

Epidemiology and costs of hospital care for COPD in Puglia

Epidemiologia e costi delle ospedalizzazioni per BPCO in Puglia

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ABSTRACT

Background and aims: Chronic obstructive pulmonary disease (COPD) is currently the 5th cause of morbidity and mortality in the developed world and represents a substantial economic and social burden. The aim of this study is to report on hospital admissions and related costs of hospital treatment for COPD in the Puglia Region of Italy in the years 2005-2007.

Materials and methods: Patients were selected who were hospitalized between 01/01/2005 and 31/12/2007 with ICD-9-CM code: 490.xx: bronchitis not specified as acute or chronic; 491.xx: chronic bronchitis; 492.xx: emphysema; 493.xx: asthma; 494.xx: bronchiectasis; 496.xx: chronic airway obstruction not elsewhere classified; 518.81: acute respiratory failure as principal or secondary diagnosis.

Results: In the period 2005-2007, there were 73,721 hospital admissions for COPD registered in Puglia (25,690 in 2005; 24,153 in 2006 and 23,878 in 2007) of which 34.3% were women, with no significant variation in the three years. There appears to be a negative trend in hospitalisations in Puglia for chronic bronchitis with ratios decreasing from 359.4 per 100,000 population in 2005 to 307.9 per 100,000 in 2007. The overall cost of COPD for Apulian hospital trusts was €272,293,182.85 over the 3-year period.

Conclusions: Analysis of the data for hospital care, its costs and performance may be an important indicator of the efficacy of community care. In particular, the lack of reduction in admissions for COPD should lead decision makers to question both the appropriateness and quality of the care given.

Keywords: COPD, epidemiology, health information systems, primary care.

RIASSUNTO

Razionale e scopo: La broncopneumopatia cronica ostruttiva (BPCO) è al momento attuale la quinta causa di mortalità e

morbilità nel mondo sviluppato e comporta un notevole impatto sociale ed economico. Scopo di questo studio è analizzare le ospedalizzazioni e i costi relativi al trattamento ospedaliero della BPCO nella regione Puglia negli anni 2005-2007. **Materiali e metodi:** Sono stati selezionati i pazienti ospedalizzati tra 01/01/2005 e 31/12/2007 con i seguenti codici ICD-9-CM: 490.xx: bronchite non specificata se acuta o cronica; 491.xx: bronchite cronica; 492.xx: enfisema; 493.xx: asma; 494.xx: bronchiectasie; 496.xx: ostruzione cronica delle vie aeree; 518.81: insufficienza respiratoria acuta come diagnosi principale o secondaria.

Risultati: Nel periodo 2005-2007 sono state registrate 73.721 ospedalizzazioni per BPCO in Puglia (25.690 nel 2005; 24.153 nel 2006 e 23.878 nel 2007), il 34,3% erano donne, senza variazioni significative nei tre anni. Il trend delle ospedalizzazioni per bronchite cronica in Puglia pare essere negativo, con tassi in riduzione da 359,4 ogni 100.000 abitanti nel 2005 a 307,9 ogni 100.000 nel 2007. Il costo complessivo della BPCO per gli enti ospedalieri pugliesi è stato pari a €272.293.182,85 nel periodo di 3 anni.

Conclusioni: L'analisi dei dati sul trattamento ospedaliero, i suoi costi e le sue performance può essere un indicatore di rilievo dell'efficacia del trattamento sul territorio. In particolare una mancata riduzione delle ospedalizzazioni per BPCO dovrebbe indurre i decisori a porsi il dubbio dell'appropriatezza e della qualità delle cure fornite in questo ambito.

Parole chiave: BPCO, cure primarie, epidemiologia, sistema di informazione sulla salute.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a disease state characterised by the presence of air-

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flow limitation due to chronic bronchitis or emphysema; the airflow obstruction is generally progressive; it may be accompanied by airway hyperactivity, and may be partially reversible [1].

COPD is currently the 5th cause of morbidity and mortality in the developed world and represents a substantial economic and social burden [2]. Earlier surveys have yielded a varied global prevalence of COPD ranging from 0.23% to 18.3%, the variability being due to differences in diagnostic criteria and epidemiologic study designs [3]. A recent large-scale, population-based study conducted in several different countries has estimated the prevalence of COPD to be more than 10% among adults aged 40 years and older [4].

