



**Liverpool
Public Health
Observatory**

**The Public Health contribution to capacity planning and
demand management in Cheshire and Merseyside,
Phase 3: Pulmonary rehabilitation**

Nigel Fleeman

Observatory Report Series No. 56

PROVIDING INTELLIGENCE FOR THE PUBLIC HEALTH

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Executive Summary

Aim

The aim of this report is to estimate the likely impact of pulmonary rehabilitation on hospital readmissions for chronic obstructive pulmonary disease (COPD).

Method

Evidence on effectiveness and quantification was obtained from the literature and from key informants and was applied to hospital data (2000/2001-2002/2003) provided by Cheshire and Merseyside Primary Care Trusts (PCTs).

Findings

Establishing a pulmonary rehabilitation programme could result in a reduction of 26.3% respiratory readmissions and 44.8% bed days a year. Furthermore, this is likely to cost less than is currently being spent on bed days for COPD.

The implications for twelve of the Cheshire and Merseyside PCTs who provided data are summarised in the Appendix to the Executive Summary (*Table 1*).

Discussion

Pulmonary rehabilitation has been shown to have impressive results in reducing readmissions for respiratory diseases in patients with COPD. However, the findings must be interpreted with caution because:

1. Anecdotal evidence suggest that community based interventions are more desirable.
2. Most pulmonary rehabilitation programmes only have limited capacity, apparently due to problems with secure funding.
3. The estimates assume that there are currently no pulmonary rehabilitation programmes already in place.
4. Difficulties in applying research findings to local situations must be borne in mind.

Conclusions

Notwithstanding the methodological limitations highlighted in applying data from one study carried out in Penarth to hospital readmissions within Cheshire and Merseyside, it is estimated that around 26% of emergency readmissions for COPD may be avoided saving around 45% of associated bed days. The estimated total cost of establishing and running a rehabilitation programme is likely to be significantly lower than the estimated savings that can be achieved in terms of the cost of bed days.

However, while there is a lack of secure funding for pulmonary rehabilitation programmes, the estimated impacts within this report are less likely to be achievable.

Appendix to the executive summary

Table 1: Estimated reductions in emergency COPD readmissions by PCT, aged 15 and over

Intervention	Estimated reduction in readmissions after a year of the service being fully functional	Resource implications: basis for assessment	Mean number of COPD readmissions 2000/2001-2002/2003		Estimated number of annual readmissions post-intervention
Outpatient pulmonary rehabilitation	26%	At least one hour of exercise supervised twice a week; provided by a respiratory nurse or physiotherapist.	Central Liverpool PCT*	516	381
			North Liverpool PCT*	247	182
			South Liverpool PCT*	150	111
		At least one hour a week of disease education, psychological and social support by a multi-disciplinary team including a dietitian, pharmacist, social worker and possibly an occupational therapist.	St Helens PCT*	252	186
			Knowsley PCT*	374	276
			South Sefton PCT*	275	202
			Southport and Formby PCT*	125	92
			Ellesmere Port and Neston PCT**	81	59
			Cheshire West PCT**	140	103
			Central Cheshire PCT**	246	181
Some consultant input will also be required.	Halton PCT***	205	151		
	Warrington PCT***	205	151		

Source: Griffiths *et al* (2000) and Inpatient CDS

* A COPD admission was counted as a readmission if it occurred within 12 months of a previous COPD admission. In all instances, the primary diagnosis was used.

** Data for Ellesmere Port and Neston, Cheshire West and Central Cheshire PCTs was only provided for admissions. Thus the mean figure for the proportion of readmissions to admissions (50%) across the seven Merseyside PCTs (all those denoted by *) has been applied to admission data to make very crude estimates. The validity of the findings for these three PCTs is therefore open to question.

*** A COPD admission was counted as a readmission if it occurred within 12 months of a previous admission for any condition. In all instances, the primary diagnosis was used.

Please see the full text of this report for a full explanation of assumptions and caveats in applying the findings to hospital data. In particular it is important to note that the findings presented *cannot* be compared across *all* PCTs because of the differences in calculating readmissions (as described briefly above).

Background

Introduction

The main reasons for emergency admissions/readmissions to Aintree and the Royal Liverpool and Broadgreen University Hospital NHS Trust for the period 1998-2001 were identified from a report produced for the North Mersey Future Healthcare Project (Gandy, 2002). The report concluded that the group most likely to be readmitted to hospital were elderly patients over the age of 75 who were also found to be the biggest users of beds.

Primary, secondary and tertiary preventive public health interventions that would impact upon those admissions have been determined and the evidence for effectiveness summarised in Fleeman (2003a). Following this, three areas were examined in more depth. These were managing heart failure, pulmonary rehabilitation and preventing falls in older people.

This report focuses on pulmonary rehabilitation. Separate reports have been produced for the other two topic areas (Fleeman 2003b; 2003c).

The epidemiology and burden of respiratory diseases - specifically chronic obstructive respiratory disease

Accurate prevalence figures for respiratory diseases are hard to come by but respiratory diseases (particularly asthma) are the third most commonly reported long-term illness in Great Britain and around a third of all English adults have a history of wheezing (British Thoracic Society, 2001).

In 1990, chronic obstructive respiratory disease (COPD) was the twelfth most common cause of combined mortality and disability but is expected to become the fifth cause by the year 2020. After diagnosis the 10-year survival rate is approximately 50% with more than one-third of patients dying due to respiratory insufficiency (Anon, 2002).

