A descriptive study of patients admitted with acute exacerbation of chronic obstructive pulmonary disease in three hospitals in Cape Town, South Africa

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Abstract

The aim of this study was to determine the profiles and outcomes of patients hospitalised with acute exacerbation in the northern suburbs of the Cape metropolitan area, South Africa. Although published reports concerning the prevalence and risk factors of chronic obstructive pulmonary disease (COPD) are available in South Africa, very little is known about the profile and admission frequency of patients hospitalised with acute exacerbation of COPD. This study reviewed the medical records of patients hospitalised in two state hospitals (tertiary and secondary) and one private hospital from 1 June 2004 to 1 June 2005. The information obtained retrospectively included demographics, co-morbidities, re-admission frequency, and length of stay.

A total of 178 patient records were reviewed, significantly less than the 730 records identified as suitable. The mean age of patients hospitalised with acute exacerbation of COPD was 63 years (SD=12); patients were predominantly males, 66% (117) were ex-smokers while 34% (61) continued to smoke during the study period. The majority (78%) of patients had at least one co-morbidity. Patients with two or more co-morbidities had an increased risk for readmission (p=0.02). In the 12 months, between 1 and 8 admissions were recorded per patient, resulting in 338 hospitalisations; 56% of the patients were hospitalised once in the study period, 25% twice, and 19% three times. Most of the readmissions occurred at the secondary level hospital. Patients admitted to the tertiary hospital were more likely to be re-admitted: mean 2.3 admissions compared with <2 admissions at the secondary hospital. There were no significant differences in hospitalisation frequency, length of stay, and presence of co-morbid diseases for patients hospitalised at the three hospitals, which provide healthcare to a range of socio-economic groups. The study concluded that re-admission with acute exacerbation was common among a substantial proportion of COPD patients. Patients with co-morbid disease were more at risk of re-admission.

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Introduction

Acute exacerbation usually refers to deterioration in the patient's clinical status, with worsening of respiratory symptoms beyond the normal day-to-day variation experienced by the patient, requiring medical intervention.[1] These episodes may contribute significantly to the burden of lung disease.[2] At the healthcare level, there is escalation in medical resource utilisation and cost; at the individual level there is loss of income, increased physical disability, and social isolation, as well as increased risk of mortality.[3] Significantly, the presence of co-morbidities such as cardiovascular disease can influence the course of chronic obstructive pulmonary disease (COPD) and can result in more hospitalisations.[4]

Research encompassing pertinent data (such as demographic profile, admission frequency, and length of hospital stay) for patients hospitalised with acute exacerbation has been conducted in developed countries in an attempt to determine the impact of acute exacerbation.[5] In a retrospective, multicentre study, Bahadori and Fitzgerald et al. found a high re-admission frequency with variability of re-admission rate among the hospitals in the study.[6] In a prospective study, Kessler et al. established that co-morbidities such as pulmonary hypertension and hypercapnia affected hospital admission.[7] In 2001–2002, COPD accounted for more than 500 000 hospitalisations in the United States alone and $20.9 billion in direct healthcare costs, hence the disease represents a significant economic burden.[8,9] Currently there is very little published data concerning COPD and the frequency of admissions due to acute exacerbation for COPD patients in sub-Saharan Africa.[9,10] In Africa, and South Africa in particular, limited evidence is available on hospitalisations although evidence of the increasing prevalence of the disease has been published.[11]

The South Africa Demographic and Health Survey 2003 provided evidence of the developing lung disease amongst men and women in the Western Cape. In the survey, males in the Western Cape had the second highest percentage of self-reported chronic bronchitis and asthma at 3.4% and 5.7% respectively and females had the third highest percentages at 5.7% and 8.9%.[12,13] The BOLD study in 2007 further revealed a high prevalence of moderate to severe COPD (stage II and higher) in Cape Town at 19.1%. Cape Town was one of four cities (the others being Krakow in Poland, Lexington in the USA, and Manila in the Philippines) that have the highest proportion of patients with moderate to severe COPD out

of a total of 12 cities worldwide in the study.[14]

In addition, South African mortality data provide evidence of the burden of disease on the population: COPD featured in the top 20 causes of death in South Africa in 2000 with 113 499 deaths from the total of 11 967 822, and a resultant 0.9% years of life not lived due to premature mortality for male and females.[15] In the Western Cape in particular, COPD accounted for 3.8% of deaths from a total of 41 547, and 2.1% of the years of life lost.[16]

This study, therefore, is an attempt to learn more about healthcare utilisation and the characteristics of patients hospitalised with acute exacerbation within the setting of a developing country. This study aimed to profile COPD patients in the Cape metropolitan area who had been hospitalised with acute exacerbation in state and private institutions. South Africa has a divided economy, which is evident through the utilisation of two different types of healthcare systems, i.e. private medical facilities and Government-funded facilities. Private healthcare caters for a small percentage of patients who are able to pay for these services. However, the majority of South Africans, who have lower incomes, use state-funded medical facilities. The institutions included in the study are representative of the healthcare accessed by the different socio-economic groups in South Africa.

