

## **Avoiding hospital admission in COPD: impact of a specialist nursing team**

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**Abstract**

Chronic obstructive pulmonary disease (COPD) is a common, preventable and incurable disease. The costs of caring for patients with COPD is estimated to be more than £800 million a year for acute hospital admissions alone (Department of Health, 2012). The hospital-at-home model is increasingly being adopted for COPD patients following British Thoracic Society (BTS) guidelines for the delivery of hospital admission-avoidance schemes (BTS, 2007). The aim of this case-note review was to evaluate the safety and effectiveness of a specialist nurse-led acute respiratory assessment service working with COPD patients in the community. The review recorded patient flow through the service and documented assessments and treatments. It was able to document potential benefits and cost savings.

**Keywords**

Chronic obstructive pulmonary disease, Cost-benefit analysis, Chronic disease, Specialist nurses

Chronic obstructive pulmonary disease (COPD) is characterised by persistent and usually progressive airflow limitation, most commonly caused by cigarette smoking (Rabe et al, 2016 (see reference list)). It is a common, preventable and treatable disease that, despite the provision of pharmacological and non-pharmacological treatments, remains incurable.

The cost of caring for patients with COPD is estimated to be more than £800 million a year for acute hospital care alone (Department of Health (DH), 2012). It is the second highest cause of emergency admissions of any chronic disease in the UK (DH, 2010). Hospitalisation is responsible for up to 60% of the total cost of management for COPD patients (Guest, 1999; O'Reilly et al, 2007), and it is inevitable that these costs will continue to rise owing to the increasing number of people living with long-term conditions (DH, 2013). For the healthcare system, acute exacerbations of COPD are the most common cause of hospital admission, particularly in the winter, which places heightened pressure on demands for hospital beds (Ram et al, 2004). It is therefore essential that alternate safe and effective models of care are developed in order to reduce unnecessary acute admissions and to provide patients and carers with the appropriate professional support and education to facilitate effective self-management.

## **Background**

The hospital-at-home model is becoming increasingly adopted for patients with COPD following recommendations and guidance from the British Thoracic Society (BTS) (2007). The guidelines detail key recommendations for the safe and effective delivery of admission-avoidance schemes, which include: inclusion and exclusion criteria, key skills of health professionals working within such teams, and assessment and treatment options.

The evidence for providing such a service for patients experiencing an acute exacerbation of COPD remains contradictory. It has been suggested that admission-avoidance schemes have no significant benefits when compared to inpatient hospital care (Shepperd et al, 2008). Shepperd et al (2016)

suggested that hospital-at-home may be an effective alternative for a small group of patients and may be more cost effective than acute admission to hospital. More recently, Fernandez et al (2013) concluded that hospital at home is a good, safe alternative, and that readmissions were associated with co-morbidities rather than the type and place of management for the acute episode.

A systematic review of eight randomised controlled trials with 870 patients concluded that hospital-at-home schemes were safe and demonstrated a significant reduction in readmission rates and a trend towards reduced mortality rate when compared with conventional inpatient treatment of acute exacerbations of COPD (Jeppesen et al, 2012). The systematic review did, however, identify a lack of evidence of patient satisfaction in either setting and the need for future research to determine which medical professionals are most appropriate to deliver hospital-at-home services.

It has been widely demonstrated that clinical nurse specialists add extra value to patients while generating efficiencies for organisations through innovative ways of working (RCN, 2010). The holistic care and timely interventions provided by clinical nurse specialists not only help to reduce patient morbidity, but also potentially prevent costly care episodes such as unplanned hospital admissions (Baxter and Leary, 2011). The majority of studies evaluating hospital-at-home schemes have recruited patients who present to accident and emergency departments and may or may not have been admitted to hospital, and therefore are referred following assessment by a team of doctors and nurses in the acute setting and/or by a specialist respiratory physician. Knolle et al (2011) developed a community-based model of direct referral of patients to COPD specialist nurses from primary care, demonstrating it to be a safe method of reducing unnecessary hospital admissions. The findings of this service evaluation was promising, but further work is required to understand the acceptability and economic impact of this model of care.

## **The study**

### **Aim**

The aim of this review was to evaluate the safety and effectiveness of a specialist nurse-led acute respiratory assessment service (ARAS) for patients diagnosed with COPD to avoid unnecessary hospital admission. The objectives of the review were to record patient-flow through the admission avoidance pathway, document the treatment provided to the patients, identify potential benefits and cost savings of providing specialist versus generalist care and report patient satisfaction with the service.