According to the British Thoracic Society (2001), respiratory diseases are the most common reason for hospital emergency admissions. Analysis carried out in London has shown that emergency admissions for respiratory diseases show the most seasonal variation, with a peak in early January (Damiana and Dixon, 2002).

It has been estimated that an average primary care organisation of 100,000 people would have about 2,600 consultations for COPD which is half to one patient per GP (Anon, 2002) although other estimates for GP consultations are much higher, at about three per patient per year (Guest, 1999).

It has also been estimated that there are 200 emergency admissions for COPD in a primary care organisation with a population of 100,000, taking up 1.7 bed days per patient (Anon, 2002; Guest 1999). Age-sex standardised rates (to the European population) for COPD provided for selected PCTs show that in Cheshire and Merseyside there were between 170 and 460 admissions per 100,000 population (aged 15 and over) in 2002-03 (Table 2).

Table 2: Age and sex standardised admission rates (with 95% Confidence intervals) for COPD per 100,000 population by PCT, aged 15 and over

	2000/01		2001/02		2002/03	
Central Liverpool PCT	415	(414-416)	372	(372-373)	406	(405-407)
North Liverpool PCT	469	(468-470)	453	(451-454)	454	(453-456)
South Liverpool PCT	367	(366-368)	313	(312-314)	319	(318-320)
St Helens PCT	302	(301-303)	271	(270-271)	298	(297-299)
Knowsley PCT	533	(532-534)	443	(442-444)	460	(460-462)
South Sefton PCT	383	(382-384)	319	(318-320)	288	(287-289)
Southport and Formby PCT	151	(151-152)	162	(162-163)	172	(171-172)
Ellesmere Port and Neston PCT	155	(129-183)	188	(159-219)	190	(162-221)
Cheshire West PCT	140	(123-159)	142	(126-160)	170	(151-190)
Central Cheshire PCT	220	(201-240)	178	(162-196)	182	(165-200)
Halton PCT	290	(265-316)	306	(280-332)	283	(258-308)
Warrington PCT	104	(93-115)	163	(148-178)	181	(166-195)

Source: In patient CDS and 2002 ADS Population (Reconciled to 2001 based mid-2001 LA population estimates)

In Cheshire and Merseyside, data for 2000-2001 revealed that up to one in eight emergency admissions were for COPD and the average length of stay for each patient was typically between 5.54 and 8.91 days (Pfizer and Boehringer Ingelheim, 2002). Admission data provided from selected Primary Care Trusts (PCTs) between 2000/01 and 2002/03 suggests the length of stay may actually be typically longer than this in most PCTs (Table 3).

Table 3: Emergency admissions and bed days for COPD by PCT, aged 15 and over

	2000/01			2001/02			2002/03			Annual mean activity (2001-2003)		
	Number of admissions	Number of bed days	Average length of stay (days)	Number of admissions	Number of bed days	Average length of stay (days)	Number of admissions	Number of bed days	Average length of stay (days)	Number of admissions	Number of bed days	Average length of stay (days)
Central Liverpool PCT	996	10916	11.0	870	10365	11.9	955	11470	12.0	940	10917	11.6
North Liverpool PCT	546	5089	9.3	469	3980	8.5	442	3501	7.9	486	4190	8.6
South Liverpool PCT	394	4228	10.7	339	3414	10.1	348	3250	9.3	360	3631	10.1
St Helens PCT	574	6670	11.6	515	6501	12.6	566	6967	12.3	552	6713	12.2
Knowsley PCT	796	8247	10.4	673	6402	9.5	696	5777	8.3	722	6808	9.4
South Sefton PCT	611	5872	9.6	534	5197	9.7	493	4501	9.1	546	5190	9.5
Southport and Formby PCT	251	1679	6.7	287	2480	8.6	293	2470	8.4	277	2210	8.0
Ellesmere Port and Neston PCT	140	1409	10.1	167	1826	10.9	177	2085	11.8	161	1773	11.0
Cheshire West PCT	263	2579	9.8	265	3033	11.4	311	3696	11.9	280	3103	11.1
Central Cheshire PCT	549	4995	9.1	462	4432	9.6	462	4455	9.6	491	4627	9.4
Halton PCT	318	2347	7.4	334	2854	8.5	305	2347	7.7	319	2516	7.9
Warrington PCT	292	3294	11.3	298	3404	11.4	333	3564	10.7	308	3421	11.1

Source: Inpatient CDS

For many people with respiratory diseases, particularly those with COPD, stopping smoking reduces the decline in health status. In addition: "Pulmonary rehabilitation is an integral part of the clinical management and health maintenance of patients with chronic respiratory disease who remain symptomatic or continue to have decreased function despite standard medical treatment" (Sharma and Arneja, 2003).

Aim

The aim of this report is to estimate the likely impact of pulmonary rehabilitation on hospital readmissions for COPD in Cheshire and Merseyside.

Objectives

1. To review the evidence of effectiveness of pulmonary rehabilitation.
2. To quantify the potential impact of this intervention on reducing hospital readmissions.

Method

The method built upon earlier work undertaken and summarised in Fleeman (2003a) by seeking out further evidence on effectiveness and quantification from the literature and from key informants and applying this to Cheshire and Merseyside hospital data.

Outcomes

1. Identification of evidence based interventions for pulmonary rehabilitation.
2. Quantification of the impact of pulmonary rehabilitation on hospital readmissions.

Pulmonary rehabilitation

Introduction

Pulmonary rehabilitation aims: “to optimise physical and social performance and autonomy” (American Thoracic Society, 1999). There is little specific published evidence for the effectiveness of rehabilitation in those without chronic obstructive pulmonary disease (COPD). Where comparisons have been made, the results in non-COPD patients appear to be identical to the rest of the published literature (British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation, 2001).

