Characteristics of COPD patients admitted to the ICU of a referral hospital for respiratory diseases in Brazil*

Características de pacientes com DPOC internados em UTI de um hospital de referência para doenças respiratórias no Brasil

Mariângela Pimentel Pincelli, Ana Cristina Burigo Grumann, Camilo Fernandes, André G C Cavalheiro, Daiane A P Haussen, Israel Silva Maia

Abstract

Objective: To report data regarding COPD patients admitted to the ICU of a referral hospital for respiratory diseases, including outcomes and treatment evaluation. **Methods:** Study of a series of patients with respiratory failure and COPD admitted to the ICU of Nereu Ramos Hospital, located in the city of Florianópolis, Brazil, between October of 2006 and October of 2007. Data related to demographics, causes of hospitalization, pharmacological treatment, ventilatory support, length of hospital stay, in-hospital complications, ICU mortality, and 28-day mortality were obtained from the medical charts of the patients. Acute Physiology and Chronic Health Evaluation II (APACHE II) scores were calculated. Mortality at 18 months was assessed by subsequent telephone calls. **Results:** During the study period, 192 patients were admitted to the ICU, 24 (12.5%) of whom were diagnosed with respiratory failure and COPD. The mean length of ICU stay was 12.0 ± 11.1 days. Noninvasive ventilation was used in 10 of the 24 patients (41.66%) and failed in 5 of those 10. Invasive mechanical ventilation (IMV) was used in a total of 15 patients (62.5%). Overall ICU mortality and 28-day mortality were 20.83% and 33.33%, respectively. However, 18-month mortality was 62.5%. **Conclusions:** Respiratory failure associated with COPD was responsible for 12.5% of the ICU admissions. Orotracheal intubation and IMV were necessary in 62.5% of the cases. The ICU mortality rate was in accordance with that predicted by the APACHE II scores. However, late mortality was high.

Keywords: Epidemiology; Respiration, artificial; Respiratory insufficiency; Pulmonary disease, chronic obstructive; Intensive care units; Mortality.

Resumo

Objetivo: Relatar dados referentes às internações de pacientes com DPOC na UTI de um hospital de referência para doenças respiratórias, incluindo desfechos e avaliando seu atendimento. **Métodos:** Estudo de uma série de pacientes internados por insuficiência respiratória e DPOC na UTI do Hospital Nereu Ramos, localizado na cidade de Florianópolis (SC) no período entre outubro de 2006 e outubro de 2007. Dados demográficos, causas da internação, tratamento farmacológico, suporte ventilatório, duração e complicações da internação, mortalidade em UTI e mortalidade em 28 dias foram obtidos através de consulta aos prontuários médicos. O índice *Acute Physiology and Chronic Health Evaluation II* (APACHE II) foi calculado. A mortalidade em 18 meses foi avaliada através de posterior contato telefônico. **Resultados:** No período, foram internados 192 pacientes na UTI, 24 dos quais (12,5%) com insuficiência respiratória e DPOC. O tempo médio de internação na UTI foi de 12,0 ± 11,1 dias. A ventilação não invasiva foi utilizada em 10 dos 24 pacientes (41,66%) e falhou em 5/10. A ventilação mecânica invasiva (VMI) foi utilizada em 15 pacientes (62,5%). As taxas de mortalidade na UTI e aquela em 28 dias foram de 20,83% e 33,33%, respectivamente. Entretanto, decorridos 18 meses, a mortalidade foi de 62,5%. **Conclusões:** A insuficiência respiratória relacionada à DPOC foi responsável por 12,5% das internações na UTI. Houve necessidade de intubação orotraqueal e utilização de VMI em 62,5% dos pacientes. A mortalidade na UTI estava de acordo com a predita pelo índice APACHE II, mas a mortalidade tardia foi elevada.

Descritores: Epidemiologia; Respiração artificial; Insuficiência respiratória; Unidades de terapia intensiva; Doença pulmonar obstrutiva crônica; Mortalidade.