Currently 210 million people have COPD and 3 million people died of COPD in 2005. According to new estimates for 2030, COPD is predicted to become the 3rd leading cause of death [5]. Much of the increase in COPD is associated with projected increases in tobacco use and the exposure to smoke from the combustion of solid fuels indoors, for heating and cooking [5].

Primary care data show that the prevalence of COPD seems to have peaked in men, but continues to rise in women [6], especially in the lower socioeconomic groups [7]. Throughout the course of their disease, COPD patients experience a progressive deterioration up to end-stage disease, which is characterised by – apart from severe airway obstruction – declining performance status, multiple comorbidities, and severe systemic manifestations and complications [2].

The actual burden of the disease in the community is much higher, as a substantial number of patients with COPD remain undiagnosed and, consequently, untreated [8].

The slowly progressive nature of COPD [9] means that the disease usually remains undetected for many years, and most patients are first identified when they have an exacerbation. By the time COPD is diagnosed, often 50% of lung function has already been lost and the need for healthcare utilisation is high [10].

The presence of comorbidities strongly influences the evolution of the disease and the frequency of exacerbations, as shown in a recent systematic investigation which examined the role of concomitant diseases in the history of COPD through the use of standardised indices such as Charlson's [11]. Exacerbations may cause serious morbidity, hospital admission and mortality, and strongly influence health related quality of life of patients with COPD. Patients with frequent exacerbations show faster deterioration of their health status than those with infrequent exacerbations [12]. Despite the impact of exacerbations on patients' health [13,14], many exacerbations of COPD go unnoticed and patients often do not consult their physician until days or even weeks after the onset of an exacerbation.

The burden of COPD in terms of healthcare use and costs strongly depends on the disease severity. For example, the costs of treating exacerbations in pri-

mary care patients with COPD increase along with the severity of the disease: these costs are mainly attributable to more physician consultations, diagnostic procedures, and prescriptions for reliever medication (e.g. bronchodilators, cough preparations) [15]. Still, the majority of COPD-related healthcare costs are generated in secondary care, and are especially due to emergency room visits and hospital admissions [16].

The aim of this work is to report on hospital admissions and related costs of hospital treatments for COPD in the region of Puglia, Italy in the years 2005-2007.

METHODS

We analysed the Apulian hospital patient discharge database for the years 2005-2007, selecting hospital admissions for patients resident in the region and those transferred to and from other Italian regions. A record of hospitalisation for COPD was selected if the 'Principal Diagnosis' field of the database contained one of the following ICD-9-CM codes: 490.xx: bronchitis not specified as acute or chronic; 491.xx: chronic bronchitis; 492.xx: emphysema; 493.xx: asthma; 494.xx: bronchiectasis; 496.xx: chronic airway obstruction not elsewhere classified; 518.81: acute respiratory failure.

For cost analysis, the Diagnosis Related Groups (DRG) for each hospitalisation were assessed at the tariffs agreed by the Puglia Regional Authority on 3 October 2006, Order n. 1464 [17]. The average weighting of the DRG produced was calculated utilizing the DRG weightings indicated by the Ministerial Decree of 27 October 2000, n. 380 [18]. To calculate the hospitalisation rate, the population data as of 1 January 2006 from the Italian Institute of Statistics (ISTAT) were used.

The mean hospitalisation time was calculated using the ratio of the sum of days spent in hospital, taken from hospital discharge records, and the number of admissions.

For comorbidities, secondary diagnosis fields were examined from 1 to 5, classifying codes according chapters in the ICD-9-CM system.

To evaluate the difference in performance between types of patient discharge units in managing cases of COPD, we also calculated and compared mean hospital stay, the average weight and the average age of patients hospitalised in pneumology, internal medicine and in other departments.

RESULTS

In the period 2005-2007, there were 73,721 hospital admissions for COPD registered in Puglia: 25,690 in 2005, 24,153 in 2006 and 23,878 in 2007; of which 34.3% were women, with no significant variation across the three years. The most frequent diagnosis was chronic bronchitis followed by asthma.

There appears to be a negative trend in hospitalisations in Puglia for chronic bronchitis with ratios de-

creasing from 359.4 per 100,000 population in 2005 to 307.9 per 100,000 in 2007 (Table I). The overall cost of COPD to hospital trusts in Puglia was €272,293,182.85 over the 3-year period: €265,492,164.59 for DRGs of COPD patients resident in Puglia and treated in Apulian health facilities (Table II) plus €6,801,018.26 for DRGs of patients resident in Puglia but treated in health facilities in other Italian regions (Table III). Non-resident DRGs treated in Apulian facilities amounted to €5,389,017.54 (Table IV).