There are many guidelines published on both the management of COPD and pulmonary rehabilitation. Arguably the most useful is that by the British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation (2001) which has developed existing guidelines with more recent evidence. The success of pulmonary rehabilitation is attributed to the multi-professional team and is effective in all settings and should consist of physical exercise, disease education, psychological, and social interventions. More recently, Morgan and Britton (2003) have assessed the role of rehabilitation in relation to other non-pharmacological means of managing COPD.

While pulmonary rehabilitation has been found to be effective for alleviating the problems of many patients with severe respiratory problems, particularly those with COPD: “Sadly, too few patients are referred for pulmonary rehabilitation and, in the UK, where you live clearly indicates the pulmonary resources available to you” (Partridge, 2003).

In a recent survey, the British Thoracic Society and British Lung Foundation (2003) found that only three hospitals (2%) of those able to provide pulmonary rehabilitation were able to do so to more than 200 patients a year, with the vast majority (85%) offering it to 100 patients or less.

Furthermore, the British Thoracic Society and British Lung Foundation (2003) found that 10% of all pulmonary rehabilitation programmes receive no NHS funding in the UK and a further 33% do not receive secure funding – a situation they find “alarming” and so recommend that the NHS commits to funding such programmes.

It has been estimated therefore that only 1.7% of COPD patients in the UK have access to pulmonary rehabilitation and it is believed that this is likely to be an underestimate (British Thoracic Society and British Lung Foundation, 2003).

Principles and programme components

The most recent definition of pulmonary rehabilitation is “a multidisciplinary programme of care for patients with chronic respiratory impairment that is individually tailored and designed to optimise physical and social performance and autonomy” (American Thoracic Society, 1999).

There are no UK Government publications equivalent to the National Service Frameworks (for example) but the British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation (2001) have neatly summed up the principles of rehabilitation and these are summarised in *Table 4*.

Table 4: General principles of pulmonary rehabilitation

- The goals of rehabilitation are to reduce the symptoms, disability, and handicap and to improve functional independence in people with lung disease.
- It is assumed that optimum medical management has been achieved or continues alongside the rehabilitation process.
- The rehabilitation process incorporates a programme of physical training, disease education, nutritional, psychological, social, and behavioural intervention.
- Rehabilitation is provided by a multi-professional team with involvement of the patients' family and attention to individual needs.
- The outcome of rehabilitation for individuals and programmes should be continually observed with the appropriate measures of impairment, disability, and handicap.

Source: British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation (2001)

The success of pulmonary rehabilitation is attributed to the multi-professional team and is effective in all settings and should consist of physical exercise (at least twice a week), disease education, psychological and social interventions (British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation, 2001). However, anecdotal evidence from staff carrying out pulmonary rehabilitation at home suggests the motivation of patients is less and the required exercise in between sessions is not always adhered to. It is beginning to be acknowledged by those who work with COPD patients that the community model is ideal, i.e. care near home which seems to be more widely appreciated by patients. It is felt that part of the rehabilitation process is being around others with COPD and so the "buddying" which can occur when pulmonary rehabilitation is undertaken as a group is of great benefit (personal communication with Carol Rogers, 22/07/2003).

Only one UK published study has evaluated the effectiveness of pulmonary rehabilitation on hospital admissions (Griffiths *et al*, 2000). In this outpatient programme based at Penarth Hospital in Wales, there were three sessions lasting about two hours each a week. Two thirds of the time was spent on educational activities and psychological issues and a third of the time was spent on exercise (such as treadmill training, 10m shuttle-walk test, static cycling, step and circuit training).

Patients were also encouraged to follow an individualized home exercise routine. "At the end of the rehabilitation programme, patients were encouraged to continue at home the various strategies they had been taught" (Griffiths *et al*, 2000).

Current provision of pulmonary rehabilitation in Cheshire and Merseyside

In Cheshire and Merseyside, pulmonary rehabilitation was found by the British Thoracic Society and British Lung Foundation (2003) to be offered by:

- The Cardiothoracic Centre, Liverpool.
- St Helens and Knowsley Hospitals NHS Trust.
- Southport and Ormskirk Hospital NHS Trust.
- North Cheshire Hospitals NHS Trust, Warrington.

As part of the Wirral Older People's Collaborative Programme, emphasis has been placed on improving the health of older people with COPD and as a result, the physiotherapy department at Arrowe Park Hospital (Wirral Hospital NHS Trust) co-ordinate a pulmonary rehabilitation programme (NHS Modernisation Agency, 2003).

Carol Rogers at South Sefton Primary Care Trust (PCT) (personal communication, 12/06/03 and 12/11/03) has undertaken a profiling exercise looking at various models of pulmonary rehabilitation across the country, in particular at Aintree Hospitals NHS Trust, Liverpool and Broadgreen University Hospitals NHS Trust, St Helens and Knowsley Hospitals NHS Trust and Southport and Ormskirk Hospital NHS Trust. It was found that DNA rates are significantly higher in some providers than others. Anecdotal evidence suggests reasons include transport issues such as getting to and from the sessions, the cost of transporting patients and the accessibility of parking. Other suggested reasons for poor attendance include the nature of the disease season (respiratory diseases being particularly susceptible to changes in the weather) while in some areas physiotherapists are employed solely to provide a service solely for pulmonary rehabilitation which would appear to improve DNA rates.

