

# Effect of a preprinted form on the management of acute asthma in an accident and emergency department

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**Abstract**

**Objective**—To assess the effect of a preprinted form on the documentation of clinical data and compliance with the national guidelines for the management of asthma.

**Methods**—Prospective audit six months before and after introduction of the form.

**Results**—Use of the form improved the documentation of past asthma history (69% v 93%,  $P < 0.001$ ), current treatment (81% v 95%,  $P < 0.01$ ), predicted peak flow (23% v 75%,  $P < 0.001$ ), per cent predicted peak flow (1% v 62%,  $P < 0.001$ ), and respiratory rate (81% v 95%,  $P = 0.007$ ). Compliance with the British recommendations for treatment improved with use of the form (50% v 89%,  $P < 0.001$ ) The prescription of steroids on discharge did not improve significantly (26% v 44%,  $P > 0.05$ ).

**Conclusions**—The preprinted form resulted in enhanced documentation of data and conformity with current guidelines for the management of asthma.

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Key terms: asthma; preprinted form

Despite the presence of published national guidelines<sup>1 2</sup> the assessment and management of patients presenting with acute asthma to accident and emergency (A&E) departments is often suboptimal.<sup>3 4</sup> In the first British study of its kind we investigated whether the introduction of a preprinted form into our A&E department would improve the documentation of clinical data and the treatment of asthma using the recently published British national guidelines as our standard.

**Methods**

Over a six month period a prospective audit of all patients aged between 16 and 80 years presenting to the A&E department with a diagnosis of asthma was carried out. All the A&E staff had been introduced to the British national guidelines for the assessment and management of acute asthma<sup>2</sup> before the audit, and departmental guidelines based on the revised British guidelines were available for reference. Following this a preprinted structured form was introduced into the department and a second six month prospective audit was initiated. The form outlined the assessment and management of acute asthma in adults as suggested by the British Thoracic Society *et al*<sup>2</sup> and contained prompts for demographic details, current

symptoms, past medical history, and physical examination. It also stipulated the management, follow up arrangements, and discharge medication according to the severity of the asthma attack. Within the A&E department the form was used as a prescription chart.

As a result of local clinical practice there were some minor variations in the protocol from the British guidelines. The variations were: (1) there was no mild category of asthma; and (2) the use of nebulised ipratropium bromide with a nebulised agonist was recommended for severe asthma.

The form was used in lieu of the A&E card for all patients presenting with asthma. These patients were identified at registration if the patient stated asthma as the reason for attendance, but could be initiated at any time by the triage nurse or medical staff if the patient's symptoms were thought to be suggestive of asthma.

A record was made of the current symptoms resulting in presentation to the A&E department, past asthma history, and current asthma medication, as well as of the presence of objective measurements necessary to assess the severity of an asthma attack.

Compliance by medical staff with the recommended treatment and whether or not patients were reviewed following treatment was also assessed. Discharge despite contraindications was recorded. Follow up arrangements and discharge medication were also audited. The hospital and departmental records were reviewed in order to identify reattendance or admission within two weeks of discharge from the department. The patients seen in the six months before were compared with those seen in the subsequent six months by means of the  $\chi^2$  test.

**Results**

Seventy patients (37 males and 33 females, median age 28 years) were seen in the six months before the introduction of the form and 105 (45 males and 60 females, median age 27 years) attended in the subsequent six months. The severity of asthma seen in patients was similar in both study periods (table 1).

Use of the form (reproduced as an appendix) significantly improved the documentation of past asthma history and current treatment. The recording of current symptoms remained high. Recording of peak flow was high in both audit periods. The documentation of respiratory rate, predicted peak flow, and per cent predicted peak flow all improved significantly following the introduction of the form. However, recording of the pulse rate and chest

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Table 1 Comparison of asthma severity between free text and preprinted groups

	Free text (n = 70)	Preprinted form (n = 105)
In extremis	0%	3%
Severe	54%	49%
Moderate	43%	46%
No assessment possible	3%	2%

\*Definition of severity: In extremis, exhaustion, silent chest, cyanosis or bradycardia; Severe, peak expiratory flow <50% predicted or pulse rate >110/min or respiratory rate >25/min or PaCO<sub>2</sub> >5 KPa; Moderate, peak expiratory flow >50% predicted, pulse rate was <110/min, respiratory rate <25/min.

