Immediate and early discharge for patients with exacerbations of chronic obstructive pulmonary disease: is there a role in "real life"?

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Abstract: An exacerbation of chronic obstructive pulmonary disease (COPD) is the most common respiratory condition necessitating admission to hospital. Many of these are relatively mild in nature and as a consequence, there is increasing interest in immediate and early discharge of patients with nonsevere exacerbations. Following initial assessment, "hospital at home" or "assisted discharge" schemes enable suitable patients with COPD to be discharged into the community earlier than normally anticipated. The putative implication is that substantial financial savings can be made in addition to increasing the availability of in-patient beds, without compromising patient care or satisfaction. We highlight the current literature which has evaluated the role of hospital at home and assisted discharge schemes and discuss our own "real life" service operating in a large teaching hospital in Scotland.

Keywords: chronic obstructive pulmonary disease, management, exacerbations, early support discharge schemes, assisted discharge, hospital at home, randomized controlled trial.

Introduction

Chronic obstructive pulmonary disease (COPD) is a common cause of morbidity and mortality encompassing large numbers of individuals in both developed and less well developed countries. It can place a significant burden upon patients, families, society, and primary and secondary care providers alike. Estimates suggest that COPD will become the world's third leading cause of mortality and the fifth most common cause of serious morbidity over the next 20 years (Pauwels et al 2001).

An exacerbation of COPD is defined as a sustained worsening of respiratory symptoms that is acute in onset and usually requires a patient to seek medical help or alter medication. The deterioration must also be more severe than the usual variation experienced by the individual on a daily basis (NCCCC 2004). Exacerbations of COPD are the most common respiratory cause for hospital admission and account for around 10% of all medical admissions in the United Kingdom (Pearson et al 1994; Ashton et al 1995). This translates into over 90 000 patients hospitalized each year, with the mean duration of stay estimated at 11 days (LAIA 2003). As a consequence, this has wide reaching financial implications for secondary care providers and is likely to be implicated in increased hospital bed occupancy and rates of hospital-acquired infections. Any intervention which successfully hastens patient recovery and discharge from hospital can therefore be seen to be advantageous in the overall management of COPD. Indeed, previous data evaluating an assisted discharge service in 241 stable elderly medical patients demonstrated a 24% reduction in cost compared with acute hospital care (Coast et al 1998).

In recent years, there has been growing interest in the use of schemes which permit patients with relatively mild exacerbations of COPD to be cared for at home. This involves selected patients being managed at home after either initial assessment in

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hospital and immediate discharge, or after several days of in-patient care. This evidence-based review highlights the current literature regarding the use of hospital at home and assisted discharge schemes for patients with exacerbations of COPD. We also illustrate our own personal experience of the everyday running of such a scheme.

All authors carried out a comprehensive literature search looking for relevant articles published up to April 2006 using Medline, Clinical Evidence, and the Cochrane library. The following keywords were used in the search: chronic obstructive pulmonary disease, management, exacerbations, early support discharge schemes, assisted discharge, hospital at home, and randomized controlled trial. Relevant fully published articles were then selected and extracted.

Definition

The two commonly used strategies which facilitate the rapid discharge of patients back into the community are termed "hospital at home" and "early" or "assisted" discharge. Hospital at home involves patients being initially evaluated in a rapid respiratory assessment unit in hospital. These units (often based in accident emergency or medical admission wards) aim to identify individuals with mild exacerbations of COPD who can be safely managed at home and as a consequence are not generally admitted to hospital. Early or assisted discharge schemes allow suitable patients to be discharged before they have fully recovered from an acute exacerbation, usually within several days after admission to hospital. In both schemes,

patients remain under the care of the hospital consultant, although General Practitioners are informed that their patient is back in the community. Multidisciplinary team assessment frequently takes place in both schemes and patients are discharged with appropriate medical treatment. Nursing support is arranged at home for a variable length of time and facilitates the identification of deterioration in clinical condition and readmission to hospital if necessary. The putative inference is that such schemes could result in reductions in length of hospital stay and potential financial savings without compromising patient care and satisfaction or adversely affecting subsequent readmission rates or mortality.