Pulmonary rehabilitation offered by the Southport and Ormskirk Hospital NHS Trust at Southport and Formby District Hospital has one of the better DNA rates and was considered to be an example of a good practice. Around 15 patients are seen at any one time, four times a year (with around 3-4 patients usually failing to complete each time) (personal communication with Jude Storer, 25/06/03). This service has been running since September 2001 and was established using current evidence on best practice following a pilot study that had shown it to have a positive impact (personal communication with Jude Storer, 09/06/03).

However, like many pulmonary rehabilitation programmes identified in the British Thoracic Society and British Lung Foundation (2003) survey, the service at Southport and Formby District Hospital does not receive secure NHS funding and so health professionals other than respiratory nurses are not always able to offer their full support. Thus it is not able to provide comprehensive input from physiotherapists which means patients may miss out on some physiotherapy components, although physiotherapy is considered "desirable" as opposed to essential by the British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation.

A Consultant refers all patients to the programme but the patients' GP is always also informed about the programme and what it will entail. Consent from both the patient and the GP is required. Patients are given a 32 page booklet which gives information

and advice on their medical condition as well as describing what pulmonary rehabilitation will entail (including the exercises they will be required to undertake) before they agree to take part.

Most patients who use the programme have COPD but patients with chronic asthma and pulmonary fibrosis are also admitted. The main factor for acceptance is motivation, not diagnosis although the following exclusion criteria does apply:

- Clinical or laboratory evidence of serious uncontrolled disease.
- Uncontrolled congestive COPD, liver failure, metastatic cancer or having suffered a disabling stroke.
- A respiratory infection which required prescribed therapy.
- The patient having been hospitalised for COPD four weeks prior to the rehabilitation commencement.

The Southport and Formby District Hospital programme is very similar in terms of content to the Penarth programme described by Griffiths *et al* (2000) although as noted above, because of funding issues, is largely organised and run by respiratory nurses (including the vast majority of the exercise sessions) with support from a dietitian, pharmacist, social worker and (sometimes) physiotherapist as available. The British Lung Foundation and the Breathe Easy group are also involved. It also has fewer sessions a week than at Penarth and a greater emphasis on exercise sessions than the psychosocial support and has a much greater input from respiratory nurses (as opposed to occupational therapist and physiotherapist).

Patients are asked to fill in a Breathing Problems Questionnaire before being assessed for the programme, and again at the end of the programme.

Table 5: A typical pulmonary rehabilitation timetable at Southport and Formby District Hospital

Week / Day	Activity (each lasting an hour)
1	
Monday	Exercise / Medication management
Thursday	Exercise
2	
Monday	Exercise / Diet and nutrition
Thursday	Exercise
3	
Monday	Exercise / Breathing techniques and Breathe Easy Club
Thursday	Exercise
4	
Monday	Exercise / Nebulisers and Oxygen
Thursday	Exercise
5	
Monday	Exercise / Relaxation
Thursday	Exercise
6	
Monday	Exercise / Final Assessment

Source: Personal Communication with Jude Storer (25/06/2003)

There are two one-hour exercise sessions a week in the purpose built exercise suite as well as one hour of comprehensive education (while at Penarth, there was two hours a week of exercise and four hours of comprehensive education and psychosocial support). A typical exercise programme is given in *Table 5*.

As at Penarth (Griffiths *et al*, 2000), patients are encouraged to undertake exercise at home and at the end of the programme, patients are encouraged to continue exercising at sessions held at Southport and Formby District Hospital. These currently cost the patient £2 a session.

Findings

Findings from studies examining pulmonary rehabilitation

In the only published UK study found, Griffiths *et al* (2000) found in a randomised controlled trial (n=200) that at 12 months follow-up there was no difference between the rehabilitation and control groups in the number of patients admitted to hospital (40 vs 41) but the number of readmissions and days these patients spent in hospital differed significantly. Patients in the intervention group had a mean of 1.4 and 1.7 respiratory and all cause readmissions respectively (compared to 1.9 and 2.2; $p < 0.05$ in both instances) and spent a mean of 9.6 and 10.6 days in hospital for respiratory and all causes respectively (compared to 17.4 and 20.0 days; $p < 0.05$ in both instances). "The decrease in average bed occupancy, equivalent to 4 days per patient rehabilitated, was derived from reductions in the frequency and duration of admissions, even though rehabilitation did not decrease the number of patients who needed to be admitted."

Thus, the proportion of saved respiratory readmissions and mean bed days annually are 26.3% and 44.8% respectively.

The benefits beyond 12 months are unclear. Griffiths *et al* (2000) commented: "A major finding of our study is that statistically and clinically significant differences were still detectable between the groups 1 year after entry. However, the difference between the control and rehabilitation groups became smaller with time, as in previous studies, suggesting a progressive loss of effect in the rehabilitation group." However, Güell *et al* (2000), for example, found a benefit in terms of quality of life (as a result in a significant reduction in exacerbations) of up to two years but failed to show any effect in terms of hospitalisations.

Griffiths *et al* (2000) also comment that: "Although only 25% of patients in the rehabilitation group attended the patient-led support sessions after the 6-week programme, long-term benefits were seen in this group. Thus, the long-term effectiveness of pulmonary rehabilitation may be largely determined by the initial programme rather than by follow-up sessions."

