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ORIGINAL ARTICLE

Compliance of prescriptions for chronic obstructive pulmonary disease patients given upon hospital discharge☆

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Abstract
Objective: Measure the degree of compliance of prescriptions given to chronic obstructive pulmonary disorder (COPD) patients upon hospital discharge by comparing them to international recommendations. Identify factors that influence the degree of compliance. Evaluate the effect of that degree of compliance on the number of COPD exacerbations.
Method: Retrospective observational study. We selected all episodes identified as COPD in a tertiary hospital during 2006. By consulting the clinical history database, we accessed the hospital discharge report and calculated the treatment's degree of proximity to the recommendations issued in the Global Initiative for Chronic Obstructive Lung Disease (GOLD). For each episode, we calculated the number of exacerbations in the six following months. Descriptive, bivariate statistical analysis.
Results: We obtained 365 episodes. The mean degree of compliance was 82% (SD=15.9). The patient's age and the severity of the disease did not influence the degree of compliance. We observed an inverse correlation between the hospital stay and the degree of compliance (P=.026). Discharge reports issued by the Pneumonology Department had a significantly higher degree of compliance (P<.001). No statistically significant relationship was found between the degree of compliance and the number of exacerbations.
Conclusions: The degree of compliance is high according to the GOLD recommendations. The Pneumology Department had the highest degree of compliance, and a higher degree of compliance was related to a shorter hospital stay. The treatment compliance had no effect on the number of exacerbations of the disease.

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PALABRAS CLAVE
Adecuación;
Alta hospitalaria;
EPOC;
Prescripción

Adecuación de la prescripción al alta hospitalaria en pacientes con enfermedad pulmonar obstructiva crónica

Resumen
Objetivo: Cuantificar el grado de adecuación de la prescripción al alta hospitalaria a las recomendaciones internacionales en pacientes con EPOC. Identificar los factores que influyen sobre el grado de adecuación. Evaluar la influencia del grado de adecuación sobre el número de reagudizaciones de la EPOC.
Método: Estudio observacional retrospectivo. Se seleccionaron todos los episodios del año 2006 con diagnóstico principal codificado como EPOC en un hospital terciario. A través de la consulta de la historia clínica digital, se accedió al informe de alta hospitalaria y se calculó el grado de adecuación a las recomendaciones de *Global Initiative for Chronic Obstructive Lung Disease*; se contabilizó para cada episodio el número de reagudizaciones en los 6 meses posteriores. Análisis estadístico descriptivo y bivariante.
Resultados: Se obtuvieron 365 episodios. El grado de adecuación medio fue del 82% (SD = 15,9). La edad del paciente y la gravedad de la enfermedad no influyeron sobre el grado de adecuación. Se observó relación inversa entre estancia hospitalaria y grado de adecuación (p = 0,026). Los informes de alta hospitalaria a cargo del servicio de neumología presentaron significativamente mayor grado de adecuación (p < 0,001). No se halló relación estadísticamente significativa entre grado de adecuación y número de exacerbaciones.
Conclusiones: El grado de adecuación a las recomendaciones de Global Initiative for Chronic Obstructive Lung Disease es elevado. Se detecta mayor adecuación en el servicio de neumología y un mayor grado de adecuación se relaciona con una menor estancia hospitalaria. El grado de adecuación no influye sobre el número de reagudizaciones de la enfermedad.

Introduction

COPD is a pathological process that can be prevented and treated, and is characterised by a limited airflow that is not completely reversible. The blockage of airflow is progressive and is associated with an abnormal pulmonary inflammatory response to noxious gases or particles, mainly caused by smoking.[1,2]

The diagnosis is confirmed using spirometry, a simple respiratory test performed under controlled circumstances, that measures lung capacities and volumes and the velocity with which these can be mobilised (air flows); air flow is considered to be obstructed when, after forced spirometry, the forced expiratory volume in one second/ forced vital capacity is less than 0.7.[1]

The value of forced expiratory volume in one second, expressed as a percentage of the reference value, is the best indicator for the severity of the airflow obstruction and allows us to classify COPD into different levels.[1]

COPD can be considered a severe health problem and constitutes the most prevalent respiratory disease with the greatest socioeconomic impact in developed countries.[3-5] In Spain, the IBERPOC[4] study demonstrated a global prevalence of chronic airflow obstruction of 9.1%in people between the ages of 40 and 70 years, with a male:female ratio of 4:1.

COPD patients require major medical assistance, both in primary care and hospital attention, where the exacerbations acquire even greater relevance, consuming large amounts of health resources.

