ORIGINAL ARTICLE

Accident and emergency departments are still failing to assess asthma severity

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Objectives: To quantify the documentation of vital signs in children attending accident and emergency (A&E) for asthma and to assess whether indicators of severity were used appropriately.
Methods: Records of all children aged 3 to 14 attending A&E for the treatment of asthma in four London hospitals over a three month period were examined for documentation of heart rate, respiratory rate, peak expiratory flow rate, oxygen saturation, and fraction of inspired oxygen. The relation between severity indicators and whether the child was admitted or not was examined.
Results: There were 255 attendances in 229 children. Heart rate, respiratory rate, and oxygen saturation were recorded on most attendances (94.5%, 85.5%, and 96.8%) but fraction of inspired oxygen and peak flow were recorded in few children (48.6% and 48.5%). Heart rate and respiratory rate were higher and oxygen saturation lower in children who were admitted compared with those who were not.
Conclusions: Assessment of airways obstruction is inadequate in children but when measured may be used appropriately to guide admission. There is a need for interventions to improve assessment of children attending A&E for asthma.

Failure to assess adequately the severity of asthma attacks is regarded as one of the factors contributing to asthma deaths.[1–3] In recognition of this, national UK guidelines emphasise the importance of objective assessment of asthma severity.[4 5] They recommend that heart rate, respiratory rate, and oxygen saturation (Sao_2) are measured in everyone presenting with an acute attack, and that peak expiratory flow rate (PEFR) is measured in everyone over the age of 5 years. They give specific cut off points for identifying people who should be admitted to hospital. These are based on evidence that abnormalities of these indicators are associated with re-presentation for medical care and need for intravenous treatment.[6–10] They are also likely to be associated with risk of respiratory failure.

Although the guidelines offer a widely accepted standard of care for people with asthma, some evidence suggests that the inadequate assessment identified by several confidential inquiries persists.[1–3] Pinnock *et al* examined the management of asthma by primary and secondary care within a UK health district and found assessment of PEFR to be incomplete.[11] PEFR was recorded in 76% of patients aged 6 years and over but, of those given a bronchodilator, only 42% had a PEFR recorded before and after treatment to assess its effectiveness. The investigators, however, did not look at differences in the care of children and adults, an issue that was highlighted by an American study of documented asthma care in the emergency room.[12] In this study, PEFR was ordered on 31% of children compared with 64% of adult patients presenting with acute asthma. Despite the availability of widely accepted guidelines and the high incidence of accident and emergency (A&E) attendances for asthma, there are no recent studies in the UK that examine the quality of care in A&E specifically in children.

About a thousand children attend Lambeth, Southwark and Lewisham A&E departments each year for the treatment of asthma (unpublished data). During the course of a study examining the risk factors for hospital attendance in children with asthma, we noticed that A&E records often did not include documentation of vital signs, which suggests that assessments of severity and decisions to admit are being made without using them.

The main aim of this study was to quantify the proportion of children attending A&E for asthma for whom heart rate, respiratory rate, Sao_2 and PEFR were recorded in the casualty records. In addition the study aimed to assess whether these indicators of severity were being used appropriately.

METHOD

Between 7 December 1998 and 14 February 1999, we carried out weekly computerised searches of A&E records of children aged 3 to 14 attending A&E at four London teaching hospitals. Where a presenting complaint of asthma attack; upper respiratory tract infection; cough; shortness of breath; or wheeze was recorded on the computer system, one of the investigators examined the records. The criteria for inclusion were: a diagnosis of asthma or possible asthma; and a presenting complaint or findings on history or examination that indicated lower respiratory tract problems—that is, difficulty in breathing, shortness of breath, cough, or wheeze. If a child had no previous history of asthma but the clinical impression was recorded as wheeze or bronchospasm, the child was included if he or she had been treated with bronchodilators. The child was not included if he or she did not wait to see a doctor, had cystic fibrosis, had radiographically confirmed pneumonia, or there was a clear focus of infection outside the chest, such as otitis media.

Data collected from the casualty records were: age; whether admitted; heart rate; respiratory rate; PEFR (or documentation of an attempt to obtain a PEFR if a child was unable to perform); Sao_2 ; and fraction of inspired oxygen (Fio_2).