Estimating the impact of pulmonary rehabilitation on hospital activity in Cheshire and Merseyside

Griffiths *et al's* (2000) percentage reductions in hospital readmissions for respiratory conditions have been directly applied to chronic obstructive pulmonary disease (COPD) hospital activity data (aged 15 and over) from 2000/01-2002/03 provided by some Cheshire and Merseyside Primary Care Trusts (PCTs). COPD has been chosen rather than all respiratory conditions because as noted already, most patients who attend pulmonary rehabilitation will have COPD.

Unfortunately, not all the Cheshire and Merseyside PCTs were able to provide data in the timescale available so not all PCTs are represented in the findings.

Definitions of readmissions differed from each PCT which means comparisons across all PCTs is not possible:

- For the seven Merseyside PCTs (Central Liverpool PCT, North Liverpool PCT, South Liverpool PCT, St Helens PCT, Knowsley PCT, South Sefton PCT and Southport and Formby PCT) a COPD admission was counted as a readmission if it occurred within 12 months of a previous COPD admission. In all instances, the primary diagnosis was used. This was the desired definition for all data.
- Readmission data was not made available within the timescale available for three PCTs (Ellesmere Port and Neston PCT, Cheshire West PCT and Central Cheshire PCT) but admission data was made available, as it had been for the seven Merseyside PCTs who had provided data. Thus, the mean figure for the proportion of readmissions to admissions across these seven PCTs (50%) has been applied to admission data to make very crude estimates. The validity of these findings is particularly open to question.
- Halton PCT and Warrington PCT were able to provide readmission data but the definition of a readmission differed to the other PCTs. Here any patient admitted with a primary diagnosis for COPD following an admission for any condition was counted as a readmission. This means that patients who may not have previously been admitted for COPD will be counted as a readmission.

The full findings for each PCT by provider can be found in the appendix. Below is a summary of the findings.

Please note that any small discrepancies between the totals and the sum of their parts are due to the rounding of figures.

Please read the discussion section for the reservations regarding these calculations.

Central Liverpool PCT

On average 136 readmissions for COPD may be avoided each year, 110 (81%) at Royal Liverpool and Broadgreen University Hospitals NHS Trust.

North Liverpool PCT

On average 65 readmissions for COPD may be avoided each year, 57 (88%) at Aintree Hospitals NHS Trust.

South Liverpool PCT

On average 39 readmissions for COPD may be avoided each year, 22 (56%) at Royal Liverpool and Broadgreen University Hospitals NHS Trust and 15 (39%) at St Helens and Knowsley Hospitals NHS Trust.

St Helens PCT

On average 66 readmissions for COPD may be avoided each year, 59 (89%) at St Helens and Knowsley Hospitals NHS Trust.

Knowsley PCT

On average 98 readmissions for COPD may be avoided each year, 45 (46%) at St Helens and Knowsley Hospitals NHS Trust and 43 (44%) at Aintree Hospitals NHS Trust.

South Sefton PCT

On average 72 readmissions for COPD may be avoided each year, 66 (92%) at Aintree Hospitals NHS Trust.

Southport and Formby PCT

On average 33 readmissions for COPD may be avoided each year, all at Southport and Ormskirk NHS Trust.

Ellesmere Port and Neston PCT

As noted above, readmission data was not provided for Ellesmere Port and Neston PCT but applying the mean figure of the proportion of readmissions to admissions (50%) found from seven other PCTs, to the Ellesmere Port and Neston PCT admission data, 22 readmissions may be avoided. Most (65%) COPD admissions were found at Countess of Chester NHS Trust, with a quarter (25%) at Wirral Hospital NHS Trust.

Cheshire West PCT

As noted above, readmission data was not provided for Cheshire West PCT but applying the mean figure of the proportion of readmissions to admissions (50%) found from seven other PCTs, to the Cheshire West PCT admission data, 37 readmissions may be avoided. Most (75%) COPD admissions were found at Countess of Chester NHS Trust.

Central Cheshire PCT

As noted above, readmission data was not provided for Central Cheshire PCT but applying the mean figure of the proportion of readmissions to admissions (50%) found from seven other PCTs, to the Central Cheshire PCT admission data, 65 readmissions may be avoided. Most (94%) COPD admissions were found at Mid Cheshire Hospitals NHS Trust.

Halton PCT

As noted above, a different definition to the desired definition was used for readmissions for Halton PCT. On average 54 readmissions for COPD may be avoided each year. In terms of length of stay, as many as 1147 days may be saved and the average length of stay per patient may be reduced from 12.5 days to 9.4 days. The breakdown by provider was not available but most (72%) admissions were found at North Cheshire Hospitals NHS Trust while around a quarter (27%) found at St Helens and Knowsley Hospitals NHS Trust.

Because the readmissions are for patients who were previously admitted for any condition, the figure is not comparable to the other PCTs. A more comparable figure may well be 50% of the original admissions (based on data provided for seven Merseyside PCTs). If so, this would imply the number of readmissions may decrease by 42 (from 160 to 118).

Warrington PCT

As noted above, a different definition to the desired definition was used for readmissions for Warrington PCT. On average 54 readmissions for COPD may be avoided each year. In terms of length of stay, as many as 990 days may be saved and the average length of stay per patient may be reduced from 10.8 days to 8.1 days. The breakdown by provider was not available but most (99%) admissions were found at North Cheshire Hospitals NHS Trust.

Because the readmissions are for patients who were previously admitted for any condition, the figure is not comparable to the other PCTs. A more comparable figure may well be 50% of the original admissions (based on data provided for seven Merseyside PCTs). If so, this would imply the number of readmissions may decrease by 41 (from 154 to 114).