Mean hospitalisation time for COPD, mean age of patients and the average DRG weight, per department, are shown in Table V.

The distribution of comorbidities was different across the various departments. The majority of patients, 53.2%, in General Medicine had concomi-

tant cardiovascular pathologies while this figure was only 43.1% in Pneumology. The second most frequent concomitant pathology in General Medicine was digestive diseases, 6.7%, while in Pneumology it was another respiratory disease, 15%.

For COPD patients with acute respiratory failure, the mean hospitalisation time, the mean patient age and the mean DRG weight, per department, are shown in Table VI. The most frequent comorbidities for patients with acute respiratory failure in Pneumology were cardiovascular disease, 31.8%, respiratory disease, acute and chronic, 35.9%, and metabolic disease, 11.3%; while in General Medicine they were cardiovascular disease, 49.9%, respiratory disease, 18.4%, and tumours, 14.9%.

TABLE I: HOSPITALISATION RATES PER 100,000 APULIAN RESIDENTS, BY YEAR AND PRINCIPAL DIAGNOSIS. PUGLIA, 2005-2007

| Diagnosis | 2005 | | 2006 | | 2007 | |
|---|------------------------|------------------|------------------------|------------------|------------------------|------------------|
| | Hospitalised in Puglia | In other regions | Hospitalised in Puglia | In other regions | Hospitalised in Puglia | In other regions |
| Bronchitis not specified as acute or chronic | 6.2 | 0.3 | 6.6 | 0.1 | 5.9 | 0.1 |
| Chronic bronchitis | 359.4 | 7.5 | 321.8 | 7.4 | 307.9 | 7.1 |
| Emphysema | 4.3 | 0.5 | 4.5 | 0.4 | 4.2 | 0.4 |
| Asthma | 63.5 | 3.4 | 65.5 | 2.9 | 64.8 | 2.9 |
| Bronchiectasis | 5.6 | 0.7 | 6.0 | 0.9 | 5.6 | 0.6 |
| Chronic airway obstruction not elsewhere classified | 1.0 | 0.1 | 0.6 | 0.0 | 0.4 | 0.1 |
| Acute respiratory failure | 191.6 | 6.4 | 188.2 | 3.9 | 197.6 | 3.4 |
| Total | 631.6 | 189 | 593,2 | 15,6 | 586,4 | 14,6 |

TABLE II: EVALUATION OF DIAGNOSIS RELATED GROUPS (DRGs) FOR HOSPITALISATIONS IN PUGLIA OF COPD PATIENTS RESIDENT IN PUGLIA, YEARS 2005-2007

| Diagnosis | Evaluation | Year | | | Total |
|---|-------------------|------------------------|------------------------|------------------------|-------------------------|
| | | 2005 | 2006 | 2007 | |
| Bronchitis not specified as acute or chronic | Admissions | 252 | 270 | 241 | 763 |
| | Cost | € 378,666.80 | € 437,565.29 | € 373,687.03 | € 1,189,919.12 |
| Chronic bronchitis | Admissions | 14,619 | 13,103 | 12,538 | 40,260 |
| | Cost | € 38,990,293.91 | € 36,616,473.75 | € 35,640,432.98 | € 111,247,200.64 |
| Emphysema | Admissions | 173 | 182 | 171 | 526 |
| | Cost | € 539,249.61 | € 629,438.25 | € 576,284.00 | € 1,744,971.86 |
| Asthma | Admissions | 2,585 | 2,668 | 2,638 | 7,891 |
| | Cost | € 3,247,305.11 | € 3,469,986.49 | € 3,209,752.01 | € 9,927,043.61 |
| Bronchiectasis | Admissions | 226 | 244 | 228 | 698 |
| | Cost | € 697,580.92 | € 744,569.81 | € 719,021.7 | € 2,161,172.43 |
| Chronic airway obstruction not elsewhere classified | Admissions | 40 | 24 | 15 | 79 |
| | Cost | € 100,431.96 | € 66,987.17 | € 41,625.4 | € 209,044.53 |
| Acute respiratory failure | Admissions | 7,795 | 7,662 | 8,047 | 23,504 |
| | Cost | € 43,485,726.66 | € 45,826,994.88 | € 49,700,090.86 | € 139,012,812.40 |
| Total | Admissions | 25,690 | 24,153 | 23,878 | 73,721 |
| | Cost | € 87,439,254.97 | € 87,792,015.64 | € 90,260,893.98 | € 265,492,164.59 |