Trials evaluating the effects of hospital at home or assisted discharge

Six randomized controlled trials have examined the effects of hospital at home or assisted discharge schemes in patients with exacerbations of COPD in terms of readmission rates, mortality, quality of life, or length of hospital stay (Table 1) (Shepperd et al 1998; Cotton et al 2000; Davies et al 2000; Skwarska et al 2000; Ojoo et al 2002; Hernandez et al 2003). After discharge into the community, patients in the six studies (range of mean forced expiratory volume in one second [FEV_1] 0.69–1.1L) were followed up for a minimum of 2 weeks and a maximum of 12 weeks. In all of them, criteria such as those suggested by the British Thoracic Society (NCCCC 2004), were followed to ensure that patients did

Table 1 Demographics and results of randomized controlled trials evaluating the use of hospital at home or assisted discharge schemes

Study	Intervention	N	%	Mean age (years)	Mean FEV$_1$ (litres)	Follow up (weeks)	Re-admission rate	Mortality	HRQL	Mean hospital stay
Skwarska et al 2000	HH	184	25	69	0.74	8	↔	↔	NA	NA
Shepperd et al 1998	HH	32	NA	72	NA	12	↔	↔	↔	NA
Ojoo et al 2002	AD	60	18	70	0.93	2	↔	↔	NA	NA
Hernandez et al 2003	HH or AD	222	35	71	1.1	8	↔	↔	↔	↓
Davies et al 2000	HH	150	26	70	0.69	12	↔	↔	↔	NA
Cotton et al 2000	AD	81	20	66	0.95	9	↔	↔	NA	↓

Abbreviations: AD, assisted discharge; FEV$_1$, forced expiratory volume in one second; HH, hospital at home; HRQL, health-related quality of life; N, total number of randomized subjects with COPD; NA, not documented or not measured in the study; ↔, no significant difference with active intervention versus conventional in-patient care; ↑, significant improvement with active intervention versus conventional in-patient care; ↓, significant reduction with active intervention versus conventional in-patient care; %, percentage of screened patients suitable for AD or HH.

not have adverse clinical parameters or social circumstances which might have indicated that in-patient care was more appropriate. It is also important to note that in all of the studies, a significant number of patients needed to be screened so suitable patients with mild exacerbations of COPD without serious concomitant disease processes or adverse social circumstances were identified (Table 1). For example, in one of the studies with the greatest number of randomized patients, 718 individuals with a diagnosis of exacerbation of COPD over an 18 month period, were assessed for inclusion and only 184 (26%) were considered suitable (Skwarska et al 2000). Reasons for patients not being eligible for study entry included presence of adverse clinical parameters (chest radiograph abnormality, confusion, impaired level of consciousness, pH <7.35; 50%), serious medical co-morbidity (19%), refusal to participate (3%), and adverse social circumstances (2%).

Mortality and need for readmission

All six trials measured mortality rates and need for readmission between patients incorporated into either hospital at home or assisted discharge schemes versus those receiving conventional hospital-based care (Shepperd et al 1998; Cotton et al 2000; Davies et al 2000; Skwarska et al 2000; Ojoo et al 2002; Hernandez et al 2003). No significant differences were observed between groups although it is important to point out that the follow-up period was limited to a maximum of 12 weeks.

Reducing length of in-patient stay

The effectiveness in terms of reduced length of hospital stay was specifically evaluated in two randomised controlled trials (Cotton et al 2000; Hernandez et al 2003). In one study (Cotton et al 2000), 41 patients with a nonsevere exacerbation of COPD were randomly allocated to early discharge and 40 were allocated to conventional in-patient management. Patients were visited on the day after admission by a specialist respiratory nurse and at intervals considered appropriate thereafter. Those in the early discharge group had a mean hospital stay of 3.2 days (range 1–16 days) while those in the conventional group had a mean stay of 6.1 days (range 1–13 days). In another study, Hernandez and colleagues (2003) evaluated the effects of randomly assigning 222 patients with COPD to either conventional in-patient care or immediate or early discharge. The desired period of follow-up was chosen by a respiratory nurse with a maximum of 5 visits at home permitted over an 8 week period with unlimited telephone access.

Conventional care resulted in a greater length of hospital stay amounting to 4.2 days versus 1.7 days in the early discharge group (p < 0.001 for the difference).

