Asthma management in the emergency department

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JM Reid, DD Marciniuk, DW Cockcroft. Asthma management in the emergency department. Can Respir J 2000;7(3):255-260.

OBJECTIVES: To evaluate various aspects of the management of adult patients who present to the emergency department with acute exacerbations of asthma and who are discharged from the emergency department without hospital admission. Further, to compare the results with accepted management guidelines for the emergency department treatment of asthma.
DESIGN: A retrospective chart collection and review until each site contributed 50 patients to the survey.
SETTING: Three tertiary care hospitals in the Saskatoon Health District, Saskatoon, Saskatchewan. The study period was from July 1, 1997 to November 18, 1997.
POPULATION: Patients aged 17 years or older, who were discharged from the emergency department with the diagnosis of asthma.
METHODS: Data were collected on 130 patients from 147 emergency department visits.
RESULTS: A number of important physical examination findings were frequently not documented. In contrast to management guidelines, peak expiratory flow rates (44%) and spirometry (1%) were not commonly used in patient assessments. Only 59% of patients received treatment in the emergency departments with inhaled or systemic corticosteroids. Furthermore, specific follow-up plans were infrequently documented in the emergency department charts (37%).
CONCLUSIONS: Adherence with published Canadian guidelines for the emergency department management of acute asthma exacerbations was suboptimal. Corticosteroid use in the emergency department was significantly less than recommended. Increased emphasis on education and implementation of accepted asthma management guidelines is necessary.

Key Words: *Asthma; Corticosteroids; Emergency department; Exacerbations; Management guidelines*

Traitement de l'asthme à l'urgence

OBJECTIFS : Évaluer divers aspects du traitement des crises aiguës d'asthme chez des adultes qui se présentent à l'urgence et qui obtiennent leur congé sans avoir été hospitalisés; comparer les résultats aux lignes de conduite adoptées, relatives au traitement de l'asthme au service des urgences.
PLAN D'ÉTUDE : Étude rétrospective comportant la collecte et la revue de dossiers jusqu'à concurrence de

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50 patients par centre.
LIEU : Trois hôpitaux de soins tertiaires du district sanitaire de Saskatoon, en Saskatchewan. La période visée s'étend du 1er juillet 1997 au 18 novembre 1997.
POPULATION : Patients âgés de 17 ans et plus, qui ont obtenu leur congé de l'urgence après qu'un diagnostic d'asthme eut été posé.
MÉTHODE : Les données porte sur 130 patients et 147 consultations à l'urgence.
RÉSULTATS : Dans bien des cas, des observations importantes faites à l'examen physique n'étaient pas documentées. Contrairement aux lignes de conduite relatives au traitement, on n'a pas eu souvent recours au débit expiratoire de pointe (44 %) et à la spirométrie (1 %) pour évaluer les patients. Seulement 59 % des patients ont reçu des corticostéroïdes en inhalateur ou par voie générale à l'urgence. En outre, les plans de suivi étaient rarement établis dans les dossiers remplis à l'urgence (37 %).
CONCLUSION : Le respect des lignes de conduite canadiennes ayant fait l'objet de publication concernant le traitement des crises aiguës d'asthme au service des urgences était moins qu'optimal. L'utilisation des corticostéroïdes était de beaucoup inférieure aux recommandations pour les traitements à l'urgence. Une formation plus poussée et l'application des lignes de conduite adoptées, relatives au traitement de l'asthme s'imposent.

Appropriate emergency management of the patient with acute asthma is critical. Clinical impression alone is a poor predictor of a patient's need for hospitalization (1-4). Objective measurements such as spirometry or peak expiratory flow rate (PEFR) provide a better measure of a patient's status than do history or clinical examination (3-5). Furthermore, the benefit of corticosteroids in controlling the inflammatory component of asthmatic exacerbations has been demonstrated and is well accepted (6-9).

In the past decade, several published guidelines have addressed the management of acute asthma exacerbations. At the time of the study, the most recent Canadian consensus guidelines on the treatment of asthma were those published in 1996 (10). In that year, Canadian guidelines were published that specifically addressed the emergency department management of asthma (11). Together, they emphasized the importance of objective measures of lung function and the important role of corticosteroids in treatment. Moreover, these guidelines stressed the need for a clear management plan that included early follow-up.

Adherence to the emergency asthma management guidelines in the emergency department is often suboptimal (8,12-19). Specifically, two quality assurance audits that were performed within the Saskatoon Health District, Saskatchewan (performed in 1987 and 1990), showed that many management recommendations were not being followed in the emergency department. Although both audits showed underuse of corticosteroids, there had been an appreciable increase in their administration from 1987 to 1990. However, these were both small audits, and in most cases did not distinguish emergency department patients who were subsequently admitted from those patients who were discharged.

