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## Trends in hospital-based management of acute asthma from a teaching hospital in South Asia

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### SUMMARY

The aim of this study is to evaluate the hospital-based management of acute asthma in south Asia and to compare practices over a 10-year period. Adult patients ( $n = 102$ ) admitted at a teaching hospital with acute asthma were studied. Documentation of precipitating factors, family history and physical signs were inadequate in more than half of patients. Pulse oximetry was documented in 95 (93%) patients, but peak flow monitoring was performed only in 50 (49%) patients. Ten-year trend showed deterioration in history and physical examination skills, under

use of peak flow readings, and poor pre-discharge instructions. Some aspects of improved care included frequent use of pulse oximeter, preference of inhaled over systemic bronchodilators and increased use of systemic steroids. Significant deficiencies were identified in hospital-based management of acute asthma. Most aspects of asthma care continued to fall short of asthma guidelines.

**Keywords:** Asthma; hospital-based management; trends; Pakistan

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### INTRODUCTION

Asthma is a chronic inflammatory disease of the airways. Global Initiative for Asthma Program estimated that approximately 300 million people around the globe suffer from asthma (1). In the ISAAC study, there was a worldwide variation in the prevalence of asthma with 20- to 60-fold difference between various centres (2). Highest prevalence was seen in developed countries, including the UK, Australia and New Zealand. Lowest prevalence was seen in Asian, African and eastern European centres. Asthma prevalence of 8% was recorded among Pakistani children. The incidence of asthma has been rising in many countries and asthma resulted in over 180,000 deaths annually (3). In the US, over 1.8 million visits to the emergency room (ER) were attributed to asthma, costing over \$430 million (4).

In a recent study from Pakistan, it was found that general medical practitioners did not generally follow asthma management guidelines (5). There was serious lack of knowledge about asthma medications coupled with misconceptions about inhaler therapy and dietary factors. Only 35% of doctors prescribed corticosteroids for persistent asthma symptoms and great majority of doctors were not aware of treatment

options for persistent symptoms. Similarly, in an audit of hospital management of asthma in Pakistan, performed 10 years ago, several deficiencies were observed. These included deficiencies in assessing severity of asthma, recording of peak flow readings and teaching of inhaler techniques (6).

The aim of this study is to evaluate the hospital-based management of acute asthma in a teaching hospital of South Asia and to compare practices over a 10-year period.

### METHODS

All adult patients (aged 15 or over) with acute exacerbation of asthma, admitted through ER, between February 2003 and March 2004, were included in the study. Data were collected on demographic and clinical features, prior use of medications and investigations and management in ER. Details of ward management, readmission within 24 h of discharge and mortality were reviewed. Asthma was diagnosed on clinical features (episodic symptoms; recurrent wheeze, cough or dyspnea; associated allergic symptoms and family history, and presence of bilateral wheeze on admission), diminished peak flow readings and absence of other diseases that may mimic asthma (e.g. pulmonary oedema, pneumonia or pneumothorax). Patients who were current smokers or who had an established diagnosis of chronic obstructive pulmonary disease (COPD) were excluded from the study. Only one ex-smoker who had stopped smoking for over 10 years was included in the study.

In 1995 study, adult patients admitted with acute exacerbation of asthma, admitted through ER, between 1991 and 1993, were included. One hundred of 593 patients admitted

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during that period were randomly selected for the study. Inclusion and exclusion criteria were similar, and questionnaire was of similar format (documentation of clinical features, ER evaluation and management) allowing us to compare the practices over time.

The statistical package for social science (SPSS) (Release 10.0.5, standard version, copyright © SPSS; 1989–1999) was used for data analysis. The descriptive analysis was performed for demographic and clinical features. Results have been expressed as mean  $\pm$  SD (or range) for continuous variables, and number (percentage) for categorical variables. Difference of the proportion was assessed by using Pearson's  $\chi^2$  test; Fisher exact test was used when expected count was  $<5$ ; *p*-value of  $<0.05$  was considered statistically significant. All *p*-values were two-sided.

## RESULTS

One hundred two patients, with acute exacerbation of asthma, were admitted from the ER during the study period. An additional four patients discharged themselves soon after initial ER treatment and were not included in the study.

Of the 102 patients, 27 (26%) were men and 75 (74%) were women. Their mean age was 53.88 years (range: 17–80), with 76 (75%) patients in the age group of 40–74 years. The mean stay in the ER was 3.84 h (range: 1–8.5) and duration of hospitalization was 3.75 days (range: 1–14). Pre-admission medications were taken by 78 (75%) patients. Of these, 25 (32%) were taking single, 36 (46%) taking two and 17 (22%) taking three or more medications. The trends in pre-admission medications over a 10-year period have been compared in Table 1. There was significant increase in the use of inhaled medications and decline in the use of systemic medications. In the present study, 71 (70%) patients used inhaled therapy before admission, 31 combination of steroids and bronchodilators, 38 bronchodilators only and two steroids only.