Resource implications in establishing pulmonary rehabilitation in Cheshire and Merseyside

As already noted above, the model of pulmonary rehabilitation currently provided at Southport and Formby District Hospital does not receive any formal NHS funding. However, it does include input from:

- Respiratory nurses, twice a week for one-two hours.
- A dietician offering dietary education for one hour.
- Support from a pharmacist, social worker and physiotherapist as available.

The Penarth model has been subject to a cost-effectiveness exercise by Griffiths *et al* (2001) (Table 6). This is based on a similar duration and target number of patients as at Southport and Formby, but with around twice the amount of time spent with patients (and by different types of staff).

Table 6: Costs of a pulmonary rehabilitation programme assuming a duration of 6 weeks and 17 patients, derived from the Llandough Hospital NHS Trust, Penarth, Wales (2000 prices)

Component	Cost
Staff costs	
• Occupational Therapist (0.9 wte)	£2,490
• Consultant (5 hours per week)	£1,500
• Senior Physiotherapist (0.5 wte)	£1,386
• Senior dietician (0.3 wte)	£834
• Clerical coordinator (0.5 wte)	£768
• Therapy helper (0.6 wte)	£690
• Respiratory nurse (0.5 hours per week)	£42
Other costs:	
• Transport (ambulance minibus)	£1,875
• Equipment and consumables	£516
• Overhead allowances (based on 20% of costs)	£2,019
Total cost	£12,120

Source: Griffiths *et al* (2001)

Based on a programme for 17 patients this cost around £725 per patient (although if only the staffing costs are considered, it is around £454 which is comparable to two other studies by Singh *et al* [1998] and White *et al* [1997]). In total, this programme cost £12,120. COPD bed-days are conservatively estimated to be £242 per per day (Netten *et al*, 2001).

Readmission data for bed days was only available for Halton PCT and Warrington PCT. Based on this data, on average readmissions would be decreased by 54 from 205 readmissions and 2,385 bed days (average length of stay = 11.6 days) to 151 readmissions and 1,332 bed days (average length of stay = 8.7 days), an overall reduction in cost from £577,130 to £318,576. This is a saving of £258,554.

However, as noted above, these patients were not necessarily originally admitted for COPD and so the number of readmissions and subsequent expected cost reductions from a pulmonary rehabilitation programme may well be smaller.

Discussion

General findings

It has been suggested from the experiences of Penarth (Griffiths *et al*, 2000) that pulmonary rehabilitation could lead to reductions in respiratory hospital readmissions (largely amongst chronic obstructive pulmonary disease [COPD]) patients by around 26% and bed days by around 45%. Furthermore, the estimated total cost of establishing and running a rehabilitation programme is likely to be significantly lower than the estimated savings that can be achieved in terms of the cost of bed days.

However, for reasons outlined below, the findings must be interpreted with caution.

Settings for rehabilitation

A number of models of good practice for managing COPD already exist and have been found to have impressive impacts on readmissions. This report has focussed on two that meet the guidelines of the British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation – one at Penarth and one locally at the Southport and Formby District Hospital. Anecdotal evidence suggests that community based interventions are the most desirable for patients. These may have greater beneficial impacts than outpatient rehabilitation although this has not been substantiated by published research.

Recommended standards for pulmonary rehabilitation have been set by the British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation (2001) for programmes to adhere to. The programmes described in this report appear to adhere to these standards.

The capacity of pulmonary rehabilitation programmes

It should be noted that it appears that in the UK, pulmonary rehabilitation cannot currently be offered to many patients. The recent survey by the British Thoracic Society and British Lung Foundation (2003) found that only 2% of all hospitals currently offering pulmonary rehabilitation could do so to 200 patients or more. For impacts to be felt as greatly as estimated, it is likely that pulmonary rehabilitation will need to be offered to more patients than currently has access in the Southport and Ormskirk Hospital Trust catchment area (and indeed most of the UK generally).

It is notable that there are no equivalents to a National Service Framework (NSF) around COPD. Clearly there are many competing interests for funding and it is likely those interventions and services that are recognised nationally within the likes of NSFs will be given higher priority. The lack of any secure funding is clearly a factor at Southport and Ormskirk Hospital Trust preventing the programme being offered to more patients. As the British Thoracic Society and British Lung Foundation (2003) noted: “Not only would health professionals benefit from knowing they had secure funding, but this would also increase patient’s access to programmes.”

The British Thoracic Society and British Lung Foundation (2003) have recommended that all respiratory departments that do not currently provide pulmonary rehabilitation should receive secure funding to do so.

Building on initiatives already in place

It should be noted that there are already some pulmonary rehabilitation programmes being provided in Cheshire and Merseyside, although as with the UK as a whole, their provision appears to be rather “patchy” and attendance rates vary widely at present. Thus the marginal benefits found from interventions and highlighted in this report may be slightly less dramatic in practice in some areas than the studies suggest.

It is expected that the effects will be most felt where there is currently little (or no) pulmonary rehabilitation being provided. However, benefits should be felt even where pulmonary rehabilitation is being offered if the number of patients seen is increased.

Applying study findings on reductions in readmissions for respiratory diseases to reductions in chronic obstructive pulmonary disease

It has been assumed that any reduction in readmissions for respiratory diseases will be directly reflected in a similar reduction in readmissions for COPD. The validity of this assumption is unknown.

Applying study findings to local data

It is assumed that the findings from one study can be directly applied to all of Cheshire and Merseyside readmission data if pulmonary rehabilitation is introduced and that around 26% COPD readmissions (and 45% of associated bed days) may be avoided each year as a result. This translates to between 22 and 136 readmissions each year depending on the size and location of the Primary Care Trust, the size of the pulmonary rehabilitation programme and the definition used for readmissions.

