4.6 | 5.4 | 0.545* |
| Rehabilitation ward (range) | - | 6.2 (3.0-16.0) | - |
| Total | 4.6 | 11.5 | <0.001* |
| No. of patients re-admitted (%) | | | |
| Within 28 days | 13 (20) | 4 (6) | 0.019† |
| Within 100 days | 37 (57) | 15 (23) | <0.001† |

* Wilcoxon rank-sum test
† Chi squared test




* P<0.001, log-rank test

**Fig. Kaplan-Meier plot of the proportion of patients remaining admission-free***

## Discussion

The hospital re-admission rate of the conventional treatment group was 3 times that of the rehabilitation group within 28 days of discharge home. This pattern lasted for at least 100 days, when the re-admission rate was approximately 2.5 times that of the rehabilitation group. The reduction in the use of medical resources after rehabilitation is a consistent finding in many studies.[2,14,26,29-31] Hospital re-admission can be an objective measure that minimises reporting bias, which may be common in studies on rehabilitation. In Hong Kong, hospital re-admission rates have recently received much attention. Our findings suggest that our rehabilitation programme was effective in keeping patients admission-free. Increasing the admission-free interval is important in increasing patients' satisfaction and confidence, and hence, in turn facilitating community-based rehabilitation.

The mean length of stay in the rehabilitation ward was 6.2 days, which is a very short period when compared with that of programmes reported in the literature (Table 1). In the study of Votto et al,[4] the short-stay in-patient rehabilitation (mean length of stay, 9.9 days) had benefits in multiple areas, such as improvement in walking distance and functional and psychosocial scores. However, the rate of use of health care resources was not measured in that study, which is why we included it as an outcome measure in our study. Our findings suggest that receipt of rehabilitation services can improve the functioning of patients and prevent hospital re-admission.

Tierney and Worth[32] found no significant association between re-admission and length of initial stay. The reduction in the re-admission rate among the rehabilitation group is thus not accounted for by the increased total duration of initial stay, but by the effect of providing a structured rehabilitation service in the rehabilitation ward during the hospital stay instead of discharging patients home. This type of short-stay in-patient rehabilitation is effective and may be of particular importance for elderly patients, especially for those who live alone (as was a large proportion of our sample in the present study), and patients with more advanced disease and more functional deficits than others (as shown in the study of Votto et al[4]). Local investigators have attempted to elucidate the physiological changes of patients with COPD during rehabilitation programmes. For example, Tang et al[33] found that underweight patients with COPD have a significant negative energy balance (overall mean energy balance was -363 kcal/d) during a rehabilitation programme; their exercise programme was shown not to significantly increase patients' energy demand as well as energy expenditure, hence the authors concluded that the negative energy balance was due to insufficient energy intake. Not only should the exercise component of a rehabilitation programme for frail patients with COPD be of a low-impact type, but it is also beneficial to keep the in-patient stay short, eg less than 1 week, so that patients can return to their place of residence, where the food is likely to be more nutritious than that in the ward.

We adhered to Mahler's recommendation that patient criteria for participation in a pulmonary rehabilitation programme include any symptomatic respiratory disease and any age.[19] One of the aims of our service was not to exclude any person based on the severity of the respiratory illness,[7] social background, and age.[8] We found that 50% of hospitalised elderly patients with COPD had undergone any kind of rehabilitation programme. There have been documented positive outcomes of rehabilitation programmes,[21-23] and the provision of pulmonary rehabilitation services is to a certain extent evidence-based.[5,11,34] Agle et al[2] first found that the improvement in performance of the patients correlated positively with psychological factors but not with lung function test results. Numerous further studies showed significantly increased exercise tolerance and improved quality of life after participation in these programmes.[35] Some subsequent studies demonstrated a physiological training effect, as well as an increase in skeletal muscle oxidative capacity.[11] Casaburi et al[5] explained in their study that a substantial lactic acidosis signifies that exercising muscles were being stressed, and the training

effect was manifested by decreased blood lactate levels after a given level of exercise, and thereby gained the benefits of a decreased ventilatory requirement. Additional benefits included a reduced use of medical resources and improved overall functional level. From the patient's perspective, the quality of life and functional levels are as important as the duration of survival.

Pulmonary rehabilitation programmes have been launched and studied in various settings (Table 1). For a discussion of the location for the programme, in the early days, research was performed in in-patient units.[2,3] Then a large number of studies in out-patient settings followed, which revealed similar and even more positive outcomes.[6-8] The 1990s saw a breakthrough in moving pulmonary rehabilitation into the home: benefits as compared with those programmes performed at hospital settings were maintained for longer[14] and the consumption of medical resources decreased.[12] A combination of various settings was also possible in some programmes,[13] whereas others took place in community-based local practices.[18] A short-stay inpatient rehabilitation programme for older patients was described by Votto et al,[4] though not particularly designed for elderly patients. The merit of this study is the authors' attempt to further shorten the duration of the programme and to collect local data. The selection of a suitable setting or an alternative environment is important for rehabilitation programmes to be feasible. It is hoped that more attention and care would be given in Hong Kong to the elderly patients with COPD who are particularly in need of these services.

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