Although no uniformly accepted definition of the condition exists, exacerbations can be defined as worsening symptoms in patients with regard to their basal values along with increased dyspnoea, expectoration, purulent sputum, increased coughing, or any combination of these symptoms.[6] Several factors have been implicated as causes of COPD exacerbations, but in 60%of cases, the aetiology of the exacerbations is infectious.[7]

The mean number of exacerbations in a COPD patient is 2-3 per year; the frequency is related to the severity of the basal respiratory obstruction, and patients with a history of previous exacerbations are more susceptible to suffering new exacerbations in the future.[8]

Clinical practice guides (CPG) can be defined as systematically elaborated guidelines designed to assist doctors and patients in making decisions regarding the proper type of health care for specific clinical problems; we could also say that they constitute a tool for organizing the best scientific evidence currently available for use in making clinical decisions.[9,10]

During the last decade, CPG have become a fundamental element to clinical practice and health planning. In recent years, various CPG have been published by different scientific societies with recommendations for the treatment of COPD. With the objective of unifying the criteria used for treating COPD patients, the National Heart Lung and Blood Institute and the WHO have set in motion the Global Initiative for Chronic Obstructive Lung Diseases (GOLD), which directs the elaboration of diagnosis and treatment guides for COPD around the world.

The GOLD recommendations are presented in the form of guidelines that are developed by expert committees from all over the world and are updated every year through an exhaustive review process of the scientific literature related

to COPD treatment and care, and so the guides continually reflect the current research and experience in the field.[11]

The level of compliance with these recommendations in our field is unknown, and an assessment of the prescription given upon discharge from the hospital seems to be important, since this is usually the element of communication that connects the various levels of health care, and should guarantee the continuity of treatment and care.

The objectives of this paper are to quantify the level of compliance in the prescription given upon hospital discharge with the GOLD recommendations for patients diagnosed with COPD, as well as to identify the factors that influence the level of compliance and to evaluate the influence of the level of compliance on the number of subsequent COPD exacerbations.

Methods

Design

We performed a retrospective observational study with an indication/prescription design. The study was performed at the Hospital Universitario Virgen de las Nieves in Granada. We selected all registered episodes with COPD as the main diagnosis upon discharge from the hospital, according to the International Classification of Disease (ICD-9-CM) code during the year 2006.

Study variables

The demographic variables that we collected were age and sex. The variables registered upon hospital admission were: medical department, duration of hospital stay, and severity of COPD (categorised as light, moderate, severe, or not classified). The variables collected with relation to exacerbations were: number of emergency room visits and number of readmissions in the following 6 months. The variables collected on the treatment given were prescription items (dichotomic [yes/no] responses to the following questions: prescription of long-acting β_2 adrenergic agonists, prescription of bronchodilators, prescription of inhaled corticoids, prescription of short-duration oral antibiotics, prescription of oral corticoids with a progressively reduced dosage, non-prescription of mucolytics, non-prescription of antitussives).

Method

By accessing the digitalised clinical histories of the patients, we evaluated variables related to exacerbations of the disease and consulted hospital discharge reports (HDR) for all selected episodes, upon which the rest of the study variables were evaluated. The level of compliance was measured as the number of prescription items complied with divided by 7 and presented as a percentage. We designed a database using the SPSS® version 15.0 software for mechanization of the data.

Statistical analysis

We performed a descriptive analysis of the study variables. In the bivariate analysis, we used Student's t-tests for comparing dichotomic qualitative variables with quantitative variables and Pearson's correlation for comparing quantitative variables.

Results

Descriptive analysis

The sample size was 388 episodes; the HDR was not available in 23 of these (5.93%). Of the 365 HDR that were consulted, the recommended treatment was not specified in 26 (7.1%), and so the number of prescribed medications in these cases was declared not applicable.

Of the episodes, 94% corresponded to male patients, with the mean age being 70.7 (9.34) years and the median 72 years. 85.5% of the episodes were treated by the pneumology department. The mean duration of hospital stay was 12.2 (12.64) days and the median was 9 days. The severity of COPD was indicated in the HDR in 66.3% of the episodes, and was catalogued as severe in 90.9% of cases.

The mean number of emergency room visits in the 6 months following the episode was 1.4 (1.81), and varied between 0 and 10 visits; the mean number of readmissions in the 6 months following the episode was 0.8 (1.12), and varied between 0 and 6.

The level of compliance with GOLD recommendations was 82 (15.9)%. Although the level of compliance is a quantitative variable, it is comprised of a small number of values and could also be described as a qualitative variable. A breakdown of the results is presented in Table 1.

