

# ORIGINAL ARTICLE

## Clinical Audit: Management of Acute Severe Asthma in West Glasgow

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### Abstract

#### Background

The UK has 75,000 hospital admissions and over 1,500 deaths from asthma annually. The British Thoracic Society (BTS) guidelines represent the recognised standard for acute asthma management. We assessed the degree of conformity with these guidelines in an acute medical unit.

#### Methodology

Data from consecutive admissions were collected prospectively. Practice was audited in October - December 2005 and October 2006 - January 2007. Between cycles an educational programme was instigated.

#### Results

Fifty-eight patients were included. Clinical parameters were well recorded in both cycles. Peak expiratory flow was consistently under-recorded (72% at admission; 67% in monitoring).

Severity assessment was documented at 55% and 66% in cycle one and two respectively. Of these, the assessment was incorrect in 33% in cycle one and 21% in cycle two. All misclassifications of severity were underestimates. All life-threatening attacks were not identified. No improvement occurred between cycles.

Overall, 60% of patients were inappropriately treated according to BTS guidelines, 40% due to under-treatment. Under-treatment occurred more frequently in cycle two compared with cycle one (57% vs. 24%,  $p=0.007$ ), predominantly due to inadequate treatment of life-threatening asthma.

#### Conclusion

Management of acute asthma in a large, urban teaching hospital is suboptimal. Educational intervention failed to improve care; more comprehensive strategies are required.

#### Key Words

Acute asthma, British Thoracic Society (BTS), audit, management

### Background

Scotland has the highest prevalence of asthma in the world, affecting over 18% of the adult population.<sup>1</sup> It still accounts for over 1,500 deaths annually (predominantly in primary care) and 75,000 hospital admissions each year in the UK.<sup>1</sup> Confidential enquiries into asthma-related deaths have implicated suboptimal assessment of these patients as one factor contributing to the adverse outcome.<sup>2,3</sup> Recognition of the suboptimal management of acute severe asthma expedited the production of the British Thoracic Society (BTS)/Scottish Intercollegiate Guidelines Network (SIGN) guidelines which represent the evidence-based, standard of care by which acute asthma should be managed.<sup>4</sup>

The BTS/SIGN guidelines emphasise the importance of objective assessment of asthma severity (Table I) to guide intervention. The BTS also highlight the importance of assessing background disease, with patients whose asthma is severe or poorly controlled at increased risk of near-fatal or fatal asthma attacks.<sup>2,4,5</sup>

Table I – Assessment of Attack Severity

#### Moderate exacerbation

Increasing symptoms  
PEF > 50-75% best or predicted

#### Acute Severe

PEF 33-50% best or predicted  
Respiratory rate > 25/min  
Heart rate > 110/min  
Inability to complete sentence in one breath

#### Life-threatening

PEF < 33% best or predicted  
SpO<sub>2</sub> < 92%  
PaO<sub>2</sub> < 8 kPa  
Normal PaCO<sub>2</sub>  
Silent chest  
Cyanosis  
Feeble respiratory effort  
Bradycardia, dysrhythmia  
Hypotension  
Exhaustion, confusion, coma

#### All patients

PEF monitoring continued on ward

PEF = peak expiratory flow rate

SpO<sub>2</sub> = oxygen saturations

Adapted from BTS acute asthma guidelines (ref. 4)

The BTS/SIGN guidelines recommend that hospital inpatients with acute asthma exacerbations are managed in specialist rather than general units, where available.<sup>4</sup> This is supported by evidence that respiratory physicians adhere better to recommended treatment guidelines and that patient outcome is improved.<sup>6,7</sup> However, practicalities of the NHS necessitate that many of these acute asthmatic patients are managed in acute medical units, and subsequently under the care of non-respiratory general physicians. Despite well recognised national guidelines, studies have demonstrated ongoing suboptimal care of acute severe asthma.<sup>8,9</sup>

## Aims

The audit aimed to examine the initial assessment and management of patients with acute exacerbations of asthma admitted to the acute medical unit (AMU), predominately managed by non-respiratory physicians.

### Objectives were to determine:

- 1) The adequacy of clinical assessment of the acute asthmatic patient, including assessment of the underlying disease severity and clinical parameters required to objectively assess the severity of the acute attack.
- 2) Whether these parameters were then used to form an objective assessment of the attack severity, and how accurately this was compared with the BTS/SIGN guideline levels of severity.
- 3) Whether the asthma attack had then been managed, according to its severity, in concordance with the BTS/SIGN guidelines.
- 4) Whether, following educational intervention between audit cycles, an improvement in clinical practice had occurred.

## Methodology

The audit was conducted in an urban teaching hospital with a catchment of approximately 220,000. We examined the assessment and management of the acute asthma attack within the initial 24 hours of admission to hospital. Data was collected prospectively from consecutive admissions to our acute medical unit using a standardised proforma based on the BTS guidelines. Data was collected from the medical notes, 'end-of-the-bed folder' for peak flow recording, and patients' drug charts.

The criteria for inclusion were: a diagnosis of asthma and a presenting complaint or clinical findings indicating an acute exacerbation – features including shortness of breath, cough, wheeze, difficulty breathing, and fall in peak flow readings. Patients were excluded if they had radiologically confirmed pneumonia or a diagnosis of chronic obstructive airways disease.