Conclusions

Different models of pulmonary rehabilitation exist. Recommended standards have been set by the British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation for programmes to adhere to. The programmes described in this report appear to adhere to these standards.

Notwithstanding the methodological limitations highlighted in applying data from one study carried out in Penarth to hospital readmissions within Cheshire and Merseyside, it is estimated that around 26% of emergency readmissions for chronic obstructive pulmonary disease (COPD) may be avoided saving around 45% of associated bed days.

The estimated total cost of establishing and running a rehabilitation programme is likely to be significantly lower than the estimated savings that can be achieved in terms of the cost of bed days.

However, it would appear that currently the main barrier to implementing pulmonary rehabilitation is that COPD is not identified as a national priority and therefore it does not attract additional funding. This in turn means there is a lack of qualified staff to run programmes due to the competing demands on their time.

While there is a lack of secure funding for pulmonary rehabilitation programmes, the estimated impacts within this report are less likely to be achievable.

References

- Anon (2002). COPD and treatment. Bandolier 98 (2).
- Bourbeau J, Julien M, Maltais F, Rouleau M, Beaupre A, Begin R, Renzi P, Nault D, Borycki E, Schwartzman K, Singh R and Collet JP (2003). Reduction of hospital utilization in patients with chronic obstructive pulmonary disease: a disease-specific self-management intervention. Archives of Internal Medicine 163: 585-591.
- British Thoracic Society (2001). The Burden of Lung Disease. A statistics report from the British Thoracic Society. London: British Thoracic Society.
- British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation (2001). Pulmonary rehabilitation. Thorax 56: 827-834.
- British Thoracic Society and British Lung Foundation (2003). Pulmonary rehabilitation survey. London: British Thoracic Society and British Lung Foundation.
- Damiani M and Dixon J (2002). Managing the pressure: Emergency hospital admissions in London, 1997-2001. London: Kings Fund.
- Fleeman N (2003a). The Public Health contribution to capacity planning and demand management in Merseyside, Phases 1 & 2: Circulatory diseases, respiratory diseases, older people (aged 75 and over), alcohol problems and musculoskeletal disorders. Observatory Report Series No. 53. Liverpool: Liverpool Public Health Observatory.
- Fleeman N (2003b). The Public Health contribution to capacity planning and demand management in Cheshire and Merseyside, Phase 3: Preventing falls in older people. Observatory Report Series No. 55. Liverpool: Liverpool Public Health Observatory.
- Fleeman N (2003c). The Public Health contribution to capacity planning and demand management in Cheshire and Merseyside, Phase 3: Managing heart failure. Observatory Report Series No. 57. Liverpool: Liverpool Public Health Observatory.
- Griffiths TL, Burr ML, Campbell IA, Lewis-Jenkins V, Mullins J, Shiels K, Turner-Lawlor PJ, Payne N, Newcombe RG, Ionescu AA, Thomas J and Tunbridge J (2000). Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial. The Lancet 355: 362-368.
- Griffiths TL, Phillips CJ, Davies S, Burr ML and Campbell IA (2001). Cost effectiveness of an outpatient multidisciplinary pulmonary rehabilitation programme. Thorax 56: 779-784.
- Güell R, Casan P, Belda J, Sangenis M, Morante F, Guyatt GH and Sanchis J (2000). Long-term Effects of Outpatient Rehabilitation of COPD. Chest 117: 976-983.
- Morgan MDL and Britton JR (2003). Chronic obstructive pulmonary disease • 8: Non-pharmacological management of COPD. Thorax 58: 453-457.
- Netten A, Rees T and Harrison G (eds) (2001). Unit costs of health and social care 2001. Canterbury: Personal Social Services Research Unit, University of Kent.

NHS Modernisation Agency (2003). The Federation of Older People's Collaborative Programmes: Sharing the learning from the modernisation of older people's services. March 2003.

Partridge MR (2003). Patients with COPD: do we fail them from beginning to end? Thorax 58: 373-375.

Pfizer and Boehringer Ingelheim (2002). Chronic Obstructive pulmonary disease hospital admissions in the UK. April 2000-March 2001. Sponsored by an educational grant from Boehringer Ingelheim Limited and Pfizer Limited. Hayward Medical Communications.

Sharma S and Arneja A (2003). Pulmonary Rehabilitation. eMedicine. <http://www.emedicine.com/pmr/topic181.htm> (Last updated 15/01/2003).

Singh SJ, Smith DL, Hyland ME and Morgan MD (1998). A short outpatient pulmonary rehabilitation programme: immediate and longer-term effects on exercise performance and quality of life. Respiratory Medicine **92**: 1146-1154.

White RJ, Rudkin ST, Ashley J, Stevens VA, Burrows S, Pounsford JC, Cratchley G and Ambler NR (1997). Outpatient pulmonary rehabilitation in severe chronic obstructive pulmonary disease. Journal of the Royal College of Physicians of London **31**: 541-545.

Appendix: Breakdown of estimated impacts by Primary Care Trust and hospital provider

The following is a breakdown of activity and expected activity within each Primary Care Trust (PCT) by provider Trust.

For each PCT the historical data is presented first. An average (mean) is calculated so that the expected impact of providing pulmonary rehabilitation (calculated by applying the findings from the Griffiths *et al* [2000] study) can then be applied to each PCT.