### **Setting**

Lincolnshire is a large rural county with a total population of 724 000, a higher than average percentage of smokers at 19.1% and a higher than national current COPD prevalence of 2.2% of the population, predicted to rise to 2.8% (Public Health England, 2015). The ARAS is commissioned to provide a hospital-at-home/admission avoidance service for patients with COPD, which is delivered by the Lincolnshire countywide community respiratory team. This service allows direct referral before patients are admitted to hospital. ARAS is provided to patients with a confirmed diagnosis of COPD who experience an acute exacerbation and require specialist care. It covers the geographic areas of west, east and south-east Lincolnshire, covering the boundaries of the former west, east and southeast Lincolnshire clinical commissioning groups. Within the west Lincolnshire area there are currently two whole time equivalent (WTE) band 7 respiratory nurse specialist posts commissioned to support the service. Each of the four nurses within the team is a non-medical prescriber, has respiratory specialist qualifications to a minimum of degree level and is competent in undertaking and interpreting capillary blood gas assessments.

## **Service**

Patients with a confirmed diagnosis of COPD who present with an acute exacerbation of COPD and are deemed to require further support to prevent hospital admission are referred to the community respiratory nurse specialists. To be eligible for the service, COPD patients must be able to cope at home and have suitable social circumstances. Patients with significant co-morbidities are excluded. Co-morbidities include acute left ventricular failure and congestive cardiac failure, pneumonia, an undiagnosed chest or cardiac condition, confused or agitated patients and those with a coexistent lung disease (such as asthma, bronchiectasis, interstitial lung disease, lung cancer). Referrals are made directly to ARAS from primary and secondary care clinicians and emergency care staff. Patients on a current respiratory caseload are able to self-refer. The referral is triaged by a respiratory nurse specialist and, if deemed appropriate for the service, the patient is contacted and an appointment to review at home is made for the next working day.

On initial assessment a comprehensive respiratory and holistic assessment is completed by a respiratory nurse specialist. This includes current and past medical history, medication review, including inhaler technique, physical examination, review of social circumstances and objective assessments including temperature, pulse rate, respiration rate, blood pressure and capillary blood gas (CBG) assessment if indicated. A personalised management plan is provided and discussed in depth with each patient and medications prescribed as indicated. These may include antibiotics, oral steroids, bronchodilators, nebulised treatment and oxygen therapy. Patients are reviewed at home and by telephone as clinically indicated, for a period of up to 14 days, although this is flexible dependent on the severity and level of support required. The respiratory nurse specialist can also refer patients directly to other services including occupational therapy, physiotherapy, social care, day hospice, hospice at home, smoking cessation and pulmonary rehabilitation, as well as specialist equipment services.

## Method

For the purpose of this review, data were analysed from the case notes of patients referred to the service over a 12-month period from 1 April 2014 to 31 March 2015. Data were also collected from anonymous surveys that patients were asked to complete to assess satisfaction on discharge from ARAS. Patients were asked to rate their satisfaction on a scale of 1 (not at all) to 5 (totally) to the following questions:

- How likely are you to recommend our services to your friends and family if they needed similar care or treatment?
- Were you treated with dignity and respect?
- Were you involved as much as you wanted to be in your treatment and care plan?
- Did you receive clear information about your care and treatment?
- Were you treated with kindness and compassion by all the staff looking after you?

## Results

During this review period 128 patients (mean  $\pm$  standard deviation; age  $74.2 \pm 11.0$  years) referred were appropriate for acceptance on to ARAS. Sources of referrals are given in Figure 1.

A further 15 patients were referred but deemed inappropriate for the ARAS service: 14 patients had a non-COPD diagnosis and one patient was admitted to hospital before an initial assessment could take place.

All patients accepted were seen on the next working day following referral and were provided with a personalised management plan. The mean number of patient visits and telephone reviews by the respiratory nurse specialist was  $3.5 \pm 1.4$  and  $1.5 \pm 1.4$  respectively. The total number of days on the scheme was  $16 \pm 8.8$ . All patients were initially treated with antibiotics and oral steroids. Ninety-two patients (72%) were treated with nebulised bronchodilators either with their own nebuliser or one provided on short-term loan from the ARAS team. Sputum culture was obtained in 26 patients (20%)

with 50% of these being negative, 30% positive for *Haemophilus influenzae*, 8% for *Pseudomonas aeruginosa*, 8% for *Moraxella catarrhalis* and 4% for *Streptococcus pneumoniae*.

