Hope NH, Ray SM, Franks AS, Heidel E. Impact of an educational intervention on steroid prescribing and dosing effect on patient outcomes in COPD exacerbations. Pharmacy Practice (Granada) 2010 Jul-Sep;8(3):162-166.

Original Research

Impact of an educational intervention on steroid prescribing and dosing effect on patient outcomes in COPD exacerbations

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Received (first version): 13-Jan-2010 Accepted: 10-Jun-2010

ABSTRACT[*]

The increasing number of patients affected by chronic obstructive pulmonary disease (COPD) and associated exacerbations has led to both rising hospital admissions and significant economic impact. Evidence-based guidelines have been formulated for COPD management recommending the use of low dose, oral corticosteroid therapy in the treatment of exacerbations. However, fewer than 50% of physicians' prescribing practices appropriately reflect the published clinical guidelines on the use of systemic corticosteroids in these patients.

Objective. The purpose of this study was to evaluate the impact of a pharmacist-led educational intervention on prescribing practices and patient outcomes when using systemic corticosteroids in patients with COPD exacerbations.

Methods. This retrospective case-control study included patients admitted to an inpatient family medicine service with a COPD exacerbation who received systemic corticosteroids. Two pharmacist-led educational interventions were delivered to prescribers to review current guidelines for managing COPD exacerbations with systemic corticosteroids. Patients were retrospectively identified over a three month span prior to and following the educational intervention. Data was collected via chart review to evaluate prescribing practices prior to and following the educational sessions. In addition, data was collected to evaluate the effects of an educational intervention on length of stay, adverse events, and cost of treatment.

Results. A total of 23 pre-intervention patients and 18 post-intervention patients met inclusion criteria. After pharmacist-led interventions, guidelines were not more likely to be adhered to by prescribers when compared to guideline adherence in the pre-intervention patients. Because no statistically significant change in guideline adherence was observed, there was no impact on secondary outcomes.

Conclusion. Pharmacist-led didactic educational interventions and guideline dissemination do not improve guideline adherence and prescribing practices with respect to systemic corticosteroids in COPD exacerbations.

Keywords: Pulmonary Disease, Chronic Obstructive. Guideline Adherence. Pharmacists. United States.

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IMPACTO DE UNA INTERVENCIÓN EDUCATIVA SOBRE PRESCRIPCIÓN Y EFECTOS DE LA DOSIFICACIÓN EN LOS RESULTADOS DE LOS PACIENTES EN LAS EXACERBACIONES DE EPOC

RESUMEN

El creciente número de pacientes afectados por enfermedad obstructiva pulmonar crónica (EPOC) y las exacerbaciones asociadas han conducido a una elevación de los ingresos hospitalarios y un significativo impacto económico. Se crearon guías basadas en la evidencia fueron creadas para EPOC recomendando el uso de corticoides orales en baja dosis para el tratamiento de las exacerbaciones. Sin embargo, menos del 50% de los actos de prescripción reflejan lo publicado en las guías sobre el uso sistémico de corticoides en estos pacientes.

Objetivo. El propósito de este estudio fue evaluar el impacto de una intervención educativa de un farmacéutico sobre la práctica de prescripción y los pacientes ambulatorios cuando se usaban corticoides sistémicos en pacientes con exacerbaciones de EPOC.

Métodos: Este estudio retrospectivo caso-control incluyó pacientes ingresados en un servicio de medicina familiar con exacerbación de EPOC que recibieron corticoides sistémicos. Se desarrollaron dos realizaron intervenciones educativas de farmacéuticos a los prescriptores para revisar las guías actuales de manejo de las exacerbaciones de EPOC con corticoides sistémicos. Los pacientes fueron identificados retrospectivamente durante los tres meses previos y posteriores a la intervención. Los datos se recogieron mediante revisión del historial para evaluar las prácticas de prescripción anterior y posterior a las sesiones educativas.

Además, se recogieron datos para evaluar los efectos de la intervención educativa en la duración de la estancia, eventos adversos, y coste del tratamiento.
Resultados. Un total e 23 pacientes pre-intervención y 18 post-intervención cumplieron los criterios de inclusión. Después de las intervenciones del farmacéutico, las guías no eran seguidas con más probabilidad por los prescriptores cuando se comparaba el cumplimiento de guías con los pacientes pre-intervención. Como no hubo cambios estadísticamente significativos en el cumplimiento de las guías, no hubo impacto en el resultado secundario.
Conclusión. Las intervenciones educativas farmacéuticas y la diseminación de guías no mejoraron el cumplimiento de las guías y las practicas de prescripción en relación al uso de corticoides sistémicos en exacerbaciones de EPOC.