In addition to national guideline publication, emergency department management of asthma has been the topic of many continuing medical education sessions conducted within our health district during the past 10 years. We therefore decided to reassess the emergency department management of patients with asthma within the Saskatoon Health District to determine whether current management more closely reflected national guidelines. For this reason, we chose to study a period beginning exactly one year after the most recent guidelines had been published. We also decided to study specifically the population of patients who were discharged from the emergency department.

PATIENTS AND METHODS

Consecutive emergency department charts with the discharge diagnosis of asthma as recorded by the attending physician from all three hospitals within the Saskatoon Health District were retrospectively reviewed. Charts were identified using emergency abstracting software (Med2020, Orleans, Ontario), according to *International Classification of Diseases, Ninth Revision, Clinical Modification* codes 493.00 to 493.9 (20). These codes are for diagnoses of extrinsic asthma, intrinsic asthma, chronic obstructive asthma and asthma unspecified.

The study began on July 1, 1997 and enrolment was closed on November 18, 1999. Charts were to be collected until each site contributed 50 patients to the survey. However, a change of emergency department operating hours led to one site enrolling only 30 patients. Some patients presented to one of the three hospital emergency departments more than once during the study period. Because each visit was a unique opportunity for assessment and management, data were collected from all visits.

Inclusion criteria were age 17 years or more and an emergency department discharge diagnosis of asthma. Exclusion criteria were admission to hospital from the emergency department and 'nonacute' presentations (ie, patients presenting to the emergency department for a prescription renewal).

Whenever possible, findings from the present study were compared with the findings of the previous audits. The findings were also compared with published Canadian guidelines for emergency management of asthma.

Some patients returned to one of the study hospitals within one month of their previous emergency department presentation for asthma. These charts were identified and individually reviewed by the primary investigator. The purpose of this review was to determine whether there were any differences in the demographics or emergency department management between these patients ('repeaters'), and the rest of the study population ('nonrepeaters').

TABLE 1
Documentation of vital signs, chest examination and investigations in patients with asthma presenting to three emergency departments in Saskatoon, Saskatchewan (July 1, 1997 to November 18, 1997)

Vital signs	
Heart rate	94%
Oxygen saturation	92%
Respiratory rate	90%
Temperature	79%
Blood pressure	70%
Chest examination	
Chest examination	94%
Wheeze status	84%
Accessory muscle use	10%
Pulsus paradoxus	1%
Investigations	
Peak flow rate	44%
Spirometry	1%
Pulmonary function tests	0%
Chest x-ray	29%

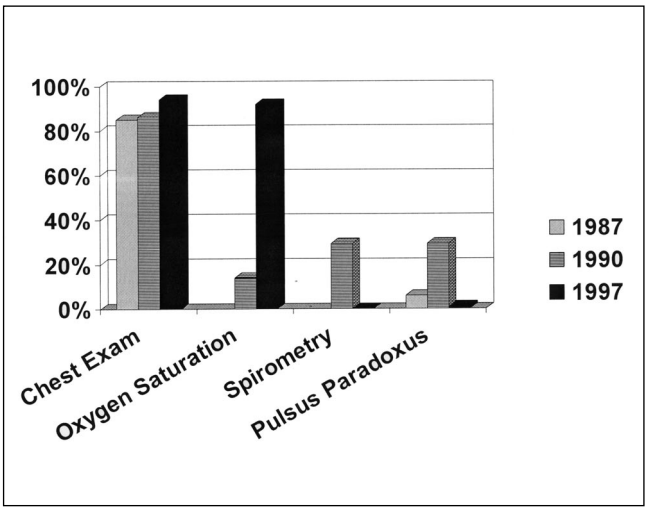

Figure 1) *Documentation of the assessment of patients with asthma presenting to three emergency departments in Saskatoon, Saskatchewan – a comparison with two previous audits. The documentation of oxygen saturation was not assessed in the 1987 audit*

RESULTS

The study population consisted of 130 patients, totalling 147 emergency department visits during the 4.5-month study period. The female to male ratio of patients was 1.9:1. The median age of patients was 39 years, and 78% were under the age of 45 years.

Prior home therapy for 84% of patients included a beta$_2$ agonist. Fifty-nine per cent of patients were using inhaled steroids at home and 10% were taking prednisone. In total, 64% of patients were receiving some form of corticosteroid therapy at home. Ten per cent of patients were receiving no asthma medications at all before presentation. In 1% of the charts, there was no documentation of home medications.