The Health Research Ethics Committee of Stellenbosch University (N05/07/118) approved this project and all the relevant authorities granted permission. No patients were contacted.

Methods

All hospitalisations at the three hospitals between 1 June 2004 and 1 July 2005 were included in the study. The variables that were investigated retrospectively included age, gender, smoking habits, and the presence of co-morbidities; this made it possible to create a profile of patients who were hospitalised with acute exacerbation in the northern suburbs of the Western Cape. Patient outcomes were assessed based on re-admission frequency and length of stay for the different hospitals. We elected to investigate the above characteristics as opposed to mortality (in hospital or after hospitalisation) to learn more about the factors that may influence re-admission.[17]

We used a sample of convenience for this study comprising one tertiary, one secondary, and one private hospital in the northern suburbs of Cape Town. The state hospitals comprised one (270-bed) secondary and one (1300-bed) tertiary hospital and serve communities surrounding the hospitals in the northern suburbs of Cape Town. The secondary hospital provides services such as trauma and emergency care, in-patient care, outpatient visits, and paediatric and obstetric care services. Critical patients are usually referred to the tertiary hospitals as these hospitals have the specialised equipment and staff to deal with complex medical cases.

The tertiary hospital serves a dual function, being a teaching hospital for health sciences students while also providing healthcare to communities from the surrounding areas. In contrast, although the private healthcare facility provides services to patients from areas surrounding the hospital, it is not limited to those areas.

Patients were included in the study following a diagnosis of COPD, emphysema, or chronic bronchitis as recorded in their medical folders. However, patients who were discharged from the emergency department within 24 hours of treatment and those who had died within 24 hours of admission were excluded from the study.

At the time of data collection, the International Classification of Disease ICD-10 with the relevant code assigned to acute exacerbation was not uniformly used to record patient diagnosis in the hospitals.[18] In order to overcome this lack of uniformity we used a two-step process to identify eligible patients as follows:

- Firstly, the principal investigator reviewed the admissions list for each of the hospitals for the period 1 June 2004 to 1 June 2005 and recorded all admissions of patients presenting with symptoms of acute exacerbation of COPD. Identifiable symptoms included complaints of dyspnoea, increase in sputum, bronchospasm, infection, pneumonia, cough, new arrhythmia, and deterioration in mobility.[19]
- Secondly, we sourced the medical folder from the records department and if the admission diagnosis by the attending doctor concurred with the existing diagnosis of COPD, the patient was included as a study participant and we extracted all relevant data from the medical folder.

The principal investigator was responsible for the extraction of all the data, using a self-designed data extraction form. All pertinent information concerning the admission was extracted from the patient's medical records. These included the nurses' notes reflecting vital signs and blood gas results, and the doctor's notes documenting the clinical status of the patient and the prescription chart.

Analysis of the data was conducted in consultation with a statistician, using Statistica Version 9 (Statsoft, Tulsa, Oklahoma, USA). We report central tendencies as means and data variability as standard deviations, when distributed normally. When not distributed normally we report medians and inter-quartile ranges. Histograms and pie charts are used to present descriptive data. Student's t-test was utilised to compare the groups for continuous variables while the Chi-squared test or Fisher's exact test were used for categorical variables (when appropriate). The analysis showed significant differences between groups or across groups at the alpha level of 0.05 with all reported p-values being two-sided. Analysis included variables (age, gender, smoking, co-morbid conditions) with less than 10% missing data.

Results

In all, 730 medical folders were requested from the three hospitals reviewed in this study (tertiary 221, secondary 423, private 86). From this, we managed to review

the medical records of 178 patients (24%) who fulfilled the inclusion criteria, which is considerably less than we anticipated (tertiary 28, secondary 119, private 31). The remaining 552 subjects were excluded because their records were unobtainable from the medical records departments, or they did not meet the inclusion criteria, or, in the case of state hospitals, the medical records were illegible. The latter problem arose because some records had been converted to poor-quality microfilms, rendering the records unreadable and unusable for this study.

The demographic profiles of the 178 patients are depicted in Table 1. Patients admitted with acute exacerbation were predominantly male, and all had a history of smoking cigarettes. The age range varied from 30 to 95 years, but 29% of patients were between the ages of 65 and 75, and 56% were younger than 65 years of age. Patients in the private hospital were slightly older (mean, 65 years) than patients at the public hospital (means, 63 and 62 years respectively).