On initial assessment, pulse oximetry results showed a mean peripheral capillary oxygen saturation (SpO<sub>2</sub>) of 93% ± 3, with 21 (16%) patients hypoxemic and requiring further CBG assessment. Of those requiring CBG assessment, seven (33.3%) were already receiving long-term oxygen therapy (LTOT) and required adjustment of flow rate, eight patients (38.1%) were started on LTOT and three patients (14.3%) had a normal CBG, with a partial pressure of oxygen (PaO<sub>2</sub>) of >8kPa. A further two patients (9.5%) were hypoxemic but oxygen therapy was considered inappropriate. One had a critical risk of fire, because of a heavy smoking habit and the other had acute type 2 respiratory failure. The latter of these patients was admitted, along with one other from this group of patients. We were unable to obtain a result from one patient (4.8%) who refused hospital admission. Short-burst oxygen was prescribed and monitored using pulse oximetry and the patient was managed safely at home. The admission costs for these 21 patients, if managed by generalists, would equate to £55 314, whereas the actual cost for this group totalled £7 899.72. This sum included admission costs for two patients admitted due to respiratory causes and the cost of respiratory nurse specialist time and initiation of emergency oxygen where indicated (*Table 1*).

From the total cohort of patients only ten out of 128 referrals resulted in hospital (all-cause) admissions (7.8%) (*Figure 2*). Only six of these admissions were owing to ongoing respiratory causes and poor response to treatment, two of these being from the same patient who was referred to ARAS on two separate occasions. All patients recovered from the acute episode and therefore the mortality rate for all patients referred to ARAS during the treatment period was nil.

### **Patient satisfaction**

Forty-eight patients completed satisfaction questionnaires. All of those questioned stated they would be 'Extremely likely' to recommend the service (in response to question 1). Questions 2 to 5



were scored from 1 to 5 ranging from answers 'not at all = 1' to 'totally = 5'. The mean score for all answers was 4.93 out of 5, indicating that the patients were extremely satisfied with the service, felt involved in their care and agreed that they were provided with clear information. Patients also provided qualitative comments relating to the care and treatment received during their time with ARAS (*Box 1*).

## **Discussion**

The results obtained demonstrate that the specialist skills of all respiratory nurse specialists were a significant contributory factor in the success of the scheme, particularly the ability to undertake and interpret capillary blood gas assessments and initiate emergency oxygen as indicated. Results demonstrate that 21 patients were hypoxemic on initial review and, without management by a respiratory nurse specialist, specialist hospital admission for further assessment would have been required in line with national guidance (National Institute for Health and Care Excellence (NICE), 2010). This would increase admission rates in this cohort to 21.1% for respiratory reasons, as opposed to 4.6%. The admission cost for these patients if managed by generalists would equate to £76 386, whereas the actual cost for this cohort totalled £28 971.72 (*Table 1*). This sum includes admission costs for ten patients admitted and the cost of respiratory nurse specialist time and initiation of emergency oxygen where indicated. Generalist costs also include the admission costs of 19 patients who would otherwise have met admission criteria if the patients had been managed by health professionals who did not have the skills to monitor and initiate oxygen therapy.

Therefore the specialist team saved an estimated £47 414.28 for this cohort, when compared with generalist care. This may be a minimum cost saving as this assumes that all other patients within this cohort would have remained at home. However, due to the nature of this review, the exact cost of consumables used could not be calculated.

CBG assessment is the preferred method of assessment by the community team as opposed to arterial blood gas (ABG) assessment, as it has been proven that there is good correlation for estimating PaO<sub>2</sub> (Eaton et al, 2001) and is a more comfortable procedure than ABGs (Pitkin et al, 1994).

The latest BTS guidelines recommend that patients being assessed for LTOT should undergo initial assessment for suitability, using ABG sampling. However, where this is not practical in a home environment, the guidelines state that a combination of CBGs and oximetry (but not capnography) could be used as an alternative (Hardinge et al, 2015).

From the ten admissions during the period of this review, four were due to non-respiratory causes (*Figure 2*). The two admissions owing to cardiac causes were both assessed by the respiratory nurses and admission was arranged immediately, thus demonstrating the advanced level of assessment skills required by this role. *Figure 2* highlights the complex conditions that patients seen by the team experience and demonstrates that patients are more likely to be admitted to hospital if they have severe comorbidities or are in current receipt of LTOT (*Table 2*). Similar problems were identified by Jeppesen et al (2012).