Acceptability

Hospital at home and assisted discharge schemes have been shown to be acceptable both to patients and healthcare workers. On the completion of their randomized controlled trial, Skwarska and colleagues (2000) obtained questionnaires on general satisfaction with their assisted discharge scheme. Sixty nine percent of patients treated at home and 55% of their General Practitioners responded to questionnaires. The vast majority of patients (95%) were "completely satisfied" with the service and 90% felt that they had been cared for "just as well or better" at home than they would have been in hospital. Moreover, all General Practitioners who responded were satisfied with the provision of domiciliary support for patients with mild exacerbations of COPD, while 65% felt that doing so did not increase their workload. In another study, satisfaction scores demonstrated similar mean scores for home management (92%) versus conventional hospital based management (88%) (Ojoo et al 2002). In the study by Hernandez and colleagues (2003), patients managed at home also had a higher satisfaction score than those assigned to hospital care.

Effects upon quality of life

Effects upon health-related quality of life were assessed in three trials (Shepperd et al 1998; Davies et al 2000; Hernandez et al 2003). In one study, the St George's respiratory questionnaire (SGRQ) was assessed during the first week of the exacerbation and after 3 months of follow up (Davies et al 2000), with no significant differences observed between groups. In another study (Hernandez et al 2003), there was a greater, although statistically nonsignificant (p = 0.05) improvement in SGRQ score in patients treated at home than in the control group. Shepperd and colleagues (1998) obtained questionnaires on general health status and respiratory health status at the beginning and following 3 months of follow up. There were no significant differences in scores between individuals managed at home compared with those receiving conventional in-patient care.

Cost effectiveness

An indirect cost calculation carried out in Lothian, Scotland showed that the cost of an early supported discharge scheme was £877 versus £1753 for a hospital admission due to an

acute exacerbation of COPD (Skwarska et al 2000). In a randomized controlled trial comparing the cost of hospital at home care versus in-patient hospital care for patients recovering from hip replacement, knee replacement, and hysterectomy, elderly medical patients and COPD, there were significantly greater healthcare costs for home managed patients with the latter (Shepperd et al 1998), although the numbers of patients included were small (n = 32). However, in a larger study (n = 222), the overall cost for an 8 week hospital at home service was 62% that of the cost of conventional in-patient management (Hernandez et al 2003). An Australian study of patients with an exacerbation of COPD (n = 25) primarily evaluated the comparative cost of home-based care with traditional in patient care. The group randomized to home care cost 30% less (p < 0.01 for the difference) than those who received in-patient management (Nicholson et al 2001).

Our own experience

Aberdeen Royal Infirmary is a large teaching hospital (n = 952 acute admission beds) situated in the North East of Scotland with a catchment population of 523,400 patients (city centre population 212,200). Due to the practical difficulties of traveling long distances and possible need for re-admission, individuals with mild exacerbations of COPD are only considered suitable for assisted discharge if they live within a 30-mile radius of the base hospital. All data from patients enrolled into our early discharge scheme are stored electronically in a secure database accessible only by passwords known exclusively by relevant staff. The data shown in Table 2 illustrates the numbers of patients entered into our own assisted discharge scheme between January 2002 to December 2005 and shows that only a relatively small proportion required readmission to hospital. As can be observed from Table 3, many patients were willing to be incorporated into our assisted discharge scheme during subsequent re-admissions to hospital.

Table 2 Numbers of patients (mean age 72 years) with mild exacerbations of COPD entered into our own assisted discharge scheme and frequency of readmission to hospital

Year	Number of assisted discharge episodes	Number of times readmission required
2002	207	13
2003	199	22
2004	184	6
2005	220	18*
Total over 4 years	810	59

Note: *1 patient died at home.

Table 3 Numbers of patients having single and repeat episodes of assisted discharge for mild exacerbations of COPD over a 3 year period

Number of episodes of assisted discharge between 2002–2005	Number of patients
1	447
2	150
3	80
4	48
5	34
6	17
7	12
8	6
9	5
10	4
11	3
12	2
13	1
14	1

Patient suitability

Patients are firstly assessed in hospital by a specialist registrar or consultant in respiratory medicine. This varies between several hours after arrival in an acute admission ward to several days of in-patient care in a general medical or respiratory ward. During this contact period, clinical condition along with laboratory and radiology results are assessed, treatment optimized, and overall suitability discussed with both the patient and nursing staff. It is not necessary for a given patient to be under the direct care of, or have previous contact with, a respiratory physician. Factors which prevent patients from being discharged earlier from our own hospital are shown in Table 4.