The variables that most contributed to diminishing the level of compliance were prescription items that were present in less than 82% of HDR for the episodes under study; these were: prescription of short-duration oral antibiotics, prescription of oral corticoids with a progressively reduced dosage, and non-prescription of mucolytics (Figure).

Bivariate analysis

The variables analyzed for a relationship with the level of compliance with GOLD recommendations are presented in Table 2. We observed a negative association between the level of compliance and duration of hospital stay. In other words, a greater level of compliance was observed with shorter hospital stays, this being a relationship of weak intensity but statistical significance (P=.026). We also observed that the level of compliance was greater in episodes treated by the pneumology department than in the rest of the medical units, this being a statistically significant result (P<.001).

Discussion

The results from our study show that, in our field, COPD still mainly affects males.

The sample corresponds to an elderly population; the oldest patients are those that are most frequently admitted for the irreversible, chronic, and progressive properties of the disease.

These results concur with those from other studies as well. According to the IBERPOC[4] study, the independent

Table 1 Level of compliance with GOLD recommendations

Level of compliance		Frequency, number of episodes	%Divided by total number of episodes
Valid	28.6% (2 items of 7)	5	1.4
	42.9%(3 items of 7)	12	3.3
	57.1% (4 items of 7)	19	5.2
	71.4% (5 items of 7)	88	24.1
	85.7% (6 items of 7)	124	34.0
	100.0% (7 items of 7)	91	24.9
	Total	339	92.9
Lost	System	26	7.1
TOTAL		365	100.0

The possible values for the variable "level of compliance" are shown along with the number of HDR that achieved that score (frequency) and the percentage with respect to the total number of HDR (%). Also shown is the number of cases lost for lack of a description of the treatment given in the HDR.

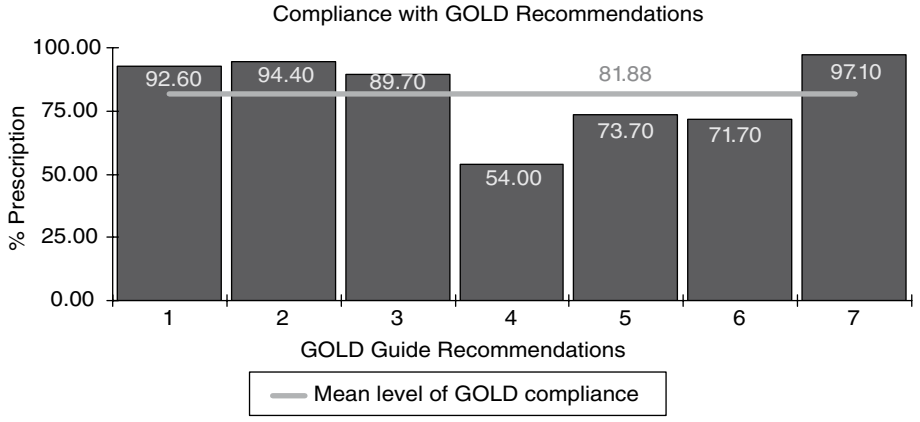

Figure Level of compliance with GOLD recommendations and the contribution of each of the items that make up the indicator. The y-axis corresponds to the percentage of HDR that comply with each item, and the x-axis shows the items that make up the GOLD recommendations. 1=prescription of long-action β_2 adrenergic agonists; 2=prescription of bronchodilators; 3=prescription of inhaled corticoids; 4=prescription of short-action oral antibiotics; 5=prescription of oral corticoids with a progressively reduced dosage; 6=no prescribed mucolytics; 7=no prescribed antitussives. GOLD indicates *Global Initiative for Chronic Obstructive Lung Disease*.

factors that are associated with the appearance of chronic bronchitis are: tobacco smoking, age over 60 years, and sex (male). In other studies performed in the same area, the study samples of COPD patients offer similar results in terms of age and sex.[12,13]

The severity of the disease was recorded in the HDR in only 66% of cases, which could constitute a major shortcoming, since the categorization of patients based on their values for forced expiratory volume in one second is considered to be the pillar of clinical management and step therapy based on the severity and progression of the disease. 90%of the episodes analyzed were categorised as severe COPD, and so it would appear that hospital referrals are being properly managed, since the majority of patients treated are in a severe state of the disease.

The mean duration of hospital stay was 12 days, which is greater than the mean value registered at the pneumology department of the Hospital Universitario Virgen de las Nieves during 2006 (10.83 days), which indicates that COPD is one of the respiratory conditions that places the greatest burden on our health services. Other Spanish studies performed with COPD patients provide shorter hospital stay values.[12,14] In either case, this result indicates the high economic impact that hospital admissions can have on a COPD patient that requires long hospital stays.