TABLE 2
Therapy administered to patients with asthma presenting to three emergency departments in Saskatoon, Saskatchewan (July 1, 1997 to November 18, 1997)

Treatment	Percentage of patients
No medications	5
Salbutamol	9
Salbutamol + ipratropium bromide	27
Salbutamol + inhaled steroids	7
Salbutamol + ipratropium bromide + inhaled steroids	11
Salbutamol + ipratropium bromide + systemic steroids	41
	100*
Oxygen	10
Intravenous access (without intravenous medications)	5

**Sum of all patients' therapy equals 100%*

Emergency department documentation of important physical examination findings was infrequent. Vital signs were frequently, but not universally, documented by the physician or nurse. The presence or absence of wheezes on chest examination was documented in 84% of visits. The status of accessory muscle use and pulsus paradoxus was documented in 10% and 1% of charts, respectively (Table 1).

The most commonly used special investigation was PEFR, recorded on 44% of the charts. Chest x-rays were ordered slightly less than one-third of the time. Despite all three sites having 24 h bedside spirometry available, spirometry was rarely (1%) reported. For the vast majority of the study, patients were assessed and managed solely by the casualty officer. Only two of 147 visits (1.4%) resulted in consultations by either internal medicine or pulmonary services. One of the sites had a full-time pulmonary consult service, while the other two had this available on an intermittent basis. All sites had full-time internal medicine consultation services available.

A comparison with the previous audits (Figure 1) showed that documentation of physical examination findings was similar. Spirometry was consistently underused in all three audits. The previous audits did not collect data on PEFR. There was a dramatic increase in the use of pulse oximetry, reflecting the improved availability of this technology during the intervening years.

Table 2 summarizes the patients' treatment in the emergency department. Five per cent of patients received no specific pharmacological therapy, while 95% received a beta$_2$ agonist, either alone or in a combination regimen. Fifty-nine per cent of patients received either inhaled or systemic glucocorticoid therapy in the emergency department. Figure 2 compares the use of corticosteroids in the present study with that of the two previous audits. While inhaled and systemic steroids were still underused, there was a steady increase in

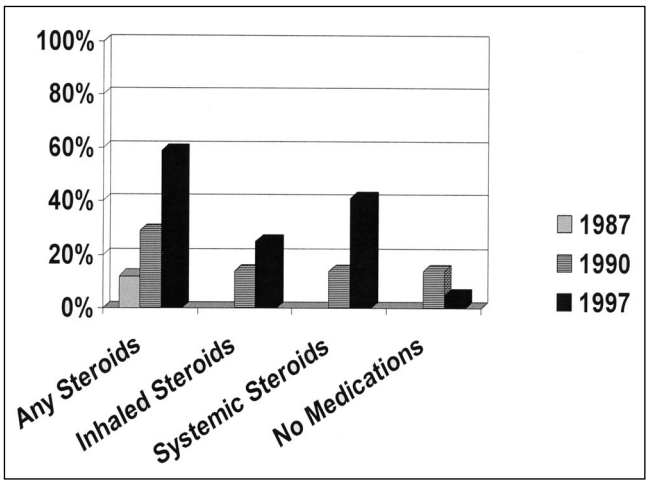

Figure 2) *Management of patients with asthma in three emergency departments, in Saskatoon, Saskatchewan, who are discharged – a comparison with two previous audits. Inhaled and systemic steroids were not distinguished in the 1987 audit*

TABLE 3

Discharge plans for patients with asthma presenting to three emergency departments, in Saskatoon, Saskatchewan, from July 1, 1997 to November 18, 1997, but not being admitted to hospital

Corticosteroids	
New corticosteroids	48%
Increased corticosteroids	9%
Increased dose and new corticosteroids	3%
Continued previous corticosteroids dose	14%
No corticosteroids on discharge	9%
No documentation	16%
Follow-up plans	
Return to emergency department if condition worsens	27%
Follow-up with family physician recommended but not arranged	9%
Follow-up with family physician arranged	1%
No documentation	63%

their use for the emergency department treatment of asthma during these 10 years.

Table 3 summarizes the emergency department discharge medications and follow-up plans. On discharge from the emergency department, 48% of patients received a new corticosteroid prescription. This included patients who were 'stepped up' from inhaled to oral corticosteroids, as well as patients who were not taking any form of corticosteroid at presentation and were started on corticosteroids at the time of emergency department discharge. Three per cent of patients had their corticosteroid dose increased, and 14% were discharged on the same dose as at emergency department presentation. In 25% of cases, either patients were discharged without any corticosteroid, or there was insufficient documentation to determine the corticosteroid status.

Documentation of a clear follow-up plan was infrequent. In 36% of patients there was documentation of instructions to return to the emergency department if symptoms worsened or if an indication that follow-up had been recommended to the patient. In 1% of patients there was documentation that an appointment with the family physician had been arranged. In 63% of patients there was no documentation of follow-up plans or recommendations.

Twenty-one (16%) of the 130 patients were categorized as 'repeaters'. That is, they returned to one of the three emergency departments within one month of their previous visit. The range was from the same day until 28 days later. These patients did not differ in demographics or emergency department management from the 'nonrepeaters'. There was no appreciable difference in their chance of receiving corticosteroids during their initial presentation, either in the emergency department or as a discharge prescription. Furthermore, there was no documented symptom, abnormal vital sign or clinical finding that was consistently present in this subgroup of patients. Additionally, no time of day pattern was observed within this subgroup of 'repeaters'. They presented to the emergency department at all times of the day or night.