Table 2 Comparison of history variables and examination documented between free text and preprinted groups

	Free text (n = 70) Recorded	Preprinted form (n = 105) Recorded	P value
<i>History</i>			
Current symptoms	66 (94%)	99 (94%)	NS
Past asthma history	48 (69%)	98 (93%)	<0.001
Medication	57 (81%)	100 (95%)	<0.01
<i>Assessment</i>			
Pulse rate	70 (100%)	93 (89%)	<0.01
Respiratory rate	57 (81%)	100 (95%)	<0.01
Peak expiratory flow	65 (93%)	99 (94%)	NS
Predicted peak flow	16 (23%)	79 (75%)	<0.001
% Predicted peak flow	1 (1%)	65 (62%)	0.0001
Chest examination	70 (100%)	96 (91%)	<0.05

Table 3 Comparison of treatment given and discharge arrangements between free text and preprinted form groups

	Free text (n = 70)	Preprinted form (n = 105)	P value
<i>Treatment</i>			
Treatment correct	(50%) 35/70	(89%) 93/105	<0.001
Reviewed post nebuliser	(72%) 44/61	(79%) 60/76	NS
Reviewed at 1 h	(26%) 11/43	(70%) 40/57	<0.001
<i>Outcome</i>			
Admitted	(50%) 35/70	(46%) 48/105	NS
Discharged home	(50%) 35/70	(54%) 57/105	NS
Discharged inappropriately	(54%) 19/35	(28%) 6/57	<0.05
Readmission/reattendance	(3%) 1/35	(0) 0/57	NS
<i>Discharge arrangements</i>			
GP follow up advised	(60%) 21/35	(61%) 35/57	NS
Chest clinic arranged	(0) 0/34*	(0) 0/57	NS
Inhaler technique checked	(3%) 1/35	(44%) 25/57	<0.001
Steroids prescribed	(26%) 9/35	(44%) 25/57	NS

\*One patient discharged home lived outside the area.

examination fell, although both were high in each period (table 2).

Compliance with the recommended treatment of acute asthma, as suggested by the British guidelines, improved significantly with use of the form. A greater number of patients was reviewed 1 h after starting treatment and, of the patients discharged home, the use of the form reduced the number with contraindications to discharge (table 3).

The prescription of steroids on discharge did not increase significantly. Referral to the chest clinic and documentation that follow up by the general practitioner had been advised did not improve. The number of patients whose inhaler technique was checked before discharge significantly increased (table 3). There was no difference in readmission rates within two weeks of discharge (table 3). There were no fatalities in those patients discharged from the A&E department (Regional Confidential Enquiry into Asthma Deaths 1992 and 1993. Personal communication, Dr B D W Harrison).

## Discussion

The results of this study show that not only was the documentation of history, medication, clinical signs, and measurements enhanced, but compliance with the current national guidelines for the management of asthma significantly improved with use of the preprinted form. In particular there was an improvement in treatment, the monitoring of therapeutic response, and follow up after discharge.

Deficits in documentation of clinical data have been reported before in asthma patients presenting to two A&E departments in the United Kingdom where the peak expiratory flow was recorded in only 11%<sup>3</sup> and 26%<sup>4</sup> of cases. Inadequate documentation was also identified in an audit by the general practitioners in Asthma Group,<sup>5</sup> in which the peak expiratory flow was recorded in 82% of cases, respiratory rate in 63%, and pulse rate in only 54% of cases.

Poor compliance with the current British guidelines was reported by Meighan *et al.*<sup>6</sup> They found that in one A&E department no patient had the percentage of predicted peak expiratory flow documented, nor did any patient have a repeat peak expiratory flow recorded one hour after treatment. The authors suggested that these findings may have been due to time constraints on staff working in the A&E department.