* Study carried out in the Intensive Care Unit, Nereu Ramos Hospital, Santa Catarina State Department of Health, Florianópolis, Brazil.
Correspondence to: Mariangela Pimentel Pincelli. Rua Sebastião Laurentino da Silva, 126, apto. 706, Córrego Grande, CEP 88037-400, Florianópolis, SC, Brasil.
Tel 55 48 3216-9441. E-mail: maripipin@gmail.com
Financial support: None.
Submitted: 27 May 2010. Accepted, after review: 17 February 2011.

Introduction

The respiratory disease known as COPD has aroused great interest and concern in the medical and scientific community due to an epidemiological trend toward an increase in its prevalence and mortality. Currently, COPD is the fourth leading cause of death worldwide, and, unlike other causes, there has been no sign of a decrease in or stabilization of this epidemiological trend.[1-3]

In Brazil, there has also been an increase in the number of deaths from COPD: from 7.88/100,000 population in the 1980s to 19.04/100,000 population in the 1990s.[1-2]

The natural history of COPD consists of progressive deterioration in pulmonary function and a progressive increase in the frequency of respiratory symptoms, negatively affecting the quality of life of patients and limiting their autonomy.[3-5] The gradual deterioration typical of the disease can be interspersed with periods of acute worsening of the clinical and functional status of patients, known as episodes of COPD exacerbation, which can manifest as increased respiratory effort and respiratory failure, requiring ICU admission and ventilatory support.[6-9]

In the Brazilian literature, we found no reports of ICU admissions of COPD patients. Therefore, we studied a population of COPD patients admitted to the ICU of a tertiary referral hospital for respiratory diseases in the state of Santa Catarina, Brazil, in order to evaluate their characteristics and clinical course.

Methods

This was a retrospective study of COPD patients admitted to the ICU of the Nereu Ramos Hospital, located in the city of Florianópolis, Brazil, between October of 2006 and October of 2007. The medical charts of those patients were reviewed.

Data on age, gender, causes of admission to the ICU, and comorbidities were collected, as were clinical data from the first 24 h of admission, which are necessary for the calculation of Acute Physiology and Chronic Health Evaluation II (APACHE II) scores.[10]

In addition, when available, data on treatment and on the use of home oxygen therapy were collected. The severity of COPD was determined by spirometry, in accordance with the classification proposed by the Global Initiative for Chronic Obstructive Lung Disease (GOLD).[3,4,11,12]

Regarding ICU admissions per se, we determined whether or not bronchodilators, systemic corticosteroids, antibiotics, and prophylaxis of thromboembolic events had been prescribed.

We assessed the need for ventilatory support, recording data on the type of support instituted, noting the installation parameters chosen, and evaluating the control blood gas analysis.

The following variables were assessed: length of ICU stay (in days); length of hospital stay (in days); duration of ventilatory support (in days); need for tracheostomy; and in-hospital complications, such as coronary events, arrhythmia, gastrointestinal bleeding, barotrauma, and ventilator-associated pneumonia.

Finally, ICU mortality and 28-day mortality were determined. Mortality at 18 months following hospitalization was assessed by telephone calls to family members or patients.

We used descriptive statistics, presented as means and standard deviations (for continuous variables) or as percentages (for categorical variables).

Results

During the study period, a total of 192 patients were admitted to the ICU. Of those 192 patients, 24 (12.5%) were diagnosed with COPD. The mean length of ICU stay was 12.0 ± 11.1 days.

In 16 patients, the diagnosis of COPD was based on spirometric data (post-bronchodilator $FEV_1/FVC < 0.7$); in 2 patients, the presence of lung hyperinflation was confirmed by a chest X-ray or CT report by a radiologist; and in 6, the diagnosis was established based on a report by a pulmonologist. Among those 16 patients, the severity of COPD was determined based on post-bronchodilator values, in accordance with the GOLD classification[3]: moderate COPD in 5 (31.25%); severe COPD in 7 (43.75%); and extremely severe COPD in 4 (25.00%). There were no spirometry results for 8 (33.33%) of the 24 COPD patients.