Readmission data that met the desired definition (of a readmission within 12 months following an admission for the same diagnosis) was only made available for seven PCTs. Data on bed days was not available for these PCTs.

The source for all data in this appendix is the Inpatient CDS.

Please note that data is rounded up or down to whole numbers for readmissions and this means that totals may not always appear to equal the sum of their parts.

Data for “other” also has to be interpreted with caution because activity at these providers is least likely to be affected by interventions (if indeed at all).

Appendix: Breakdown of estimated impacts by Primary Care Trust and hospital provider

Central Liverpool PCT

Emergency COPD readmissions by provider, aged 15+

	2000/01 Activity	2001/02 Activity	2002/03 Activity	Average Activity
Royal Liverpool and Broadgreen University Hospitals Trust	455	392	405	417
Aintree Hospitals Trust	85	61	53	66
St Helens and Knowsley Hospitals Trust	19	20	28	22
Cardiothoracic Centre	16	3	5	8
Other	2	3	2	2
Total	577	479	493	516

Central Liverpool PCT

Estimated annual reductions and estimated new annual activity in emergency COPD readmissions by provider, aged 15+

	Estimated Reduction	Estimated New Activity
Royal Liverpool and Broadgreen University Hospitals Trust	110	308
Aintree Hospitals Trust	17	49
St Helens and Knowsley Hospitals Trust	6	16
Cardiothoracic Centre	2	6
Other	1	2
Total	136	381

North Liverpool PCT

Emergency COPD readmissions by provider, aged 15+

	2000/01 Activity	2001/02 Activity	2002/03 Activity	Average Activity
Aintree Hospitals Trust	268	204	179	217
Royal Liverpool and Broadgreen University Hospitals Trust	24	26	25	25
Other	5	5	4	5
Total	297	235	208	247

North Liverpool PCT

Estimated annual reductions and estimated new annual activity in emergency COPD readmissions by provider, aged 15+

	Estimated Reduction	Estimated New Activity
Aintree Hospitals Trust	57	160
Royal Liverpool and Broadgreen University Hospitals Trust	7	18
Other	1	3
Total	65	182

South Liverpool PCT

Emergency COPD readmissions by provider, aged 15+

	2000/01 Activity	2001/02 Activity	2002/03 Activity	Average Activity
Royal Liverpool and Broadgreen University Hospitals Trust	106	82	63	84
St Helens and Knowsley Hospitals Trust	71	46	58	58
Other	13	7	4	8
Total	190	135	125	150

South Liverpool PCT

Estimated annual reductions and estimated new annual activity in emergency COPD readmissions by provider, aged 15+

	Estimated Reduction	Estimated New Activity
Royal Liverpool and Broadgreen University Hospitals Trust	22	62
St Helens and Knowsley Hospitals Trust	15	43
Other	2	6
Total	39	111

Appendix: Breakdown of estimated impacts by Primary Care Trust and hospital provider

St Helens PCT

Emergency COPD readmissions by provider, aged 15+

	2000/01 Activity	2001/02 Activity	2002/03 Activity	Average Activity
St Helens and Knowsley Hospitals Trust	212	224	238	225
Other	22	31	30	28
Total	234	255	268	252

St Helens PCT

Estimated annual reductions and estimated new annual activity in emergency COPD readmissions by provider, aged 15+

	Estimated Reduction	Estimated New Activity
St Helens and Knowsley Hospitals Trust	59	166
Other	7	20
Total	66	186

Knowsley PCT

Emergency COPD readmissions by provider, aged 15+

	2000/01 Activity	2001/02 Activity	2002/03 Activity	Average Activity
St Helens and Knowsley Hospitals Trust	189	155	174	173
Aintree Hospitals Trust	181	134	177	164
Royal Liverpool and Broadgreen University Hospitals Trust	26	28	23	26
Cardiothoracic Centre	3	9	6	6
Other	2	9	6	6
Total	401	335	386	374

Knowsley PCT

Estimated annual reductions and estimated new annual activity in emergency COPD readmissions by provider, aged 15+

	Estimated Reduction	Estimated New Activity
St Helens and Knowsley Hospitals Trust	45	127
Aintree Hospitals Trust	43	121
Royal Liverpool and Broadgreen University Hospitals Trust	7	19
Cardiothoracic Centre	2	4
Other	1	4
Total	98	276

South Sefton PCT

Emergency COPD readmissions by provider, aged 15+

	2000/01 Activity	2001/02 Activity	2002/03 Activity	Average Activity
Aintree Hospitals Trust	288	255	212	252
Southport and Ormskirk Hospital Trust	26	18	12	19
Other	4	2	7	4
Total	318	275	231	275

South Sefton PCT

Estimated annual reductions and estimated new annual activity in emergency COPD readmissions by provider, aged 15+

	Estimated Reduction	Estimated New Activity
Aintree Hospitals Trust	66	185
Southport and Ormskirk Hospital Trust	5	14
Other	1	3
Total	72	202

Appendix: Breakdown of estimated impacts by Primary Care Trust and hospital provider

Southport and Formby PCT

Emergency COPD readmissions by provider, aged 15+

	2000/01 Activity	2001/02 Activity	2002/03 Activity	Average Activity
Southport and Ormskirk Hospital Trust	96	134	142	124
Other	0	1	2	1
Total	96	135	144	125

Southport and Formby PCT

Estimated annual reductions and estimated new annual activity in emergency COPD readmissions by provider, aged 15+

	Estimated Reduction	Estimated New Activity
Southport and Ormskirk Hospital Trust	33	91
Other	0	1
Total	33	92

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