Alternatively, inadequate documentation may be because doctors do not record negative findings. Of more concern is the possibility that poor documentation reflects a lack of awareness of those features associated with severe asthma and a failure to use these objective criteria to assess severity. In the Norwich A&E department, recording of objective data was already higher than in these reports.

Structured preprinted protocols for the management of patients presenting with asthma to emergency departments in other countries<sup>7,8</sup> have been shown to improve both case documentation and adherence to accepted clinical practice, but we are unaware of their use in Britain to improve the management of asthma. The structured format of the form allowed the assessment of an asthmatic patient to be carried out in a logical and safe manner and ensured that appropriate management decisions were based on objective criteria obtained during this assessment. As the form was an approved clinical protocol, nurses could also initiate treatment according to the severity of the asthma attack.

Although we found that the number of patients discharged home in the presence of contraindications was significantly reduced by use of the form, nevertheless patients were still discharged home despite contraindications and without referral to the duty medical registrar as suggested by the protocol. The failure of doctors to appreciate the severity of an asthma attack has many times been implicated in deaths from asthma.<sup>9-12</sup>

Although the prescription of steroids did increase following the introduction of the

preprinted form, this increase failed to reach significance although the form clearly stated the criteria for use of both inhaled and oral steroids on discharge. This we find difficult to explain. The institution of a management plan in a New Zealand emergency department also failed to improve significantly the prescription of oral steroids on discharge.<sup>8</sup> Structured problem-specific charts used for patients presenting with asthma to an American emergency department resulted in fewer investigations and an increased use of pulse oximetry but, again, did not significantly change prescribing practice.<sup>7</sup>

Preprinted forms have advantages other than improved documentation. Regular use of these forms will reinforce the recommended standards of care and act as a constant reminder to the doctor using them. The education and continual reinforcement of clinical standards is important within the A&E department, where inexperienced doctors may work unsupervised seeing a whole range of medical and surgical emergencies. Also, as essential clinical data are recorded in the same way for every patient the collection of information for audit is easier and the identification of discrepancies in documentation and management more rapid.

As yet no change in outcome, using death, readmission, and reattendance as outcome

measures, has been demonstrated. In this study we identified only one patient who returned to the A&E department with worsening symptoms three days after discharge; with such small numbers no conclusion can be drawn about whether the outcome in patients discharged home was altered by the preprinted form. We anticipate that improved processes of care will result in improved outcomes when large numbers of patients are studied. We plan to continue using this form within the department.

The preprinted form used in this study resulted in enhanced documentation and conformity with the current guidelines for the assessment and treatment of asthma. We acknowledge that there is room for further improvement, particularly in the prescription of steroids and arrangements for follow up on discharge. Guidelines will only contribute to an improved standard of care if they actually move a doctor's clinical practice closer to that recommended. Continual peer review of these forms and feedback to the doctors concerned is the only way to ensure this occurs.

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**Appendix**

THE PREPRINTED STRUCTURED FORM USED IN THE STUDY

<b>A &amp; E PROTOCOL FOR THE MANAGEMENT OF ACUTE ASTHMA IN ADULTS</b>		
NAME:	A&E No:	DOB:
Arrival Time:	Age:	Male/Female
Name of SHO:	Triage time:	Triage category:
Time Seen By SHO:		
<b>ASSESSMENT OF SEVERITY: HISTORY</b>		
Onset:	Date:	Time:
Present Symptoms:	Cough Sputum Wheeze Shortness of breath Nocturnal Symptoms Precipitating Factors	
Past Asthma History:	Previous admissions Previous ventilation/ITU	
Current Asthma Medication: Inhaled	Drug	Exact Usage
Oral		
Other medication		
Other PMH		