Palabras clave: Enfermedad pulmonar obstructiva crónica. Cumplimiento de guías. Farmacéuticos. Estados Unidos.

INTRODUCTION

COPD is the fourth leading cause of death and a leading cause of illness and disability in the United States.[1] An estimated 11.2 million adults had a diagnosis of COPD in 2002, but recent data from a national health survey suggest that as many as 24 million Americans are affected by the disease and its sequelae.[1] The growing prevalence of this disease has also been associated with an increase in hospital admissions due to exacerbations as well as an increased economic burden associated with COPD.[1,2] Task forces have been created nationally and internationally to provide consensus statements and guidelines for standardization of diagnosis and management with an overall goal of improving care in this patient population. Current published clinical guidelines for the treatment of COPD exacerbations recommend the use of low dose, oral systemic glucocorticosteroids for a maximum of two weeks.[3-6] In the Global initiative for chronic Obstructive Lung Disease (GOLD) guidelines, 30-40 mg of oral prednisone daily for 7-10 days is the recommended safe and effective dose for managing COPD exacerbations.[7] The American Thoracic Society/European Respiratory Society (ATS/ERS) and the British Thoracic Society (BTS) guidelines are similar to the GOLD guidelines with the exception of administering prednisone for up to 14 days.[8,9] Based on the literature supporting the use of low-dose oral steroids as part of the management of COPD exacerbations and the inconsistency of prescribers adhering to the evidence-based guidelines, education regarding these published clinical guidelines may improve awareness and ensure application of effective and evidence-based medical practice.

Evidence-based clinical guidelines provide effective tools for improving the quality and standardization of patient care. The implementation of such guidelines allows patients to benefit from the evidence-based recommendations.[10] In a study done by Grol and colleagues[11], average overall adherence to published clinical guidelines by physicians was 67%. More specifically, adherence to COPD guideline recommendations in the clinical decision making process falls in the lowest bracket, with only 48.8% adherence to published clinical guidelines.[11] Based on the pathophysiology of COPD exacerbations and difficulty identifying patients who will benefit from systemic corticosteroid treatment, low-dose steroids are recommended to manage the symptoms of a patient experiencing an exacerbation. Because maximum improvement has been seen by day five of treatment, low-dose steroids for a shorter period of time are recommended.[7-9] Compared to high-dose steroids, low-dose steroid usage decreases the number of patients experiencing hyperglycemia requiring treatment, decreases the number of patients that experience secondary infection, and has no significant difference in outcomes at two weeks.[3,12] A previous study conducted by Self and colleagues[13] concluded that education of medical professionals by a clinical pharmacist demonstrated a trend toward decreasing the cost of steroid therapy in COPD exacerbations, and established that this type of education is an effective means of practitioner education. Based on literature describing the positive impact of prescriber education conducted by a clinical pharmacist, this type of educational technique was used by investigators in this study to improve physician adherence to published clinical guidelines for the management of COPD exacerbations.[14]

This study focused primarily on the impact of a pharmacist-led educational intervention specifically on prescribing practices of systemic corticosteroids and the adherence of the prescribing practices to clinical guidelines.

METHODS

Design, Setting, and Population

This Institutional Review Board approved study consisted of a two part retrospective chart review of patients admitted to an inpatient family medicine teaching service at an academic medical center prior to and following a pharmacist-led educational intervention. The study population included consecutive patients admitted to the family medicine service for COPD exacerbation treated with systemic corticosteroids before the educational intervention (January-March 2008) and following the intervention (January-March 2009). Patients were excluded if they were less than 18 years of age, did not receive systemic corticosteroids, or were admitted to the intensive care unit.

Study Procedures

Patients were identified for inclusion using International Classification of Disease Code-9 496.0 for COPD exacerbation. Data collected included patient demographic information (age, ethnicity, gender), systemic corticosteroid use (dose, route,

frequency, duration), length of hospital stay, cost of treatment, and adverse events (hyperglycemia, elevated white blood cell (WBC) count). In both groups, the documented first dose of steroids was the dose administered on the floor upon admission from the emergency department (ED). If a dose was administered in the ED, it was not identified as the first dose because the decision of steroid dosing was not made by the primary admitting team, the recipients of the educational intervention. Educational sessions were conducted to attending and resident physicians at a noon conference and a morning report, conducted on January 8th, 2009 and February 4th, 2009 respectively. Each session was conducted by the same pharmacist and included a review of current published guidelines for the treatment of COPD exacerbations with a specific focus on the prescribing of systemic corticosteroids. More specifically, the sessions consisted of power point presentations as visual aids, presentation handouts for future reference, copies of the pertinent guidelines and supporting literature, and an in-depth question and answer session to stimulate discussion amongst the physicians surrounding the topic. Also, informational pocket cards including a steroid conversion chart and an overview of the GOLD guideline recommendations for exacerbation management were distributed at each session to the attending and resident physicians (Table 1). An average of twenty medical residents and attending physicians attended each session representing well over half of the total physicians that comprise the practice. Some physicians attended both sessions. Additionally, important points made in the presentations were reiterated by the pharmacist faculty, residents, and students on rounds when treating patients admitted for a COPD exacerbation during the post-intervention time frame.