We examined the associations of heart rate, respiratory rate, and Sao_2 with admission using *t* tests. Because heart rate and respiratory rate vary with age, the associations between heart rate and admission and respiratory rate and admission were adjusted for age using multiple regression.

Ethical permission was granted by the ethical committees of all three trusts involved.

RESULTS

A total of 8259 attendances were made by children aged 3 to 14 years at the four paediatric A&E departments over the

Table 1 Proportion of attenders with recorded vital signs by time of attendance

	Heart rate		Respiratory rate		PEFR (5–14 y)*		Sao_2		Sao_2 ($Fi0_2$ recorded)	
Time of attendance	n	%	n	%	n	%	n	%	n	%
0001–0600 (n=50)	47	94.0	38	76.0	17	50.0	50	100.0	31	62.0
0601–1200 (n=61)	60	98.4	57	93.4	17	47.2	60	98.4	30	49.2
1201–1800 (n=52)	50	96.2	44	84.6	17	48.6	50	96.2	21	40.4
1801–0000 (n=92)	84	91.3	79	85.9	27	46.6	85	94.4	42	45.7
χ^2 (p value)	2.31 (p=0.51)		7.35 (p=0.06)		0.06 (p=1.00)		3.86 (p=0.28)		5.13 (p=0.16)	
Total (%, 95% confidence intervals)	241 (94.5, 91.0 to 97.0)		218 (85.5, 80.6 to 89.6)		78 (47.9, 40.0 to 55.8)		245 (96.1, 92.9 to 98.1)		124 (48.6, 42.3 to 54.9)	

*Values based on 163 attenders aged 5–14 years.

Table 2 Associations between vital signs and admission from A&E (all ages)

	Not admitted (n=196)	Admitted (n=59)	Difference (95% CI)	Difference (95% CI) after controlling for age
Mean heart rate (beats/min)	120 (n=186)	131 (n=55)	11.5 (4.9 to 18.0)	8.1 (2.0 to 14.2)
Mean respiratory rate (breaths/min)	30 (n=164)	38 (n=54)	8.6 (5.4 to 11.8)	7.5 (4.4 to 10.5)
Mean Sao_2 (%)	96 (n=188)	92 (n=57)	–4.2 (–5.1 to –3.3)	
% with all vital signs recorded*	40.9 (n=54)	41.9 (n=13)	–1.0 (–20.3 to 18.3)	
% with all vital signs excluding PEFR	80.6 (n=158)	86.4 (n=52)	–5.8 (–16.2 to 4.5)	

95% CI, 95% confidence intervals. *Children aged 5–14 years only.

study period, of which 255 (3.1%) met the criteria for inclusion. These attendances were made by 229 children, of whom 152 were boys (59.6%). Eighteen children attended casualty twice, one child attended three times, and two children attended four times during the study period. Fifty nine attendances (23.1%) resulted in admission to hospital. Only limited data were available for two attendances as the casualty records were missing.

Table 1 shows the numbers and proportions of children in whom vital signs were recorded. Of the 245 children with a recorded Sao_2, the Fio_2 (or "room air" as appropriate) was recorded in 124 (50.6%). Children aged 5–14 years made 163 attendances (63.9%) to A&E and of these PEFR was recorded in 78 (47.9%). Age (data not shown) and time of day had no significant effect on the documentation of vital signs. Respiratory rate however was measured less often (76% of attendances) during the night (table 1).

The children who were admitted were slightly older on average that children who were not (mean age 6.7 years compared with 7.6 years, 95% confidence intervals (CI) for difference –0.08 to 1.9). Table 2 shows the proportion of children for whom all vital signs were recorded and the mean levels of each vital sign in children who were and were not admitted to hospital, before and after controlling for age. Only 41.9% of children aged 5–14 years who were admitted had all four vital signs recorded. After controlling for age, children who were admitted had a significantly higher heart rate, by about 8 beats per minute, and a significantly higher respiratory rate, by about 8 breaths per minute, than those who were not admitted. Children who were admitted had a significantly lower Sao_2, by about 4%, than those who were not admitted.