The mean age was 70.9 ± 7.6 years, and 13 patients (54.2%) were female. The mean

APACHE II score was 22.88 ± 5.46, with a predicted mortality of 37.31 ± 18.25%.[10]

As can be seen in Figure 1, the causes of ICU admission, in descending order, were as follows: acute exacerbation of COPD, in 11 patients (45.83%); community-acquired pneumonia, in 8 patients (33.33%); cardiovascular events (arrhythmia, pulmonary edema, or ischemic stroke), in 3 patients (12.50%); obstructive pneumonia, in 1 patient (4.17%); and pneumomediastinum, in 1 patient (4.17%). The major comorbidities were systemic arterial hypertension, in 11 patients (45.83%), and diabetes mellitus, in 8 patients (33.33%). Table 1 shows the demographic and clinical characteristics of the patients evaluated.

Prior to ICU admission, 14 patients (58.33%) were using long-acting bronchodilators and inhaled corticosteroids, 12 (50.00%) were using tiotropium, and 12 (50.00%) were using systemic corticosteroids. Of the 24 patients, 17 (70.83%) were using home oxygen therapy, 16 (66.66%) had received seasonal influenza vaccination, and 11 (45.83%) had received pneumococcal vaccination.

For venous thromboembolism prophylaxis, all of the patients received albuterol and hydrocortisone intravenously, as well as subcutaneous enoxaparin, while in the ICU. In addition, all received antibiotic therapy, the most common being beta-lactam antibiotics, which were prescribed for 16 patients (66.66%), and quinolones, which were prescribed for 12 (50.00%).

Noninvasive ventilation (NIV) was used as initial ventilatory support in 10 patients (41.67%). This approach failed in 5 (50.00%) of those 10 patients.

Intubation and invasive mechanical ventilation (IMV) were employed in 15 (62.5%) of the 24 patients. Of those 15, 9 (60.0%) were submitted to volume-controlled ventilation, 3 (20.0%) were submitted to pressure support ventilation, and 3 (20.0%) were submitted to pressure-controlled ventilation. The ventilation parameters used were as follows: mean positive end-expiratory pressure (PEEP) of 7.4 ± 1.6 cmH_2O; tidal volume of 7.8 ± 2.5 mL/kg of ideal weight; and peak inspiratory pressure (PIP) of 26.3 ± 7.8 cmH_2O. The mean PaO_2/FiO_2 ratio was 236.7 ± 77.0. The mean duration of IMV was 6.95 ± 11.90 days, and tracheostomy was performed in 6 (40.0%) of the 15 patients on IMV.

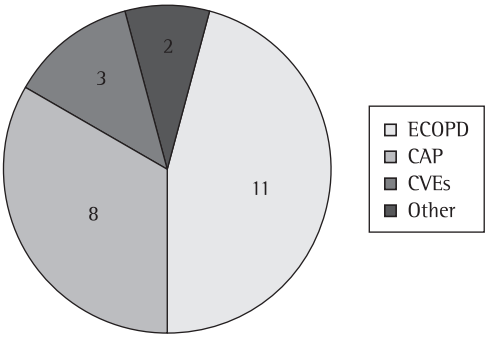

Figure 1 - Causes of admission to the ICU: exacerbation of COPD (ECOPD); community-acquired pneumonia (CAP); and cardiovascular events (CVEs).

Weaning from IMV was performed after clinical stabilization, by gradually reducing pressure support ventilation to 8 cmH_2O and by maintaining tidal volume ≥ 5 mL/kg, RR < 30 breaths/min, and PEEP ≤ 6 cmH_2O. Extubation was performed after spontaneous ventilation had been successfully maintained for 30 min (T-tube test). In 5 (33.3%) of the 15 patients, weaning from IMV was facilitated by the use of NIV.

Ventilator-associated pneumonia was the most common complication, observed in 4 (26.67%) of the 15 patients submitted to IMV, followed by barotrauma, observed in 2 patients (13.33%).