Community management and follow up

Prior to starting our service in 2001, all General Practitioners were provided with written information outlining the assisted discharge scheme (Figure 1). The General Practitioners of all patients entering the scheme are informed by fax on the day of their discharge back into the community. This also allows changes in treatment, diagnosis and results of investigations to be communicated. Thereafter, General Practitioners only become involved in a patients' care if a nonrespiratory problem is encountered throughout the subsequent assisted-discharge period.

After discharge from hospital, nursing advice— by home visit or by telephone— is available on a 24 hour basis for a minimum of 7 to a maximum of 14 days. If required, oxygen cylinders and nebulizers are given for short-term use during

Table 4 Clinical features and social circumstances considered unsuitable for entering patients into our own assisted discharge scheme

Clinical features	Social circumstance
Confusion	No telephone
Worsening peripheral oedema	Patient, family, or General Practitioner unwilling
pH <7.35, pO_2 < 8 kPa, pCO_2 > 6.5 kPa	Home > 30 miles from base hospital
Heart rate > 110 beats per minute	Adverse home circumstances
Respiratory rate > 28 breaths per minute	
Unable to complete sentences	
Undiagnosed or cardiac chest pain	

Abbreviations: pCO_2, partial pressure of carbon dioxide ; pO_2, partial pressure of oxygen.

this period, the use of which is monitored by respiratory specialist nurses. Currently, a team of 7 nurses are available to conduct the daily visits which take place at an agreed time suitable for all relevant parties. During home visits, patients' physiological observations (temperature, blood pressure, pulse, respiratory rate, oxygen saturation, and peak expiratory flow rate) are recorded and the patients' progress discussed. When necessary, intravenous antibiotics are administered and

Patient admitted with an exacerbation of COPD

↓

Assessment by a middle grade or consultant respiratory physician

↓

Optimised pharmacological treatment

↓

Absent adverse clinical parameters
Patient, family and General Practitioner agreeable to early hospital discharge

↓

Hospital discharge with nurse led follow up for 1–2 weeks Clinical progress discussed with respiratory physician if required

↓

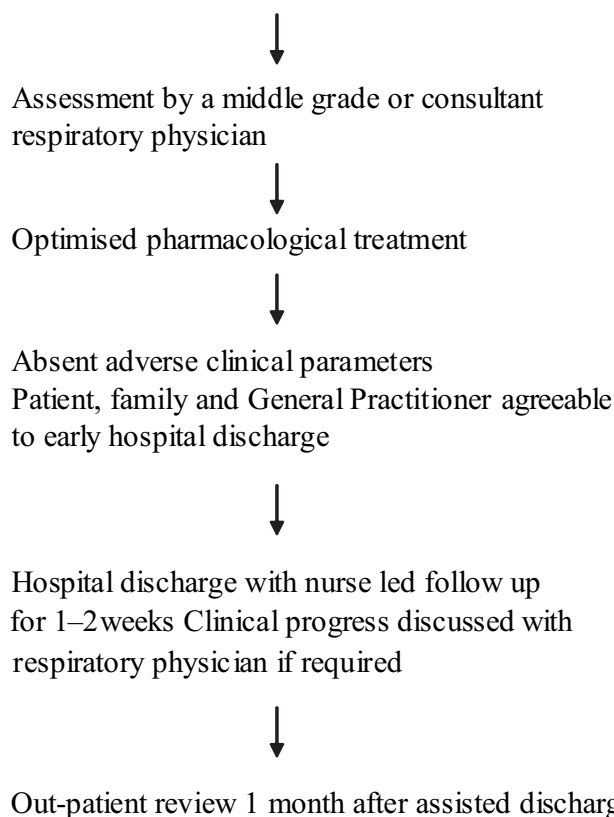Out-patient review 1 month after assisted discharge

Figure 1 Algorithm describing proposed protocol for entering patients into assisted hospital discharge.
Abbreviation: COPD, chronic obstructive pulmonary disease.

venepuncture carried out to check, for example, aminoglycoside levels. If at anytime during assisted hospital discharge a patients' progress is considered unsatisfactory, re-admission to hospital can be arranged by the nurse directly to the respiratory ward (Table 2). All individuals entered into the scheme are given an appointment to be reviewed at a respiratory out-patient clinic 1 month following assisted discharge.

Patient satisfaction

All patients embarking on their initial episode of assisted discharge are asked to fill in a satisfaction questionnaire. Of those questionnaires returned between 2002–2005, more than 90% felt that their "overall satisfaction with the service provided at home" was between 8–10 on a 10 point scale.