<b>EXAMINATION</b>	
If exhausted, moribund, gasping, silent chest, cyanosed or bradycardic –	
The patient is IN EXTREMIS	
<b>TREAT IMMEDIATELY</b>	
– Crash call	
– Resuscitate (ABC) Give Oxygen 40 – 60% Obtain IV access	
– Cardiac monitor	
– Salbutamol 5 mg OR Terbutaline 10 mg	
AND Ipratropium 500 mcg via nebuliser	
AND Salbutamol OR Terbutaline 250 mcg IV over 10 mins OR	
Aminophylline 250 mg (5 mg / Kg) over 20 mins	
(only if patient not on oral Theophyllines)	
AND Hydrocortisone 200 mg IV	
<b>Otherwise give 40–60% Oxygen and record:</b>	
Ability to speak in sentences	Pulse rate Y/N
BP	PEF Predicted normal % normal
RR	Tracheal Position
Percussion note	Expansion
Auscultation	Paradox
2	

Assess the severity according to the following criteria:-

If any one of the following is present the patient has SEVERE ASTHMA  
 PEF < 50% expected  
 Pulse > 110 / min.  
 Respiratory rate > 25 / min.  
 Paradox > 10 mmHg  
 PaCO<sub>2</sub> > 5 KPa

If any of the following are present the patient has MODERATE ASTHMA  
 PEF > 50%  
 Pulse < 110 / min.  
 Respiratory rate < 25 / min.  
 No Paradox

Caution: Patients in extremis or with severe asthma may not be distressed and may not have all these abnormalities. The presence of any should alert you

ASSESSED AS: IN EXTREMIS  Go to page 2  
 SEVERE  Go to page 4  
 MODERATE  Go to page 5

**SEVERE ASTHMA**

Give supplemental Oxygen (40-60%) in ALL cases  
 Check blood gases and do PEF  
 Initiate treatment as below  
 Monitor with ECG and pulse oximetry  
 Insert IV cannula, Check serum K+ and Theophylline level

TREATMENT Time: Dr. Given:

**Nebulise with Oxygen**

Salbutamol 5 mg or  
 Terbutaline 10 mg  
 And Ipratropium bromide 500 mcg

**Intravenous**

Start Crystalloid (500 ml) infusion  
 200 mg Hydrocortisone if patient unable to take.....

**Oral**

Prednisolone 40 mg

**REFER TO RMO**

**INITIATE INVESTIGATIONS**

Hb	WCC	PLT	
Na	K	Urea	Cr
BS			
pH	pCO <sub>2</sub>	pO <sub>2</sub>	HCO <sub>3</sub>
CXR			
OTHERS			

If any deterioration, consider a tension pneumothorax and treat as for

IN EXTREMIS (record outcome details on Page 7)

**MODERATE ASTHMA**

TREATMENT Time: Dr. Given:

**Nebulise with Oxygen**

Salbutamol 5 mg or  
 Terbutaline 10 mg

<b>Immediately post nebuliser review and record;</b>		Time:
PEF	% normal	RR
Pulse Rate	BP	Paradox
Able to speak sentences	Y/N	

IF ANY DETERIORATION OR NO OBJECTIVE IMPROVEMENT TREAT AS SEVERE ASTHMA AND REFER. Go to Page 4.

If PEF > 75%  
 No paradox  
 RR normal,

If objective improvement but  
 PEF > 50 - 75%  
 RR 20-25 / min.  
 Paradox present

REVIEW AFTER 1 HOUR

REPEAT NEBULISER GIVE PREDNISOLONE 40 MG

Time: Dr. Given:

Salbutamol 5 mg or  
 Terbutaline 10 mg  
 Prednisolone 40 mg

Go to final assessment on Page 6

Time:

**FINAL ASSESSMENT:**  
 PEF % normal RR  
 Pulse rate Paradox  
 Able to speak sentences Y/N

If PEF < 75% - REFER

If PEF > 75% - no paradox and normal respiratory rate the patient may be discharged PROVIDING NO CONTRAINDICATIONS (see below)