Since the introduction of ARAS in 2010, hospital admission rates have reduced significantly including during the time period reviewed. However, it is difficult to attribute this reduction solely to the ARAS. Another strength of the respiratory nurse specialist led-service, underlying the continued reduction in admission rates, may be the self-management education given. Patients receiving the service are more aware of the community services available and have the confidence to access and self-refer back to the service as required. The appropriate use of self-management plans encourages patients to access treatment at an early stage at the first sign of an exacerbation (NICE, 2010).

Wilson et al (2006), identified that, apart from specialist nurses, the majority of nurses (including community nurses) were limited in facilitating self-management. Therefore, the benefits for the use of self-management plans are greater when combined with education and support of a respiratory

nurse specialist who also has the ability to optimise inhaled therapies and review inhaler technique (Tashkin et al, 2008).

Providing an individual and holistic assessment and referring to other services can also have a longer-term impact. Reinforcing the multidisciplinary approach, and incorporating this with physical training, disease education and psychological and behavioural interventions, can improve health-related quality of life in COPD patients (Puhan et al, 2016).

The findings of this review highlight the importance of increasing awareness and availability of these schemes. Specialist nurses have a key role to play when supporting admission avoidance and have the ability to care for patients safely and effectively and prescribe treatment that would otherwise necessitate hospital admission if managed by generalists. This therefore emphasises the importance of continued education and training to develop and maintain specialist roles. These findings can be used to support planning and delivery of hospital-at-home schemes nationally and internationally.

### **Limitations**

Our study is a retrospective analysis of case notes with all the inherent limitations. Reliance on the accuracy and completeness of documentation should be viewed cautiously, as it was not recorded for the specific purpose of research. The lack of randomisation and blinding makes it difficult to control bias and confounders. The number of notes analysed was relatively small, but surveying consecutive cases helped to minimise selection bias. The audit was conducted in one centre, but may well reflect the practice in other centres offering an ARAS.

The service operates on weekdays only. Work is being undertaken to align specialist nursing teams with community nursing teams. This will provide opportunities to educate general nurses and create closer links to support the ongoing education and self-management of COPD patients at all stages. It may be a requirement to develop a specialist nurse on-call service for weekends to support community nursing teams for patients with complex conditions. However, until GP surgeries open

routinely at weekends, there is only a minimal need for this at present as GPs are the main referrers for ARAS.

The patient survey assessed satisfaction with the service but changes in the condition of patients pre- and post-treatment were not captured routinely. It would therefore be beneficial to introduce a validated assessment tool, such as the COPD Assessment Test (Jones et al, 2009) to assess these changes, thereby providing an opportunity to include patient-centred and individual measures to assess efficacy of treatment. The surveys collected were kept anonymous and therefore we were unable to analyse patient profiles. A more in-depth qualitative research study may be of benefit.

Details relating to the severity of COPD and previous hospital admissions were not obtained for the purpose of this review. It would also be interesting to obtain hospital admissions and mortality rates in the 12 months following referral to ARAS.

Gathering this information would provide increased evidence to support the future delivery of such services and may provide vital information to demonstrate which patients would be the most appropriate to receive this service in the long term. This review justifies the need for further research into this area, capturing these key elements to analyse safety, effectiveness and the longer-term impact of hospital-at-home schemes.

## **Conclusion**

In summary, this retrospective case-note review suggests that a community specialist nurse-led admission avoidance service can be a safe and cost-effective model of care for managing patients experiencing acute exacerbations of COPD. It is vital that all healthcare professionals involved are skilled and competent in assessing and prescribing appropriate pharmacological treatment, undertaking a CBG assessment, and that the provision of equipment is available to enable these key skills to be undertaken appropriately. Healthcare professionals should also have the ability to

provide specialist education to promote effective self-management. This model is replicable and would be appropriate to incorporate into all admission-avoidance schemes for COPD patients.

**Declaration of interest:** none

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Table 1. Summary of actual costs of treatment specialist vs generalist care

	Specialist	Generalist
Admissions of patients requiring O2 assessment if under generalist care (n=2 specialist vs 21 generalist)	£5,268	£55,314
Cost of visits for above	£1,470	x
Cost of emergency O2 for above	£1,161.72	x
Cost of other respiratory admissions (n=4)	£10,536	£10,536
Cost of other all cause admissions (n=4)	£10,536	£10,536
<b>Total</b>	<b>£28,971.72</b>	<b>£76,386</b>