Funding

In December 2001, funding of £86,000 was initially allocated from the Scottish Executive's Winter Planning Initiative. This agreed amount was given to pilot an early assisted discharged scheme for 3 months for patients admitted to hospital with an exacerbation of COPD. Following the success of the pilot, NHS Grampian continued to fund the service on a "non-recurring basis". In 2005, this service was integrated into respiratory medicine with recurring annual funding of £200,000.

Conclusion

Current randomized controlled trials evaluating hospital at home or assisted discharge schemes for patients with mild exacerbations of COPD suggest that they do not result in patients requiring readmission and are not associated with an increased mortality rate over a 12 week period. Moreover, patients generally find them an acceptable alternative to

hospital admission although it is important to point out that many patients with an exacerbation of COPD are not suitable for inclusion in such schemes. Several of the studies highlighted in this review have also shown considerable financial savings as compared with conventional in-patient care.

In a meta-analysis of randomized controlled trials (n = 754 patients), Ram and colleagues (2004) evaluated the overall efficacy of hospital at home schemes. This demonstrated that hospital readmission (relative risk [RR] 0.89, 95% confidence interval [CI] 0.72 to 1.12) and mortality rates (RR 0.61, 95% CI 0.36 to 1.05) were not significantly different when hospital at home or assisted discharge schemes were compared with standard in-patient care. As anticipated, substantial financial savings were made along with the increased availability of in-patient beds. It is important to point out that in the same meta-analysis (Ram et al 2004), only 1 out of every 4 patients presenting to hospital were eligible for inclusion, although it possible that due to strict study entry requirements, this figure may not be completely reflective of "real life".

Despite these clear advantages, hospital at home or assisted discharge services are not generally in widespread use in hospitals throughout the UK. For example, a postal questionnaire was sent to consultants in 223 different respiratory departments in the UK in 1999. Although over 90% of consultants were aware of early discharge schemes, in only 16% of departments was such a service in place with difficulty in securing adequate funding the main reason for not having one (Johnson et al 2001). However, in a UK-based national COPD audit in 2003, 44% of hospitals did in fact have an immediate or early discharge service of some sort available (Quantril et al 2005). Greater emphasis should perhaps be made of such schemes in national published guidelines in addition to provision of a suggested working framework (NCCCC 2004). Indeed, it is increasingly important that all practicing respiratory physicians and health authorities are made aware of the existence of hospital at home and assisted hospital discharge schemes and of the potential financial savings involved.

Our own experience and data suggests that assisted hospital discharge schemes can result in reductions in the length of hospital stay for patients with COPD, as the mean length of stay in our hospital is now 4 days. Moreover, we have also extended our service to incorporate patients with other chronic respiratory disorders such as bronchiectasis, interstitial lung disease, and chronic asthma (Currie et al

2005). We feel that part of the success of our own scheme is related to the meticulous screening and appropriate selection of patients for inclusion (Table 4). It is known that the mortality from COPD on admission to hospital is closely linked to the degree of acidosis (Warren et al 1980) and presence of concomitant medical disorders (Seneff et al 1995; Connors et al 1996). As a consequence, patients with a pH <7.35 are not considered suitable for assisted hospital discharge, although we do not exclude patients with other medical disorders such as ischemic heart disease, diabetes mellitus or cardiac failure who are considered to be clinically stable. However, it is important to note that one patient with end-stage COPD died while on our own assisted discharge scheme, although this may not have been preventable with in-patient care.

In conclusion, hospital at home and assisted discharge schemes facilitate a safe and effective means by which to discharge patients with mild exacerbations of COPD back into the community and may result in potential financial savings and reductions in bed occupancy. We have also shown that such schemes—which have been shown to be effective in the realms of randomized controlled trials— can be successfully incorporated into the "real life" management of patients. It is important that templates determining which patients may be safely incorporated into assisted discharge schemes are formulated and that they are delivered by appropriately qualified nursing and medical personnel. Factors which are associated with re-admission to hospital or patient dissatisfaction also require to be audited frequently. Perhaps in the future, hospital at home and assisted discharge schemes can be linked up with intensive pulmonary rehabilitation programmes and encouragement of patients to maintain as high a level of physical activity in their daily life as possible, both of which are known to have benefits in the overall management of COPD (Garcia-Aymerich et al 2003; NCCCC 2004).

Acknowledgement

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