The documentation of clinical features and peak expiratory flow rate (PEFR) monitoring has been summarized in Table 2. Precipitating factors and family history were documented in less than half of the patients. Important physical signs, including accessory muscles and inability to speak, were documented in less than a quarter of patients. When the

results are compared with the findings in 1995, there was a decline in the documentation of physical signs. PEFr monitoring was performed more often but still documented only on 50 (49%) ER patients and 38 (37%) ward patients.

The salient aspects of investigations and management have been summarized and they have been compared with those of the study performed a decade ago (6) in Table 3. Pulse oximetry was documented in 95 (93%) patients, whereas this facility was not routinely available 10 years ago. This resulted in a significant fall in the number of arterial blood gas (ABG) analyses performed. Chest radiograph continued to be performed on most patients.

In the ER, nebulizers were administered to 94 (92%) patients; 55% receiving salbutamol alone and remaining in combination with ipratropium. All the patients were administered systemic steroids; 72% received intravenously. On the wards, 43 (42%) received oral steroids only, the remaining intravenous followed by oral steroids. Frequencies of use of other medications remained unchanged. Antibiotics were prescribed to 59 (58%) patients; indications were abnormal chest radiograph in 25%, fever in 68%, leucocytosis in 54% and sputum purulence in 47%. Compared to previous study, there was a significant decrease in the use of intravenous theophylline from 68 to 4%. Hypoxaemia was present in 17% of patients. None of the patients required mechanical ventilation and there was no mortality.

Out patient follow-up appointment was given to 95% with a 67% turnover. Readmission rate within 24 h of discharge was 1%. Many aspects of discharge planning were poor including documentation of inhaler technique in only 7%. Similarly, oral steroid was prescribed to 53% but inhaled steroid to only 3% and there was no formal documentation of self-management plan.

## DISCUSSION

This study describes the trends in the management of acute asthma at a teaching hospital in South Asia. Although a number of improvements have been observed, this has occurred at the expense of deterioration in other parameters. History taking was insufficient on a number of important aspects. Similarly, less emphasis was placed on physical signs (e.g. inability to speak, use of accessory muscles and cyanosis),

**Table 1** Ten-year trend in the use of pre-admission medications in patients admitted with acute asthma

Pre-admission medications	1995 (100 patients) (%)	2004 (102 Patients) (%)	<i>p</i> -value
Inhaled bronchodilator	31	69	$<0.0001$
Oral bronchodilator	20	7	0.006
Inhaled steroid	4	33	$<0.0001$
Systemic steroid	21	9	0.015
Antibiotic	6	11	Not significant
Oral theophylline	18	1	–

**Table 2** Ten-year trends in the documentation of history, examination and peak expiratory flow rate in patients admitted with acute asthma

	<i>Documentation</i>		<i>p-value</i>
	<i>1995 (%)</i>	<i>2004 (%)</i>	
History			
Precipitating factor	77	37	<0.001
Previous attacks	92	81	0.027
Family history	39	40	Not significant
Physical signs			
Pulse rate	100	98	Not significant
Respiratory rate	100	97	Not significant
Inability to speak	60	22	<0.001
Use of accessory muscles	59	22	<0.001
Cyanosis	92	75	0.002
Wheeze	100	96	Not significant
Peak expiratory flow rate			
Monitoring in emergency room (ER)	23	49	<0.001
Monitoring in ward	10	37	0.001

which help us in assessing the severity of asthma attack at bedside. When we compare our findings with those of the previous study performed a decade ago (6), the documentation of physical signs had deteriorated over time. Similar results were found in an audit on assessment and management of acute bronchial asthma in the emergency department of a district hospital in Malaysia, which seriously affected their decision of admission and was responsible for a large number of relapses (7).

Ready availability of pulse oximeter in ER had resulted in the monitoring of oxygen saturation in 93% and this was accompanied with a significant decline in the number of ABG analyses. Use of peak flow meter to assess asthma severity had significantly improved with time but still remained low in ER (49%) and on the wards (37%). The discrepancy between the use of pulse oximetry and peak flow rate, despite both being performed by nurses in ER, could be related to the fact that

oximetry was immediately performed on all patients presenting with pulmonary symptoms, but PEFr was only performed once a need to assess asthma was made by the attending doctor or nurse. Similar discrepancy was seen in Chicago asthma surveillance initiative project, where PEFr measurements, while common, were used less frequently than pulse oximetry (8). In Asian countries, several reports have highlighted the low use of PEFr. In Malaysia, PEFr were only documented in 14.5% of ER and 54.8% of ward notes (9). We have observed that none of the general practitioners use peak flow monitoring to assess asthma severity, despite treating patients with asthma exacerbations on a regular basis. This is supported by the findings in recent survey that the prescribing practices of general physicians in Pakistan did not generally conform to the national and international asthma guidelines (5). A number of studies have reported inadequate compliance with international guidelines in countries of Asia