One positive result from our study is that the clinicians responsible for the treatment of COPD patients are following international guidelines. The IBERPOC[4] study, from 1999, detected a low percentage of patients treated according to the guidelines of the time, around 60% Subsequently, several papers have been published that evaluate the level of compliance with CPG, and although they do not provide global results, but rather for therapeutic subgroups, they serve to show the differences in treatment for COPD patients

Table 2 Relationships studied in the bivariate analysis

Study variable	Test employed	Significance
Age	Pearson corr.	NS
Duration of hospital stay	Pearson corr.	$P=.026$
Severity of COPD (recategorised as severe and other)	Student's t-test	NS
Medical Department (recategorised as pneumology and other)	Student's t-test	$P<.001$
No. of emergency room visits in the past 6 months	Pearson corr.	NS
No. of readmissions in the past 6 months	Pearson corr.	NS

COPD indicates chronic obstructive pulmonary disorder; NS, not significant.
The table shows the study variables with influence on the degree of compliance, the test used, and the statistical significance.

between different countries,[15,16] different levels of health care,[17] and even between the professionals working in the same environment.[18]

These are necessary mechanisms of dissemination and implementation of CPG to ensure that they are available for all health professionals and guarantee the efficacy and cost-effectiveness of the recommended strategies.

The prescription of oral corticoids with progressively reduced dosages and short-duration oral antibiotics are two of the most poorly completed items in our study.

The lack of prescribing the antibiotic treatment could be justified by the fact that it was not indicated, but it is well known that a large percentage of subsequent exacerbations of the disease are infectious.[7] It could also be that the prescription might have been left out because the antibiotics were prescribed for a limited time, although no current evidence exists to support this,[19] or that the treatment was concluded during the hospital stay.

Similarly, it could be that the oral corticoids were not indicated, were prescribed indefinitely, or the treatment was concluded in the hospital. Evidence exists for treating COPD exacerbations with corticoids: they enhance recuperation and reduce the need for additional medication, improve lung function, and reduce the level of dyspnoea.[20] Regarding the duration of treatment, no evidence exists that would suggest that cycles longer than 7-14 days provide any additional benefit.[21]

With respect to the possibility of concluding the treatments while still in the hospital, this practice could have needlessly prolonged the duration of hospital stay. The possibility of finishing the therapeutic treatment by converting the intravenous dose to an oral prescription in patients that have shown clinical improvements was proposed in the 80's, introduced as "sequential therapy."

The interest in sequential therapy is explained by 3 circumstances: the convenience of reducing the costs derived from extended hospital stays, the problems derived from using a venous access for administering parenteral treatment, and the appearance of drugs with good oral bioavailability that allow for serum and tissue concentrations that are equivalent to those achieved under parenteral administration.[22]

In our study, mucolytics were prescribed in 30% of HDR. However, the GOLD initiative maintains that insufficient evidence exists for recommending their use, and studies have even shown that N-acetylcysteine is ineffective in the prevention of COPD exacerbations and deterioration of lung function.[23]

As strong points in the level of compliance, the prescription of anticholinergics, long-acting β_2 adrenergic agonists, and inhaled corticoids stand out. Antitussives were also not prescribed, in accordance with the GOLD recommendations.

The inverse relationship observed in the level of compliance with GOLD recommendations and duration of hospital stay is a significant finding. It is very useful and gratifying to find that the prescriptions that follow international pharmacotherapeutic recommendations and, as we know, are based on the available scientific evidence, are related with more efficient health care.

It is also interesting that a higher level of compliance was observed in the HDR issued by the pneumology department; this information can be useful when assigning medical departments the responsibility of elderly patients with obstructive respiratory pathologies, probably concomitant to other diseases, whose management could easily fit into several different medical specialties.

In the natural history of COPD, exacerbations occupy a very prominent place. The literature indicates that 63% of patients are readmitted at least once per year, and having presented a COPD exacerbation the previous year stands out as a risk factor, among others.[24] Taking into account the results from our study and extrapolating them to 12 months, COPD patients could have a mean of 3 emergency visits and 2 hospital admissions per year.

It is well known that severe exacerbations are independent predictors of patient mortality,[25] and that mortality increases with the frequency of severe exacerbations suffered, particularly if these require hospitalization.[26] Therefore, the factors capable of reducing the severity and frequency of severe exacerbations could potentially reduce the mortality that is inherent to them. *A priori*, those episodes whose prescription upon discharge from the hospital follow international recommendations could be predicted to be associated with a better progression and management of the disease, and therefore, with a fewer number of emergency visits and readmissions. However, these were not the results observed in our study.

Conflict of interest

The authors affirm that they have no conflicts of interest.

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