Table 2. Characteristics and treatment given

	<b>Non-admitted (n=118)</b>	<b>Admitted with respiratory causes (n=6)</b>	<b>Admitted all causes (n=10)</b>
Age	74.4 ±11.1	68.8 ±9.8	72.6 ±9.2
SpO2	93 ±3	93 ±3	94 ±3
Nebulised therapy	82 (69.5%)	6 (100%)	10 (100%)
Postive sputum result	12 (10%)	1 (16.6%)	1 (10%)
Already receiving long term oxygen therapy	48 (41%)	4 (66.6%)	6 (60%)
CBG indicated (SpO2 ≤90%)	19 (16%)	2 (33.3%)	2 (20%)

Box 1. Comments from the patient satisfaction survey

“Always very nice and explained things and seen to get things done”

“So nice knowing someone was there to help with breathing and to give advice on how best to help me. Nothing could be improved the nurse was excellent and very helpful”

“All care from this department is great”

“The care I got from nurse coming in to my home kept me out of hospital. They are very caring and friendly people, highly recommended.”

“The fact that honesty prevailed and I was involved and fully informed, on use of inhalers and equipment.”

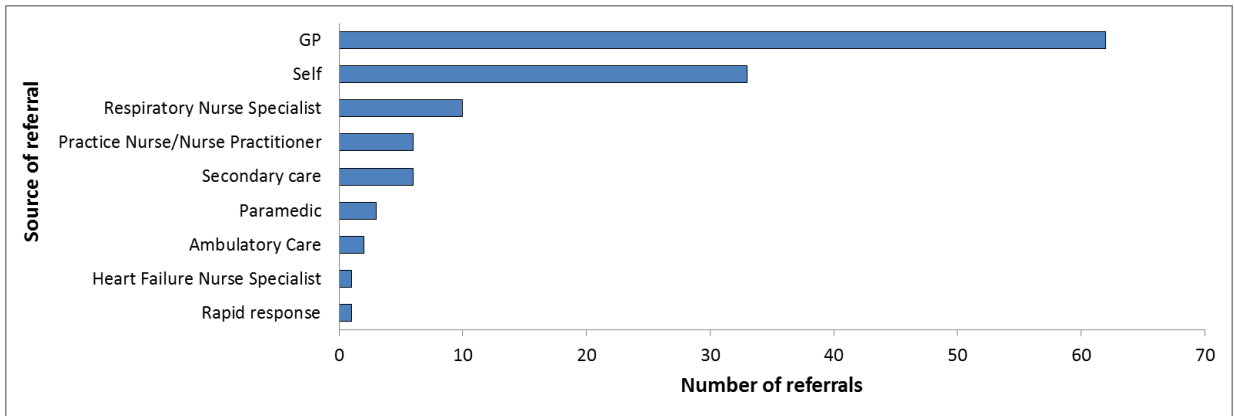


Figure 1. Source of referrals to ARAS

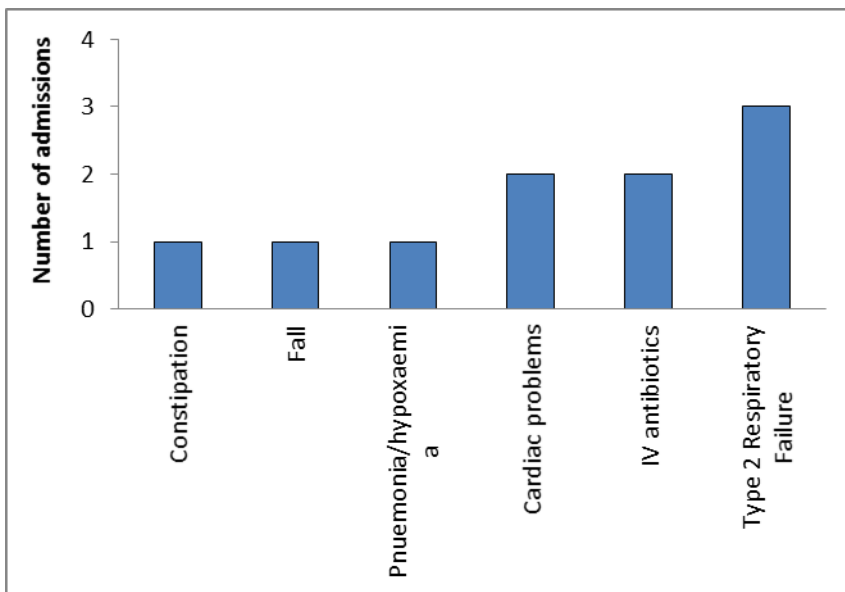


Figure 2. Reasons for admissions