Demographic	Classification
Number of patients	178
Mean age (years) (±SD)	63 (±12)
Gender (male:female)	103:75
History of smoking	178 (100%)
Current smokers (yes:no)	117:61

Table 1: Demographics of all patients on entry into study

The admission frequency ranged from 1 to 8, during which time 338 re-admissions were recorded for the 178 patients, with those patients admitted twice or more (n=78) contributing to the majority of re-admissions. Neither age nor gender were associated with risk for re-admission. Table 2 describes the age, gender, days in hospital (length of stay (LOS)), and co-morbid conditions for the COPD patients admitted with acute exacerbation in relation to the admission frequencies.

Most of the re-admissions occurred at the secondary hospital (n=221); 56 re-admissions occurred at the private hospital; 61 readmissions occurred at the tertiary hospital. Patients admitted to the tertiary hospital were more likely to be re-admitted, mean of 2.3 re-admissions compared with <2 re-admissions at the secondary hospital; however, this was not significant (p=0.49). Although the mean age of the patients at the private hospital was slightly higher (65 years) than individuals at the secondary and tertiary hospitals (means, 63 and 62 years, respectively) this was not associated with higher re-admission rates (p=0.28). There was no significant difference in LOS between the hospitals.

There were a total of 78% of patients with reported co-morbidities. Figure 1 depicts the co-morbidities recorded at the beginning of the study, with hypertension occurring most often amongst the patients. Patients with two or more co-morbidities were more likely to be re-admitted to hospital three or more times (p=0.02). Specifically, patients with congestive cardiac failure were more likely (p=0.01) to be admitted three or more times. No other co-morbid conditions were associated with a higher risk for readmission.

Discussion

Limited data exist on the profile of patients hospitalised in South Africa with acute exacerbation of COPD. This study thus provides data on the profile and outcomes of patients admitted with acute exacerbation of COPD in public and private health institutions in Cape Town. We recorded data for all patients admitted to hospital for more than 24 hours. It should be noted that the argument by Weiss et al. (2003) that a hospital stay of less than 24 hours suggests that the exacerbation was not severe enough for admission does not hold for South Africa's public healthcare system, where limited bed space could hinder hospitalisation.[20] For this reason, comparisons between admissions of less than and greater than 24 hours were not conducted in this study, which focused more pertinently on patient demographics, co-morbidities, and smoking history. This study also focuses on and records the number of re-admissions of patients within the 1-year study period as well as the LOS for each admission.

A pertinent finding is that no difference was recorded in the outcomes or profiles of patients admitted with acute exacerbation in state and private institutions in the northern metropolitan area. This suggests that patients across these different sectors in the study are exposed to a range of risk factors associated with the development of COPD, most commonly tobacco smoking, and most likely of variable intensity. However, some variations among the risk factors in affluent and non-affluent communities

Admission frequency	No. of patients (n=178) (male:female)	Age, median (25-75% IQR)	Days in hospital, median (25-75% IQR)	Co-morbidities, median (25-75% IQR)
1	100 (57:43)	61 (52:71)	4 (3–7)	1 (1–2)
2	44 (30:14)	66 (59-71)	4 (3–6)	1 (0–2)
≥3	34 (16:18)	65 (56-73)	5 (3–7.5)	1 (1–2)
IQR: interquartile range				

Table 2: Days in hospital, age, gender, and co-morbidities in relation to the number of admission frequencies

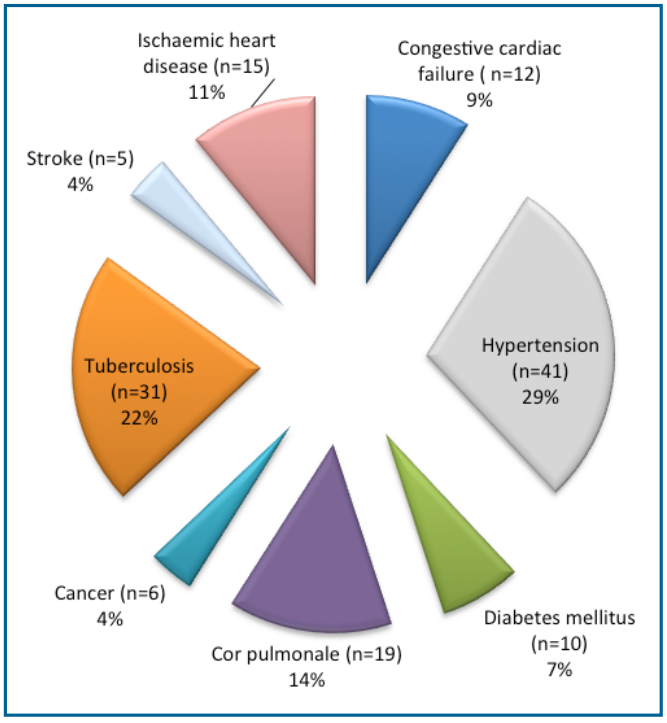

Figure 1: Percentage of patients with co-morbid conditions at entry into the study