Table 1. Informational corticosteroid conversion and COPD exacerbation management quick facts pocket card distributed to physicians at educational sessions.

Agent	Equivalent dose (mg)	AI potency	Classification
Hydrocortisone	20	1	Short to medium acting GC
Cortisone	25	0.8	Short to medium acting GC
Prednisone	5	4	Short to medium acting GC
Prednisolone	5	4	Short to medium acting GC
Methylprednisolone	4	5	Short to medium acting GC
Triamcinolone	4	5	Intermediate acting GC
Betamethasone	0.6	25-40	Long acting GC
Dexamethasone	0.75	30	Long acting GC
Fludrocortisone	2	10	Mineralocorticoid

AI: Anti-Inflammatory, GC: Glucocorticoid

COPD Exacerbation Management Quick Facts:
1. COPD guidelines centered around 2008 GOLD recommendations
2. Prednisone 30-40 mg PO Daily x 7-14 days is recommended exacerbation treatment
   a. No additional benefit seen beyond two weeks of therapy
3. PO is preferred route of steroid administration over IV

Outcomes

The primary outcome was prescribing practice adherence to current clinical guideline recommendations for administering systemic corticosteroids to patients admitted with a COPD exacerbation. A patient was considered to have received appropriate corticosteroid therapy consistent with the guidelines if they received less than or equal to 40 mg oral prednisone daily, excluding the fact that they may have received a higher dosage or intravenous administration of corticosteroid in the ED. If a patient received both intravenous and oral steroids at different doses throughout the course of their hospital stay, the initial dose and route that was prescribed to the patient upon admission to the floor from the ED was what classified guideline adherence. To appropriately measure the primary outcome, dosage, route, administration, and frequency of corticosteroids was documented on each study patient. Documented duration of therapy was based on whether the steroid was continued or discontinued upon discharge via physician documentation in the discharge summary and/or medication reconciliation record. Data was collected to secondarily evaluate the effect of an educational intervention on patient outcomes including length of stay (LOS), adverse events, and cost of treatment. Each patient's LOS was calculated by tracking the admission and discharge dates. Adverse drug events were assessed by elevations in glucose averaging greater than 150 mg/dL and WBC laboratory values averaging greater than 10 thou/mcL during the patient's course of corticosteroid therapy. Comparison of cost of treatment between the pre- and post-intervention group was measured by the total cost to the hospital secondary to steroid use during the patient's hospital course.

Data Analysis

Pearson Chi-Square and Fisher's Exact tests were utilized to assess differences in proportions of adherence to guidelines from pre- to post-intervention. A significance level of .05 was used for all statistical analyses. Independent-measures t-tests were used to measure the differences in mean

values of data points used to assess patient outcomes. When violations of normality or homogeneity of variance occurred, non-parametric Mann-Whitney U tests were performed to correct for violations.

RESULTS

A total of 23 patients met criteria for the pre-intervention cohort and 18 patients comprised the post-intervention cohort. No difference in demographic data was observed between the pre- and post-intervention groups (Table 2). There was not a significant difference in guideline adherence between pre- and post- intervention reporting, chi-square (1, n=41) =1.74, p=0.216. There was a non-significant reduction in length of stay from pre-intervention to post-intervention mean values (M=6.38, SD=5.75 vs. M=3.67, SD=2.03; p=0.066). There was also a non-significant lowering of cost in dollars from pre-intervention to post-intervention (M=21.56, SD=28.39 vs. M=17.05, SD=16.14; p=0.79). A non-significant increase in WBC occurred from pre-intervention to post-intervention (M=10.08, SD=3.57 vs. M=11.46, SD=5.17; p=0.321). A non-significant change in glucose was observed from pre to post intervention (M=167, SD=77.9 vs. M = 153.4, SD=54.23; p=0.533).