DISCUSSION

We conducted a retrospective survey of the emergency department management of patients presenting with acute asthma, by auditing the emergency department charts from the three tertiary care hospitals within our health district. Two audits that were performed within our health district during the previous 10 years served as comparisons.

It is important to identify, at presentation to the emergency department, patients who are likely to have a more severe course. Historical features such as corticosteroid use and frequency of emergency department presentations help to identify higher risk patients (4,21). Conversely, clinical impression of the severity of airflow obstruction is notoriously unreliable (2-4,12). While the prognostic value of vital signs, pulsus paradoxus and status of accessory muscle use is debatable, these findings are probably useful aspects of the clinical examination (4,12,17). We found that important physical examination findings such as pulsus paradoxus and accessory muscle use were rarely documented.

Objective measurements of flow rate are more reliable indicators of a patient's status and serve as better prognostic indicators than routine examination findings (2-4). Serial measurements of lung function are important because they provide an opportunity to monitor a patient's response to treatment. These tests are additive to overall clinical impression when determining a patient's management plan (4,22,23). Of the two, spirometry is the preferred objective test (24), but PEFR is an acceptable alternative if spirometry is unavailable. Their use is recommended in the assessment of all episodes of acute asthmatic exacerbations (10,11). Surprisingly, we found that these objective measures of lung function were documented in fewer than half of the charts.

The use of corticosteroids in the emergency department management of asthma improves lung function (7,8,25) and decreases hospitalizations (7). This is well established for systemic corticosteroids and may also be true of inhaled corticosteroids, if given in a high enough dose (25,26). Furthermore, a short course of corticosteroid given on discharge from the emergency department decreases the rate of relapse (6,9). Similarly, a clearly written action plan, which involves home PEFR measurements and corticosteroid use, given to patients with asthma at the time of emergency department discharge has been demonstrated to decrease the rate of relapse (27). These are important issues in this era of cost-conscious health care. In Canada, a visit to the emergency department costs between $120 and $300 (28,29), and the cost of inpatient care is approximately $320 to $670/day (28,29). In total, the acute care of exacerbations contributes at least 20% to 30% to the total cost of asthma care (29,30).

Within the Saskatoon Health District, corticosteroid use in the emergency department has increased during the past 10 years, but remains less than guidelines recommend (10,11). Moreover, clear discharge plans were documented for only about one-third of the patients.

Our study was different from most others that have looked at emergency department asthma management in that we studied only patients who were discharged. Still, our findings were consistent with those in the published literature that looked at both admitted and discharged patients (5,12,13,15-17,19). Furthermore, our findings are consistent with those of Fitzgerald and Hargreave (18), who also looked specifically at the management of patients with asthma who were discharged from the emergency department. That is, the management of patients with acute asthma exacerbations frequently falls short of recommendations in terms of objective assessment, corticosteroid use and documentation of clear follow-up plans.

The present study has several limitations. First, as a retrospective study, we relied on documentation in the chart. It is possible that important physical findings and lung function were assessed by the emergency department physician but not recorded in the chart. Because most of the emergency department physicians in our health district do not have an office practice, it is very unlikely that they would have arranged follow-up with themselves. It is possible that patients were instructed to follow-up with their family physicians, but that these instructions were not recorded in the chart. Similarly, we do not know how extensive or explicit any physician-patient discussions were. At the time, a dedicated asthma nurse-educator was not available in the district.

Hospital protocol requires that any medication administered to a patient in the emergency department must be recorded in the nursing notes of that patient's emergency department chart. Our findings regarding medication administration to patients with asthma in the emergency department should therefore accurately reflect real practice. Documentation in the chart of prescriptions given upon emergency department discharge may not have been rigorous. Our study may therefore underestimate the number of patients who were discharged with a prescription for steroids.

During the study, the most recent Canadian asthma guidelines were those published in 1996 (10). Therefore, it was this document that served as the standard with which our audit results were compared. We recognize that updated guidelines have subsequently been published (24). However, we believe that the publication of this new consensus statement does not alter the conclusions of this study.

Asthma is increasing in incidence and severity (31). Therefore, we can expect that emergency department presentations for acute asthma exacerbations will only increase. National guidelines emphasize both the need for serial objective measurements of lung function in patient assessment and the crucial role of corticosteroids in management. More effective ways of translating these published guidelines into clinical practice need to be sought.

ACKNOWLEDGEMENTS: Dr Cockcroft is a Saskatchewan Lung Association Ferguson Professor and Dr Marciniuk is a Saskatchewan Lung Association Research Professor.

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