**CONTRAINDICATIONS TO DISCHARGE**

	Y	N
- Patients already on oral steroids	<input type="checkbox"/>	<input type="checkbox"/>
- Patients with a history of ITU admission +/- ventilation	<input type="checkbox"/>	<input type="checkbox"/>
- Patients presenting late at night	<input type="checkbox"/>	<input type="checkbox"/>
- Patients living alone	<input type="checkbox"/>	<input type="checkbox"/>
- Patients waking at night and/or presenting in the afternoon	<input type="checkbox"/>	<input type="checkbox"/>
- Significant chest infection	<input type="checkbox"/>	<input type="checkbox"/>
- Patients whom you suspect may not be able to recognise a deterioration in their condition	<input type="checkbox"/>	<input type="checkbox"/>
- Pregnancy; risk of foetal hypoxia	<input type="checkbox"/>	<input type="checkbox"/>
- 'Brittle asthma' - repeated admissions	<input type="checkbox"/>	<input type="checkbox"/>
- Patients attending within ONE week of A&E or GP visit	<input type="checkbox"/>	<input type="checkbox"/>

IF YES TO ANY OF ABOVE - DISCUSS WITH EITHER THE RMO OR CHEST PHYSICIANS

<b>OUTCOME</b>	
If referred, RMO's assessment:	
Admitted	<input type="checkbox"/>
Discharged by RMO / Chest Physicians	<input type="checkbox"/>
Discharged by A&E staff	<input type="checkbox"/>
<b>DISCHARGE PLAN</b>	
FOLLOW UP	
- GP review (within 5 days) plus letter	
- Consider Chest clinic referral	<input type="checkbox"/>
Inhaler technique checked	<input type="checkbox"/>
Asthma information leaflet offered	<input type="checkbox"/>
Medication	<input type="checkbox"/>
- Start inhaled steroids: Becloforte 2 puffs B.D.	<input type="checkbox"/>
- Oral Prednisolone 40 mg OD (1 week)	<input type="checkbox"/>
7	

- 1 British Thoracic Society. Guidelines for the management of asthma in adults: II-acute severe asthma. *BMJ* 1990; **301**:797-800.
- 2 British Thoracic Society, Research unit of the Royal College of Physicians of London, King's Fund centre and National Asthma Campaign. Guidelines for the management of asthma in adults. *Thorax* 1993; **48**(suppl):S1-24.
- 3 Reed S, Diggle S, Cusley MJ, Sleet RA, Tattersfield AE. Assessment and management of asthma in an accident and emergency department. *Thorax* 1985;**40**:897-902.
- 4 Ebdon P, Carey OJ, Quinton D, Codtson JB. A study of acute asthma in the accident and emergency department. *Br J Dis Chest* 1988;**82**:162-7.
- 5 Neville RG, Clark RC, Hoskins G, Smith B for general practitioners in Asthma Group. National asthma audit 1991-2. *BMJ* 1993;**306**:559-62.
- 6 Meighan JM, Mak VHF, Williams DJ, Bateman NT. Management of acute asthma in the A&E department: how practical are the BTS guidelines? [abstr] *Thorax* 1993;**48**:1064P.
- 7 Wrenn K, Rodewald L, Lumb E, Slovis C. The use of structured, complaint specific patient encounter forms in the Emergency Department. *Ann Emerg Med* 1993; **22**:805-12.
- 8 Town I, Kwong T, Holst P, Beasley R. Use of a management plan for the treatment of asthma in an Emergency Department. *Thorax* 1990;**45**:702-4.
- 9 Cochrane GM, Clark TJH. A survey of asthma mortality in patients between ages 35 and 64 in the Greater London hospitals. *Thorax* 1975;**30**:300-5.
- 10 British Thoracic Association. Death from asthma in two regions of England. *BMJ* 1982;**285**:1251-5.
- 11 Robin ED. Death from bronchial asthma. *Chest* 1988; **93**:614-8.
- 12 Wareham NJ, Harrison BDW, Jenkins PF, Nicholls J, Stableforth DE. A district confidential enquiry into deaths due to asthma. *Thorax* 1993;**48**:1117-20.

## Injury Research Group

The 1996 annual meeting will be held in Manchester on 1-2 April. There will be a session of free communications and symposia on wound healing and on the psychological and psychiatric consequences of trauma. For details please contact:

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