Table 2. Patient Demographic Data

	Pre-Intervention	Post-Intervention
Sex- no. (%)		
Male	9 (40%)	7 (39%)
Female	14 (60%)	11 (61%)
Age- yr		
>/= 65- no. (%)	17 (74%)	11 (61%)
<65- no. (%)	6 (26%)	7 (39%)
Ethnicity- no. (%)		
Caucasian	23 (100%)	18 (100%)
African American	0 (0%)	0 (0%)
Hispanic	0 (0%)	0 (0%)
Other	0 (0%)	0 (0%)

DISCUSSION

The definition of the educational intervention used in this study is consistent with previous studies, defined as any attempt to persuade physicians to modify their practice performance by communicating clinical information, specifically in this case by academic detailing via physician educators such as pharmacists.[14] A systematic review by Davis, et al. evaluated the effects of different medical education techniques on physician performance and outcomes.[14] This review supports the role of educational interventions by other health care professionals to improve health care outcomes.[14] Numerous studies support the importance of interdisciplinary collaboration between physicians and pharmacists to achieve optimal patient goals.[12-17] There are, however, studies concluding that certain pharmacist-conducted interventions show better outcomes in changing prescribing practices than others. One study by Grindrod and colleagues[15] demonstrated that passive didactic lectures and guideline dissemination were not as effective as actual prescriber auditing with printed or electronic feedback, as well as consistent presence of reminders such as point of care prompts, educational outreach visits to discuss progress towards goals, and patient-mediated strategies. Other studies have concluded that educational outreach and audit and feedback consistently show positive results; however, the effectiveness of different interventions may also depend on the prescribing problem being targeted for improvement as one approach may not be ideal for all issues in all settings.[16,17] Considering the aforementioned data, the lack of adherence by prescribers to the national published guidelines for COPD exacerbation management is a key area for targeting interventional educational sessions. Several probable reasons exist for low adherence including decreased recognition by physicians of the presence or significant impact of the guidelines and associated literature, despite the recent update of the GOLD recommendations. The primary outcome in this study showed that pharmacist-led educational sessions by didactic interventions and pocketcard/guideline dissemination did not have an impact on adherence with published practice guidelines in this practice setting. Analysis of these findings are suggestive of the fact that either the wrong form of intervention was employed to yield an improvement in prescribing practices to reflect the GOLD guidelines or there was not enough manpower to have the pharmacists devote ample time to physician education.

Limitations of the study include the fact that a portion of the data collected in January 2009 was prior to the final educational session. As a result, some of the post-education data may have been collected pre-education. Because this was a retrospective study, all data collected was limited by relying on chart documentation. Also, the only aspect of adherence that was studied was the appropriate dose, route, and length of therapy as evidenced in the guidelines versus all aspects of care including bronchodilator use, oxygen use, antibiotic use, severity of COPD, and concomitant disease states. The study protocol was not written to include the patient's past medical history (diabetes) or to assess for insulin initiation which could have added more depth to the assessment of secondary patient outcomes. The number of patients included in the study as well as the three month intervals of patient data collected pre- and post- intervention limited the amount of data available for analysis. Since there was no difference found in the primary outcome, the secondary outcomes were not correlated to increased guideline adherence. Although a negligible value was found in the secondary cost analysis, not all aspects of actual cost savings were evaluated including nursing time, drug administration of IV versus PO, and drug wastage. Another limitation is the fact that for study purposes, a patient's documented first dose was what was prescribed by the primary team on the floor upon admission rather than what the patient actually received in the ED. Because an incidental finding was that the majority of patients received 125 mg intravenous methylprednisolone upon presentation to the ED with a COPD exacerbation, future educational

interventions should target ED physicians and residents. This finding also supports the need to enhance pharmacist presence at all institutions in the ED for educational, clinical, and patient care purposes.

This study, educating physicians in through noon conferences and morning reports using a lecture-based, didactic format, pocket card distribution, and literature review did not significantly change prescribing practices or enhance guideline adherence. More time dedicated to the education of physicians using various educational methods and patient specific interventions may aid in determining the most effective way to improve prescribing practices in this setting. Since pharmacists are a vital part of rounding at the study facility, engaging them to be more proactive as a constant reminder for physicians to employ national guidelines may be an ideal way to improve prescribing practices in such a way. Based on the evidence in the literature that led to the GOLD recommendations, if guideline adherence can be accomplished by a successful form of physician education, then patient outcomes should secondarily improve. Therefore, different methods of information dissemination will be vital for pharmacists to incorporate into their clinical practice when attempting to change physician behavior to better comply with published guidelines and evidence-based medicine.

CONCLUSIONS

Pharmacist-led didactic educational sessions and guideline dissemination on COPD exacerbation management with systemic corticosteroids did not change prescribing practices to enhance guideline adherence.

CONFLICT OF INTEREST

No conflicts of interest exist among the investigators in this study.

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