Of the 24 patients studied, 8 (33.33%) died within the first 28 days after ICU admission: 5 (20.83%) died in the ICU; and 3 (12.50%) died after discharge to the ward. The leading causes of death were as follows: respiratory failure,

Table 1 - Demographic data and clinical characteristics.[a]

Characteristic	Result
Patients, n	24
Age, years	70.9 ± 7.6
Female gender, %	54.2
APACHE II score	22.88 ± 5.46
APACHE II predicted mortality (in %)	37.30 ± 18.35
Systemic arterial hypertension, %	45.83
Diabetes mellitus, %	33.33
Home oxygen therapy, %	70.83

APACHE II: Acute Physiology and Chronic Health Evaluation II. [a]Values expressed as mean ± SD, except where otherwise indicated.

Table 2 - Characteristics of ventilatory support and clinical outcomes.[a]

Characteristic	Result
NIV, %	41.67
NIV failure, %	50
OTI, %	62.5
VCV, %	60
PS, %	20
PCV, %	20
PEEP, cmH_2O	7.4 ± 1.6
V_T, mL/kg	7.8 ± 2.5
PIP, cmH_2O	26.3 ± 7.8
PaO_2/FiO_2	236.7 ± 77
Length of ICU stay, days	12.0 ± 11.1
Duration of IMV, days	6.95 ± 11.9
Tracheostomy, %	40
VAP, %	26.7
ICU mortality, %	20.83
28-day mortality, %	33.3
18-month mortality, %	62.5

NIV: noninvasive ventilation; OTI: orotracheal intubation; VCV: volume-controlled ventilation; PS: pressure support; PCV: pressure-controlled ventilation; PEEP: positive end-expiratory pressure; V_T: tidal volume; PIP: peak inspiratory pressure; IMV: invasive mechanical ventilation; and VAP: ventilator-associated pneumonia. [a]Values expressed as mean ± SD, except where otherwise indicated.

in 4 (50%); multiple organ system failure, in 2 (25%); and heart failure, in 2 (25%).

By 18 months after admission, 15 of the 24 patients had died (observed mortality, 62.5%). Table 2 summarizes the characteristics of ventilatory support and the major clinical outcomes observed in this group of patients.

Discussion

The present study shows that COPD-related respiratory failure was not a common cause of admission to our facility, despite the fact that it is a referral hospital for respiratory diseases.

Mortality in the ICU was relatively low (20.8%), consistent with that predicted by the APACHE II scores, and 28-day mortality was 33.3%. Late (18-month) mortality was found to be high (62.5%). Therefore, although the management of the patients evaluated can be considered appropriate, being associated with good survival of the acute injury that resulted in ICU admission,[13] mortality was high in the period following hospitalization. Few studies have focused on the long-term follow-up of patients with exacerbation of COPD,[14-17] and, in the Brazilian literature, we found no similar reports.

Admission of patients with severe COPD to the ICU is a controversial issue. If we consider that the disease has an inexorable course, with gradual deterioration in pulmonary function and consequent worsening of quality of life, we can discuss the terminal nature of these patients, for whom palliative care is indicated. Conversely, some studies have reported good ICU survival rates,[14-16] which, together with the fact that the factors involved in the mid- and long-term prognosis are indeterminate, often makes ICU admission with ventilatory support the management option of choice.

Despite the variability in ICU mortality rates, the rate found in the present study (20.83%) is in accordance with those reported by other researchers, such as Rivera-Fernández et al. (31.8%),[14] Connors et al. (11%),[8] Sennef et al. (30%),[15] Breen et al. (20.3%),[16] and Ai-Ping et al. (24.5%).[17] Late mortality is high, which is in accordance with our findings, with rates ranging from 43% to 75% among the studies. We believe that the pathophysiological reason for this might be the deterioration in pulmonary function and its delayed recovery, as well as changes in airway inflammation and mucociliary clearance. In addition, the deterioration in respiratory muscle function, associated with respiratory muscle disuse due to the period on IMV and with the use of corticosteroids and neuromuscular blocking agents, is likely involved.[18,19] These factors indicate the need to intensify nutritional therapy, respiratory therapy, and medical therapy during the recovery period after the acute injury. In a multicenter study of 508 COPD patients admitted to 86 ICUs, conducted in Spain and reported in 2006, Rivera-Fernández et al.[14] observed that the rate of late mortality was directly related to pre-ICU admission quality of life. This variable, as well as other possible prognostic indices, could not be evaluated in the present study.