Although there was some variation between hospitals in the recording of specific vital signs, there was no consistent pattern (data not shown).

DISCUSSION

Documentation of initial assessment of children presenting at paediatric A&E departments for the treatment of asthma in four teaching hospitals in London was incomplete. While heart rate and respiratory rate were recorded in most cases, documentation of PEFR and Fio_2 in the A&E records was very poor. While Sao_2 itself was frequently recorded, Fio_2 was recorded in only about half of cases, making Sao_2 uninterpretable. Our findings also suggest that, where measured, heart rate, respiratory rate, and Sao_2 are being used to guide the decision to admit.

Twenty years ago the British Thoracic Society published the results of a confidential inquiry into death from asthma of adults aged 15 to 64 years.[1] It concluded that 77 of the 90 deaths studied were avoidable, and made recommendations about closer supervision and monitoring of patients with asthma. The British Thoracic Society, with a number of other professional organisations, has since produced clear guidelines for the assessment and management of adults and children with asthma.[4 5] Although these guidelines were published in 1993, and are widely disseminated and accepted, our study found that A&E departments are not following them.

In this study, we did not collect information on other outcomes such as length of hospital stay or reattendance at A&E, but previous studies provide clear evidence that lower oxygen saturation is associated with an increased risk of reattendance for acute care[6 8 9] and need for intravenous treatment.[10] There is a strong consensus among paediatricians that PEFR is a useful indicator of the need for hospital admission. Our findings suggest that the A&E departments are assessing severity of asthma in children inadequately. This may lead to mistakes in the management of these children—either inappropriate discharge or inappropriate admission.

This audit has two main strengths in its methods. Firstly, all children with asthma who attended casualty were included. This means that there was no selection bias that could arise if only children seen by certain members of staff, or at certain times of day, were included. Secondly, it used standardised inclusion criteria and methods of data collection. This means that the methods can be repeated exactly and that the results of future audits will reflect real changes in practice, not changes in the way that data were collected.

One possible reason for the under-recording of PEFR is that it may only be considered interpretable with reference to an expected value for a person. This is not a valid justification for poor documentation, however, because the change in PEFR after inhaled bronchodilators, regardless of the expected value, is important in deciding whether a child should be admitted or not.[4 5 7]

It could be argued that documentation does not necessarily reflect actual care given, so is a poor measure of quality of care.

However, we believe that documentation itself is an important part of the process of care. Trends are often more valuable than single values and cannot be identified unless single values are recorded in the first place. Handover of care to other health care professionals may be incomplete without documentation. Careful recording is also important for medicolegal reasons. It is also unlikely that heart rate, respiratory rate, Sao_2, FIO_2, and PEFR were always measured and simply not recorded.

It seems likely from our results that the decision to admit was at least partly based on heart rate, respiratory rate, and Sao_2. Of course, the decision to admit is influenced by other factors that we did not record, such as the child's social environment, parental anxiety, and other clinical indicators of severity. We cannot tell from our data whether unnecessary admissions occurred or whether children were discharged safely.

Other audits have also found the recording of clinical data to be suboptimal,[12–17] but few have focused on children. In 1989, O'Halloran and Heaf reported that a PEFR was recorded for 35% of children presenting at A&E.[17] Our results suggest that there has been little improvement in the assessment of children with asthma since then despite the introduction of national guidelines.

Good, well disseminated guidance on the assessment and treatment of children with asthma is freely available. Asthma is a major cause of chronic ill health and causes thousands of hospital admissions in children each year.[18] It is probable that many children are discharged inappropriately, leading to worse morbidity and reattendance, or admitted inappropriately leading to avoidable consumption of health care resources. High quality assessment of severity could help reduce this. Our study shows that the guidance is still not followed, even in teaching hospital paediatric A&E departments. Assessment of asthma severity in children should be a high priority for acute trusts. We believe that there is a case for interventions to improve assessment, recording, and understanding of asthma severity indicators in children.

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Contributors

All authors contributed to the design of the study and commented on drafts of the paper. SH wrote the paper. SH and LF collected the data and did the analysis. LF is guarantor.

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