do exist, contributing to differences in the risk profiles of these groups. The identification of patients as young as 30 years with acute exacerbation is surprising because COPD generally occurs well above this age. The possibility exists that the similarity in symptoms to other respiratory disease such as asthma could have contributed towards a misdiagnosis.[19,20] As the information was obtained retrospectively, we relied on the clinical information within the medical folder to verify the diagnosis of acute exacerbation of COPD.

As expected, all patients had a history of smoking. However, it was disconcerting to find that almost a third of patients admitted with an acute exacerbation of COPD elected to continue smoking. This in itself may not increase the risk for hospital admission, but it certainly increases the severity of the disease process, which affects risk of re-admission. Both the growing use of tobacco smoke among younger people in South Africa and the effects of industrialisation in developing economies are of great concern.[21–23]

A study by Fletcher et al. of patients aged between 45 and 67 years found that the financial loss due to lost working hours was substantial. Significant too is the fact that a large percentage of the patients in the study retired before their actual retirement age due to poor health.[24] In our small study, we found that a large proportion of patients younger than 65 years, which is generally considered the retirement age for males in South Africa (60 years for females), were admitted with an acute exacerbation at least once during the study period. This may be indicative of an emerging burden of disease affecting the working age population.

Of significance, patients with two or more co-morbid diseases, particularly congestive cardiac failure, had an increased risk of admission compared with patients with one or no co-morbidities. These results are similar to the study by Miravitlles et al. who found that diabetes mellitus and cardiac disease increased the risk of hospital admission.[25] These findings also surface in a prospective longitudinal study by Terzano et al. who found evidence of increased hospital admission relating to cardiovascular disease in their study cohort.[26]

Given the multi-cultural and diverse socio-economic society that exists in South Africa, with all its accompanying lifestyle and dietary differences, the expectation was that the results yielded would mirror these differences. However, surprisingly, the co-morbid diseases observed in this study of patients hospitalised with acute exacerbation in both the private and state hospitals, correlate with findings from studies conducted in developed countries.[26,27] These findings may well be attributed to lifestyle influences transmitted from developed countries to developing countries and suggests that the far-reaching effects should not be under-estimated.

Of the 338 hospital admissions recorded over the 1-year study period, individual admissions varied between 1 and 8 admissions per patient. It should be noted that a substantial percentage (44%) of patients demonstrated significant health care usage, as they were re-admitted twice or more during the 1-year period. This is similar to the findings reported by Cao et al., which showed 46% of patients were readmitted twice or more in 1 year.[28] These frequent exacerbators exact a huge financial burden on the healthcare system, as hospitalisation may be necessary to manage episodes of acute exacerbation in patients with moderate to severe lung disease. The findings by Oostenbrink and Rutten-van Mölken, a Belgium and Netherlands study, confirm the economic consequences. They found the majority (90%) of the total healthcare costs aimed at managing mild, moderate or severe exacerbations were due to hospitalisation for such an episode.[29] The potential economic impact of these hospitalisations could be substantial both for the patients themselves and for developing countries, in terms of loss of income and loss of productivity. Further studies should be carried out to determine the socio-economic implications of frequent hospitalisations in resource-constrained healthcare settings.

Notwithstanding a huge effort on our part to conduct as exhaustive a study of COPD patients hospitalised with acute exacerbation as possible, this study has certain limitations. In addition to problems with identifying COPD patients due to poor use of a diagnosis or the ICD-10 code, we had to exclude many patients when two requests to the medical record department produced no results or when the records were illegible. Since we could not conclusively verify the diagnosis of acute exacerbation without the medical records, these aforementioned factors led to the small sample of records reviewed in the study. Hence, we cannot assume that our sample of patients is fully representative of all patients hospitalised with acute exacerbation in the Western Cape, although

we also have no reason to believe that our sample was seriously biased.

Conclusions

This study has sought to determine the profile and outcomes of patients hospitalised with acute exacerbation within different healthcare settings of the northern suburbs of the Cape metropolitan area. From the study, we conclude that there are no significant differences in outcome for patients admitted to the three hospitals under review that provide different levels of healthcare for a range of different socio-economic groups.

Furthermore, because hospitalisations may vary across hospitals in the same city, it is vital that hospitals document, monitor, and respond to disease patterns within the communities they service, in an attempt to reduce the impact of chronic diseases.

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