**Table 3** Investigations and treatment in patients admitted with acute asthma

	<i>Documentation</i>		<i>P value</i>
	<i>1995 (%)</i>	<i>2004 (%)</i>	
Investigations			
Pulse oximetry	–	93	–
Arterial blood gas (ABG) analyses	73	46	<0.001
Chest radiograph	85	84	Not significant
Treatment			
Nebulized bronchodilators	99	92	Not significant
Intravenous theophylline	68	4	<0.001
Systemic steroids	69	100	<0.001
Systemic antibiotics	56	58	Not significant
Pre-discharge management			
Inhaler technique reviewed	–	7	–
Follow-up appointment given	88	95	Not significant

Pacific region and Middle East (10,11). In Taiwan, differences in compliance were also observed between various hospitals (district general vs. regional centres) of the same country (12).

Less than 70% of the asthma patients, in our study, were on inhaled bronchodilators and less than a third on inhaled steroids before their asthma attack. Although there was a significant increase in the use of inhaled medications and a decline of oral medications over a 10-year period, there remained a room for improvement. Similar trends were seen in the pattern of drug prescribing in ER. Use of nebulized bronchodilators was seen in over 90% of patients in both studies, but there was a substantial decline in the use of intravenous theophylline and a significant increase in the use of systemic steroids. Antibiotics prescribing remained unchanged and unacceptably high, being used in more than 50% of patients. Overuse of antibiotics in the management of acute asthma has been observed both in the East (11) and in the West (13), but this issue has not been adequately addressed in many recent studies from Asia. In developing countries, where cost is a major concern, overprescribing would lead to more expensive regimen with a greater risk of side-effects.

One area of asthma management, which remained seriously underrecognized, was pre-discharge planning. Although outpatient appointments were given to most patients, inhaler technique was rarely documented before discharge. In a study from Kuwait, there was no documentation of discharge planning (11). In a study from Malaysia, poor discharge planning resulted in frequent readmission (37%) of patients discharged from ER (7). In the Chicago asthma surveillance initiative, a marked decline was seen, between 1996 and 2000, in instructions to inform patients what to do in the event of inability to attend their follow-up appointment (14).

Over a 10-year period, management of acute asthma in South Asia has improved in some aspects, but continues to fall short in many areas. Of particular concern were the declines in history and physical examination skills, underuse of peak flow readings and poor pre-discharge instructions to use asthma medications. Similar conclusions were noted in Chicago Study with improvement in some areas and worsening in others, but most aspects of asthma care continued to fall short of national asthma guidelines (14).

British Thoracic Society (BTS) guidelines are widely used for the management of acute severe asthma (15). Based on suggested items in BTS audit tool, some aspects of asthma care continued to fall short of guidelines. Peak expiratory flow reading assessment was made in only 49% of patients on admission and 37% received serial monitoring on the wards. Oral steroids were prescribed to 53%, but a prescription of inhaled steroid on discharge was given to only 3%. BTS guidelines recommend that, at the time of discharge, patients should be administered both oral and inhaled steroids in

addition to bronchodilators. There was no formal documentation of self-management plan and this aspect needed urgent attention. Those aspects that were conforming to BTS audit tool included measuring ABG in patients with SaO<sub>2</sub> below 90% (100%), administering systemic steroids in ER (100%) and giving a follow-up appointment (95%).

Continued medical education may help improve the dissemination of guidelines to the physicians, but it was not found to be sufficient in improving ER asthma care (14,16). Development of a multidisciplinary asthma disease management programme in a large medical group practice in an urban area of USA was associated with a marked reduction in the rates of hospitalization and ER usage for asthma, as well as significant improvement in several essential processes of care (17). The disease management intervention included the development of a patient registry, a systematic approach to the assessment of asthma control by using the Asthma Therapy Assessment Questionnaire, case management and physician education. Each hospital should address its management deficiencies, behaviour of doctors and nurses and available resources to deliver cost-effective asthma care according to international guidelines.

In order to improve hospital management of acute asthma, we propose to (i) publish patient education material in local language to be given at the time of discharge; (ii) recruit a practice nurse to implement patient education, teach inhaler technique and document a self-management plan; (iii) organize teaching workshops for doctors and nursing staff; (iv) perform annual audit to monitor progress; (v) to improve deficiencies identified in annual audit.

## CONCLUSIONS

Significant deficiencies exist in the hospital management of acute asthma in South Asia. Despite some advances over a 10-year period, most areas of assessment and management fall significantly short of international asthma guidelines. Implementation of a multidisciplinary management programme may help us in improving the documentation and management of patients with acute asthma.

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