TABLE III: EVALUATION OF DIAGNOSIS RELATED GROUPS (DRGs) FOR HOSPITALISATIONS IN OTHER REGIONS OF COPD PATIENTS RESIDENT IN PUGLIA, YEARS 2005-2007

| Diagnosis | Evaluation | Year | | | Total |
|---|------------|----------------|----------------|----------------|----------------|
| | | 2005 | 2006 | 2007 | |
| Bronchitis not specified as acute or chronic | Admissions | 11 | 3 | 3 | 17 |
| | Cost | € 15,178.4 | € 2,169.48 | € 2,952.07 | € 20,299.95 |
| Chronic bronchitis | Admissions | 306 | 303 | 288 | 897 |
| | Cost | € 712,055.71 | € 753,420.51 | € 736,917.83 | € 2,202,394.05 |
| Emphysema | Admissions | 21 | 15 | 18 | 54 |
| | Cost | € 85,079.93 | € 57,816.16 | € 148,000.74 | € 290,896.83 |
| Asthma | Admissions | 137 | 117 | 119 | 373 |
| | Cost | € 166,621.48 | € 132,705.52 | € 130,916.59 | € 430,243.59 |
| Bronchiectasis | Admissions | 29 | 35 | 25 | 89 |
| | Cost | € 83,037.26 | € 100,831.61 | € 117,033.46 | € 300,902.33 |
| Chronic airway obstruction not elsewhere classified | Admissions | 5 | 1 | 4 | 10 |
| | Cost | € 16,861.42 | € 2,345.28 | € 5,318.35 | € 24,525.05 |
| Acute respiratory failure | Admissions | 259 | 161 | 138 | 558 |
| | Cost | € 1,526,925.19 | € 1,001,694.14 | € 1,003,137.13 | € 3,531,756.46 |
| Total | Admissions | 768 | 635 | 595 | 1998 |
| | Cost | € 2,605,759.39 | € 2,050,982.70 | € 2,144,276.17 | € 6,801,018.26 |

DISCUSSION

COPD is one of the most widespread health problems in the world and represents a high direct cost for the national health services. However, because of the high levels of comorbidities and death associated with this chronic disease it is difficult to evaluate the costs of its management in hospital [19]. The use of hospital records to analyse the burden of disease produced by hospital services and procedures for COPD can be problematic. First, only a small proportion of COPD patients are admitted to hospital, the majority being treated at home and using at most the hospitals' outpatient services for analysis and therapy. The accuracy of a diagnosis of

COPD can vary from hospital to hospital as not all suspected cases undergo spirometry [20] and the hospital patient discharge database does not record the outcome of spirometry, blood gases analysis and other instrument based diagnostic procedures. Furthermore, the management databases are inadequate in evaluating the severity of disease and any attempt at staging can be made only through proxy indicators such as comorbidities and average age of the patient.

However, hospital admission data are still important indicators of the burden of the disease, both in terms of the quality of the management of home treatment and healthcare costs. Admission to hospital is almost always linked to a worsening episode,

TABLE IV: EVALUATION OF DIAGNOSIS RELATED GROUPS (DRGs) FOR HOSPITALISATIONS IN PUGLIA OF NON-RESIDENT COPD, YEARS 2005-2007

| Diagnosis | Evaluation | Year | | | Total |
|---|------------|----------------|----------------|----------------|----------------|
| | | 2005 | 2006 | 2007 | |
| Bronchitis not specified as acute or chronic | Admissions | 11 | 5 | 5 | 21 |
| | Cost | € 16,827.35 | € 5,623.42 | € 8,157.44 | € 30,608.21 |
| Chronic bronchitis | Admissions | 227 | 230 | 205 | 662 |
| | Cost | € 661,158.02 | € 602,797.67 | € 577,197.06 | € 1,841,152.75 |
| Emphysema | Admissions | 3 | 6 | 7 | 16 |
| | Cost | € 5,975.91 | € 18,579.48 | € 30,213.61 | € 54,769.00 |
| Asthma | Admissions | 79 | 80 | 96 | 255 |
| | Cost | € 112,039.77 | € 109,784.65 | € 137,996.87 | € 359,821.29 |
| Bronchiectasis | Admissions | 5 | 7 | 7 | 19 |
| | Cost | € 19,097.86 | € 22,968.17 | € 20,900.70 | € 62,966.73 |
| Chronic airway obstruction not elsewhere classified | Admissions | 0 | 2 | 0 | 2 |
| | Cost | 0 | € 5,944.01 | 0 | € 5,944.01 |
| Acute respiratory failure | Admissions | 166 | 137 | 141 | 444 |
| | Cost | € 912,449.57 | € 965,909.02 | € 1,155,396.96 | € 3,033,755.55 |
| Total | Admissions | 491 | 467 | 461 | 1419 |
| | Cost | € 1,727,548.48 | € 1,731,606.42 | € 1,929,862.64 | € 5,389,017.54 |