Retrospective studies have the bias of limited homogeneity and incompleteness of data due to the difficulty in finding complete and accurate medical charts. This is noted in the present study, especially in relation to confirmation of the diagnosis of COPD. Spirometry results were available for only 16 patients. This was

also observed in a recent population-based study conducted in Brazil, which showed that spirometry was underused even in the presence of chronic respiratory symptoms and in individuals with risk factors for COPD.[2]

Regarding the pharmacological treatment of the patients admitted to the ICU, we found considerable homogeneity in the prescription of intravenous bronchodilators and corticosteroids, as well as in the prophylaxis of pulmonary thromboembolism, all of which were used in most of the study population. Antibiotic therapy was also widely used, in accordance with recommendations in the medical literature.[1,3,4,18,20,21]

The initial support for patients with acute exacerbation of chronic respiratory failure should be based on the use of bronchodilators, the treatment of the triggering cause, the administration of systemic corticosteroids, and the use of oxygen supplementation. When there is need for ventilatory support, NIV should be attempted first. In such cases, the use of NIV is considered the treatment of choice and is supported by extensive data in the literature, which suggests the following: a lower rate of tracheal intubation; a lower risk of infection; shorter ICU stays; and, consequently, lower mortality.[4,9,22-24] In our population, NIV was widely used. In cases of NIV failure or in patients requiring a ventilatory prosthesis, IMV was used. In accordance with guidelines on the administration of IMV in patients with COPD,[9] low PEEP and low PIP were used, which was probably responsible for the low incidence of barotrauma.

In summary, the treatment given was consistent with the recommendations in the medical literature, and this might explain the high ICU survival rate observed in the study population. However, improving the long-term survival and the quality of life of COPD patients after episodes of worsening of respiratory failure remains a challenge. In addition to appropriate pharmacological treatment, the use of pulmonary rehabilitation and muscle rehabilitation programs, together with nutritional improvement and counseling on energy-saving strategies,[1,3,4,25] is recommended for recovering as much patient autonomy and well-being as possible.

Finally, it is important to point out the paucity of reports regarding long-term survival and the lack of any large-scale studies in the Brazilian literature. Therefore, there is a need for further studies involving larger patient samples, which will make it possible to determine which factors are related to prognosis and will inform decisions regarding the care of patients with exacerbation of COPD.

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About the authors

Mariângela Pimentel Pincelli
Adjunct Professor. Department of Pulmonology, Federal University of Santa Catarina; Intensivist. Intensive Care Unit, Nereu Ramos Hospital, Santa Catarina State Department of Health, Florianópolis, Brazil.

Ana Cristina Burigo Grumann
Attending Physician. Intensive Care Unit, Nereu Ramos Hospital, Santa Catarina State Department of Health, Florianópolis, Brazil.

Camilo Fernandes
Pulmonologist. Nereu Ramos Hospital, Santa Catarina State Department of Health, Florianópolis, Brazil.

André G C Cavalheiro
Intern. Intensive Care Unit, Nereu Ramos Hospital, Santa Catarina State Department of Health, Florianópolis, Brazil.

Daiane A P Haussen
Intern. Intensive Care Unit, Nereu Ramos Hospital, Santa Catarina State Department of Health, Florianópolis, Brazil.

Israel Silva Maia
Physician-in-Chief. Intensive Care Unit, Nereu Ramos Hospital, Santa Catarina State Department of Health, Florianópolis, Brazil.