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

S M Robinson, B D W Harrison, M A Lambert

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), 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.


Key terms: asthma; preprinted form

Despite the presence of published national guidelines the assessment and management of patients presenting with acute asthma to accident and emergency (A&E) departments is often suboptimal. 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 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 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 readmittance 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-squared 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
**Table 1 Comparison of asthma severity between free text and preprinted groups**

<table>
<thead>
<tr>
<th></th>
<th>Free text (n = 70)</th>
<th>Preprinted form (n = 105)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In extremis</td>
<td>0%</td>
<td>3%</td>
</tr>
<tr>
<td>Severe</td>
<td>54%</td>
<td>49%</td>
</tr>
<tr>
<td>Moderate</td>
<td>43%</td>
<td>46%</td>
</tr>
<tr>
<td>No assessment</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>

*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 PaCO₂ >5 KPa; Moderate, peak expiratory flow >50% predicted, pulse rate <110/min, respiratory rate <25/min.

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

<table>
<thead>
<tr>
<th></th>
<th>Free text (n = 70)</th>
<th>Preprinted form (n = 105)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>Recorded</td>
<td>Recorded</td>
<td></td>
</tr>
<tr>
<td>Current symptoms</td>
<td>66 (94%)</td>
<td>99 (94%)</td>
<td>NS</td>
</tr>
<tr>
<td>Past asthma history</td>
<td>48 (69%)</td>
<td>98 (93%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Medication</td>
<td>57 (81%)</td>
<td>100 (99%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse rate</td>
<td>70 (100%)</td>
<td>93 (89%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>57 (81%)</td>
<td>100 (99%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Peak expiratory flow</td>
<td>65 (93%)</td>
<td>99 (94%)</td>
<td>NS</td>
</tr>
<tr>
<td>Predicted peak flow</td>
<td>16 (23%)</td>
<td>77 (75%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>% Predicted peak flow</td>
<td>1 (1%)</td>
<td>65 (62%)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Chest examination</td>
<td>70 (100%)</td>
<td>96 (91%)</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

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% and 26% of cases. Inadequate documentation was also identified in an audit by the general practitioners in Asthma Group, 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. 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 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.

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

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

<table>
<thead>
<tr>
<th></th>
<th>Free text (n = 70)</th>
<th>Preprinted form (n = 105)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment correct</td>
<td>(50%) 35/70</td>
<td>(89%) 93/105</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Reviewed post nebuliser</td>
<td>(72%) 44/61</td>
<td>(79%) 60/76</td>
<td>NS</td>
</tr>
<tr>
<td>Reviewed at 1 h</td>
<td>(26%) 11/43</td>
<td>(70%) 40/57</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Outcome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admitted</td>
<td>(50%) 35/70</td>
<td>(46%) 48/105</td>
<td>NS</td>
</tr>
<tr>
<td>Discharged home</td>
<td>(50%) 35/70</td>
<td>(54%) 57/105</td>
<td>NS</td>
</tr>
<tr>
<td>Discharged inappropriately</td>
<td>(54%) 19/35</td>
<td>(28%) 6/57</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Readmission/readtendance</td>
<td>(3%) 1/35</td>
<td>(0) 0/57</td>
<td>NS</td>
</tr>
<tr>
<td>Discharge arrangements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP follow up advised</td>
<td>(60%) 21/35</td>
<td>(61%) 55/57</td>
<td>NS</td>
</tr>
<tr>
<td>Chest clinic arranged</td>
<td>(6%) 0/34</td>
<td>(0) 0/5</td>
<td>NS</td>
</tr>
<tr>
<td>Inhale technique checked</td>
<td>(3%) 1/35</td>
<td>(44%) 25/57</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Steroids prescribed</td>
<td>(26%) 9/35</td>
<td>(44%) 25/57</td>
<td>NS</td>
</tr>
</tbody>
</table>

*One patient discharged home lived outside the area.
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. 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. 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.

We would like to thank Boehringer Ingelheim for their generosity in providing the printed forms and posters used in this study. The authors also thank Mr B Finlayson, Dr P Jenkins, and the reception, nursing, and medical staff of the accident and emergency department for their cooperation during this study and Ms Sylvia Cooper for her assistance in data collection.