TABLE V: MEAN HOSPITALISATION TIME, AGE AND DIAGNOSIS RELATED GROUP (DRG) WEIGHT OF COPD PATIENTS, BY DEPARTMENT

| Department | Average stay (days) | Average age of patients (years) | Average DRG weight |
|--|---------------------|---------------------------------|--------------------|
| Pneumology | 8.0 | 70.2 | 1.18 |
| General Medicine | 8.2 | 73.2 | 1.19 |
| Other (geriatrics, paediatrics, long stay) | 11.6 | 70.0 | 1.33 |

TABLE VI: MEAN HOSPITALISATION TIME, AGE AND DIAGNOSIS RELATED GROUP (DRG) WEIGHT OF COPD PATIENTS WITH ACUTE RESPIRATORY FAILURE BY DEPARTMENT

| Department | Average stay (days) | Average age of patients (years) | Average DRG weight |
|------------------------|---------------------|---------------------------------|--------------------|
| Pneumology | 11.6 | 72.4 | 1.96 |
| General Medicine | 9.6 | 74.1 | 1.45 |
| Other (intensive care) | 14.5 | 62.1 | 4.10 |

impacting on the quality of life of the patient with COPD [21].

Regional health policies [22] are geared towards a more efficient use of hospital care for acute cases; however we observed no trend in the period of study for COPD - this may be due to the lack of alternative care facilities within the community or to problems related to chronic disease in general or COPD in particular, all of which can influence the demand for hospitalisation. The slight reduction in the number of admissions observed during the study period seems a poor outcome of the strong regional administrative push in promoting treatment appropriateness and prevention of avoidable hospitalisation, and it cannot be ascribed to changes in the epidemiology of disease.

While Pneumology departments more frequently treated patients with respiratory-related problems, General Medicine wards treated older patients and so more pathologies.

Analysis of average DRG weight and hospital stay do not show particular differences in performance between the different departments except for acute respiratory failure, which is a major cost for the Puglia Region both within and without the Region. The treatment of acute respiratory failure has a much lower average DRG weight and average hospital stay within non-specialised departments than in Intensive Care which generates complex DRGs due to the quantity of care necessary and the frequent practice of tracheotomy.

In Italy there are still no national data on the prevalence of COPD and even the analysis of the database of hospital admissions, available from the Ministry of Health, is hampered by various problems related to inadequate updating of information

and the availability of only aggregate data. A recent survey of a representative sample of the population estimated the prevalence of COPD in Italy at around 3% [23]. As already noted in other surveys conducted in Italy, cardiovascular pathologies are the most commonly reported comorbidities; the high frequency highlighted in our study is to be placed in relation to the analysis of the hospitalised population, at increased risk of pluripathology [24]. The emergence of new healthcare needs and the necessity to re-orientate the management of chronic healthcare from hospitals to the community oblige Pneumology departments and pneumologists to play a leading role in the application of innovative management of chronic pulmonary diseases, for reasons of both their social-health impact and their costs. In fact, services in the community should be reinforced and not reduced in order to create a network of facilities that ensures the maximum cost-benefit for the health services and for patients. In effect, the network of anti-tuberculous dispensaries in Italy was the first example of community healthcare for a chronic disease with a strong social-health impact and it should be a starting point for specialist community healthcare for respiratory disease.

The analysis of data on hospital care, its costs and performance may be an important indicator of how effectively community care functions, while the lack of reduction in admissions for COPD should lead decision makers to question both the appropriateness and quality of the care given.

CONFLICT OF INTEREST STATEMENT: None of the authors has any conflict of interest to declare in relation to the subject matter of this manuscript.

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