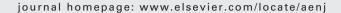RESEARCH PAPER

Early predictors of hospital admission in emergency department patients with chronic obstructive pulmonary disease

Julie Considine, RN, RM, BN, GDipNurs, GCertHigherEd, MNurs, PhD, FRCNA [a,*], Mari Botti, RN, BA, GDCAP, PhD [b,d], Shane Thomas, BA(Hons), DipPubPol, PhD [c,e]

[a] Deakin University-Northern Health Clinical Partnership, c/- School of Nursing and Midwifery, Deakin University, 221 Burwood Hwy, Burwood, 3125 Victoria, Australia
[b] School of Nursing and Midwifery, Deakin University, 221 Burwood Hwy, Burwood, 3125 Victoria, Australia
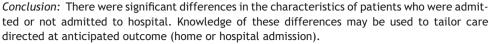[c] School of Primary Health Care, Monash University, Building 1, Omnico Business Park, 270 Ferntree Gully Rd, Notting Hill, 3168 Victoria, Australia

Summary
Background: Streamlining emergency department (ED) care of patients with chronic obstructive pulmonary disease (COPD) may be an important strategy in managing the increasing burden of this disease.
Study objectives: The aim of this study was to identify factors predictive of hospital admission in ED patients with COPD, specifically factors that can be used early in the ED episode of care.
Methods: Using retrospective regression analysis, case data from 321 randomly selected medical records from five Australian EDs were analysed. Patient characteristics, triage and ED system features, physiological status, and ED treatment during the first four hours of ED care were compared between discharged and admitted patients.
Results: Factors available *on ED arrival* associated with increased likelihood of admission were: age (OR = 1.04, $p = 0.008$) respiratory symptoms affecting activities of daily living (OR = 1.8, $p = 0.043$) and signs of respiratory dysfunction (OR = 2.5, $p = 0.005$). Factors available from the *first four hours of ED care* associated with increased likelihood of admission were: age (OR = 1.04, $p = 0.021$), oxygen use at four hours (OR = 3.5, $p = 0.002$) and IV antibiotic administration (OR = 2.6, $p = 0.026$). There were conflicting findings regarding the association between ambulance transport and admission.

* Corresponding author. Tel.: +61 3 9244 6175; fax: +61 3 9244 6159.
E-mail addresses: julie.considine@deakin.edu.au, julie.considine@nh.org.au (J. Considine), mari.botti@deakin.edu.au (M. Botti), Shane.Thomas@monash.edu (S. Thomas).
[d] Tel.: +61 3 9244 6123.
[e] Tel.: +61 3 8575 2244.

Conclusion: There were significant differences in the characteristics of patients who were admitted or not admitted to hospital. Knowledge of these differences may be used to tailor care directed at anticipated outcome (home or hospital admission).

What is known

- The growing burden of COPD will increasing the need for Emergency Departments to manage acute exacerbations.
- Improving decisions about hospital admission in these patients is important given the high risk of relapse and re-presentation.

What this paper adds?

- There are significant differences in the characteristics of patients who were admitted or not admitted to hospital.
- Knowledge of these differences may be used to better tailor care directed at anticipated outcome (home or hospital admission).

Introduction

Chronic obstructive pulmonary disease (COPD) is a chronic respiratory illness characterised by airway inflammation and irreversible airflow limitation.[1] The growing burden of COPD is increasing the need for emergency departments (EDs) to manage acute exacerbations of this debilitating disease. COPD results in over 1.5 million ED visits in the U.S. and, in Australia, 87% of hospitalisations for COPD are via EDs.[2,3] Approximately one third of patients discharged from the ED with acute exacerbation of COPD will have symptom recurrence within 14 days and 17% will relapse and require hospital admission.[4] Risk of relapse and re-presentation makes identification of high risk patients an important strategy for improving decisions about hospital admission in these patients.[4]

There are several guidelines that provide consensus-based indicators for hospital admission for patients with COPD.[4–6] Similarities between guidelines include indicators of increased symptoms, high-risk co-morbidities, inability to self-care, increasing hypoxemia or hypercapnia, and inadequate response to outpatient management.[4–6] While these admission criteria are useful, they share some limitations. For example, the guidelines cite 'inadequate response to treatment' as a criterion for admission however there are no objective criteria to guide decision-making.[4–6] Identifying the need for hospital admission for acute exacerbation of COPD early in the ED episode of care has important clinical and organisational implications: patient management can be tailored towards achieving a preferred outcome (hospital admission or discharge) thereby decreasing unnecessary delays; optimising patient management and decreasing unnecessary variation in management will decrease clinical risk; and, facilitating patient movement from the ED (either home or to an inpatient unit) improves patient flow so may reduce risks associated with ED overcrowding. Streamlining the ED care of patients with COPD may be important in managing the increasing demands that this chronic disease places on health systems. The aim of this study was to identify factors predictive of hospital admission in ED patients with COPD, specifically factors that can be used early in the ED episode of care.

Materials and method

Study design

This study was conducted using analysis of retrospective randomly selected cases from five EDs in Melbourne, Australia. This study was approved by the Human Research and Ethics Committee at Deakin University and the study sites.

Study setting

The study sites were a major private hospital and four urban district public hospitals in metropolitan Melbourne, Australia. The public sites were similar in size and patient populations: all were situated in hospitals that managed adult and paediatric patients. During the study period, the annual ED presentation rates of the public ED ranged from approximately 41,000 to and 64,000.[7] The private ED had an annual presentation rate of approximately 25,000 presentations.

Population

Participants were adult patients (over 18 years) at the study sites from July 2006 to July 2007 with an ED discharge diagnosis of COPD (classified using the ICD-10-AM codes).[8] The ICD-10-AM codes indicative of COPD were J439 (emphysema) and J449 (chronic obstructive airways disease). Patients were included if they had these codes as: (i) primary ED discharge diagnosis or (ii) secondary ED discharge diagnosis and a primary ED discharge diagnosis related to an acute respiratory illness that will exacerbate COPD. There were 1452 patients who met the above diagnostic criterion for exacerbation of COPD over the 121 month period. A total of 400 patients were randomly selected from this data set using the random case selection feature in SPSS Version 14.0. Of these, medical records were available for 321 patients. Sample size estimates for this study were based on the convention that there should be at least 10 cases in the sample for every independent variable entered into a regression model[9–11] and it was anticipated that there would be approximately 30 predictor variables.