Appendix
THE PREPRINTED STRUCTURED FORM USED IN THE STUDY

<table>
<thead>
<tr>
<th>A &amp; E PROTOCOL FOR THE MANAGEMENT OF ACUTE ASTHMA IN ADULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME: A&amp;E No: DOB:</td>
</tr>
<tr>
<td>Arrival Time: Age: Male/Female</td>
</tr>
<tr>
<td>Name of SHO: Triage time: Triage category:</td>
</tr>
<tr>
<td>Time Seen By SHO:</td>
</tr>
</tbody>
</table>

**ASSESSMENT OF SEVERITY: HISTORY**

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: Drug Exact Usage Inhaled
Oral Other medication Other PMH

**EXAMINATION**

If exhausted, moribund, gasping, silent chest, cyanosed or bradycardic –

The patient is IN EXTREME

TREAT IMMEDIATELY

- Crash call
- Resuscitate (ABC) Give Oxygen 40 – 60% Obtain IV access
- Cardiac monitor
- Salbutamol 5 mg OR Terbutaline 10 mg
- 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

Otherwise give 40–60% Oxygen and record:

Ability to speak in sentences Y/N

BP PEF
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.
- PaCO₂ > 5 KPa

If any of the following are present the patient has MODERATE ASTHMA
- PEF > 50% but < 75%
- 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

ASSESS AS: IN EXTREMIS ☐ SEVERE ☐ MODERATE ☐ Go to page 2

MODERATE ASTHMA

TREATMENT: Time: Dr. Given:
Nebulise with Oxygen
Salbutamol 5 mg or Terbutaline 10 mg
Immediately post nebuliser review and record:
- Time:
  - PEF % normal RR Paradox
  - Pulse Rate BP
  - 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 20-25 / min.
  Reassess again after 1 hour

REVIEW AFTER 1 HOUR
GIVE PREDNISOLONE 40 MG
Time: Dr. Given:
Salbutamol 5 mg or Terbutaline 10 mg
Prednisolone 40 mg
Go to final assessment on Page 6

SEVERE ASTHMA

TREATMENT: Time: Dr. Given:
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

NEBULISE:
- Terbutaline 10 mg
- Nebulised with oxygen
- Nebulise with oxygen
- Salbutamol 5 mg or Terbutaline 10 mg
- Intraplottipm bromide 500 mcg

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

Oral
Prednisolone 40 mg

INITIATE INVESTIGATIONS:
Hb WCC PLT Na K Urea Cr BSR pH pCO₂ pO₂ HCO₃ CO2 OTHERS

IF any deterioration, consider a tension pneumothorax and treat as for IN EXTREMIS (record outcome details on Page 7)

FINAL ASSESSMENT: Time:
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
- Patients with a history of ICU admission +/- ventilation
- Patients presenting late at night
- Patients living alone
- Patients waking at night and/or presenting in the afternoon
- Significant chest infection
- Patients whom you suspect may not be able to recognise a deterioration in their condition
- Pregnancy, risk of foetal hypoxia
- 'Brittle asthma' – repeated admissions
- Patients attending within ONE week of A&E or GP visit

IF YES TO ANY OF ABOVE – DISCUSS WITH EITHER THE RMO OR CHEST PHYSICIANS
### OUTCOME

If referred, RMO's assessment:

- Admitted
- Discharged by RMO / Chest Physicians
- Discharged by A&E staff

### DISCHARGE PLAN

**FOLLOW UP**
- GP review (within 5 days) plus letter
- Consider Chest clinic referral

**Inhaler technique checked**

**Asthma information leaflet offered**

**Medication**
- Start inhaled steroids: Becloforte 2 puffs B.D.
- Oral Prednisolone 40 mg OD (1 week)

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**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:

Dr R N Barton  
North Western Injury Research Centre  
Stopford Building  
University of Manchester  
Oxford Road  
Manchester M13 9PT  
(Telephone 0161-275 5188, fax 0161-275 5190)

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