Two cycles of data collection were performed from October to December 2005 and October 2006 to January 2007; the second cycle was extended, due to low admission frequency, to include a comparable number of patients. Between cycles an educational programme directed towards medical staff contributing to acute receiving was instigated, including both junior and consultant level physicians. Hospital-wide and departmental presentations were undertaken. Displayed guidelines were updated in the accident and emergency

department, where within our unit patients were always assessed by the medical receiving team before transfer to the AMU. Guidelines were available via internet access on the AMU.

Statistical comparison was made between the two cycles using the chi-squared test (significance level set at  $p < 0.01$  to account for the potential confounding effect of multiple comparisons).

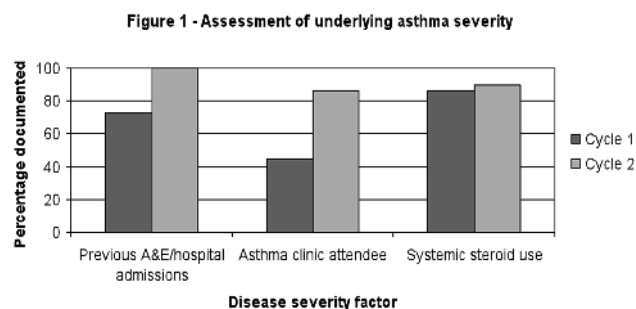
## Results

### Patient population

Data was collected from 58 patients, 29 in each cycle. Median age was 36 years (IQR: 23-51) in audit cycle one, and 33 years (IQR: 23-49) in cycle two. Female admissions accounted for 62% and 38% of patients in cycle one and two, respectively.

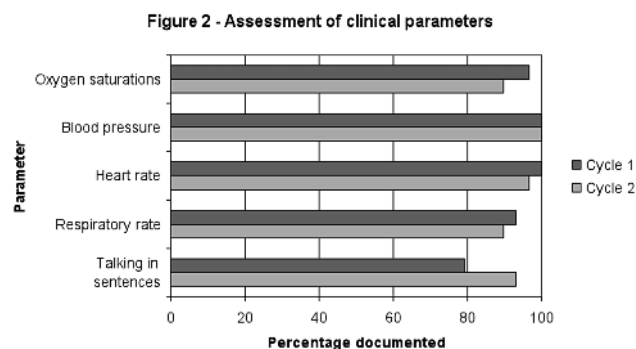
### Assessment of underlying disease severity

Figure 1 shows the documentation of potential indicators of background asthma severity by the receiving team. The average number of factors recorded per patient was two out of three in cycle one and 2.8 out of three in cycle two.



### Recording of clinical parameters

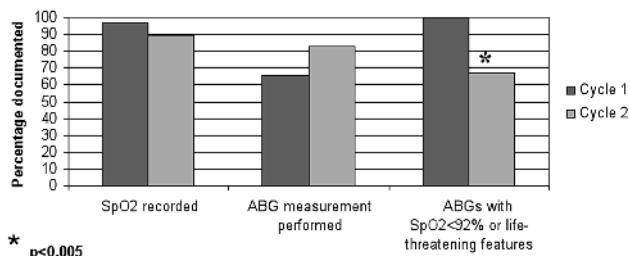
The documentation of clinical parameters is shown in Figure 2, with no significant difference found between cycles. In addition, peak expiratory flow rate (PEFR) was documented at admission in 76% (22) of patients in both audit cycles. The PEFR was compared with the patient's best value or predicted PEFR in 66% (19) and 83% (24) in cycle one and two, respectively. When patients were admitted to the AMU, PEFR monitoring was performed during convalescence in 62% (18) and 73% (21) of patients in cycle one and two, respectively.



The adequacy of oxygenation assessment via pulse oximetry ( $SpO_2$ ) was documented in the majority of patients at admission (Figure 3). ABGs are recommended when saturations fall

below 92%, or patients display other features of life-threatening asthma. In cycle two, 33% of patients with such features were not further assessed via ABGs.

Figure 3 - Assessment of oxygenation



### Assessment of the attack severity

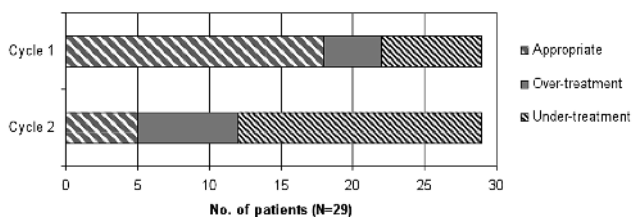
Of the 29 patients in each audit cycle, the severity of the acute asthma attack was documented in 15 patients (55%) in cycle one and 19 patients (66%) in cycle two, with no significant improvement ( $p=0.286$ ). Comparison was made between the documented attack severity and the actual severity level based on the patients' clinical parameters. In cycle one, 10 (67%) of the 15 patients with a documented severity assessment were appropriately assessed, while in cycle two, 15 (79%) of 19 patients were appropriately assessed; there was no significant improvement between audit cycles ( $p=0.18$ ). All inappropriate assessments were under-estimates of the attack severity.

Overall, 23 of the 58 patients (57%) audited had either no documented attack severity or an under-estimate of the attack severity made. Failure of documentation or under-estimation of severity resulted in failure to highlight acute severe or life-threatening asthma attacks in 84% (16 of 19) of patients in cycle one and 89% (16 of 18) of patients in cycle two. All life-threatening asthma attacks in both audit cycles were not identified (eight attacks in cycle one and 16 attacks in cycle two).

### Management of the acute attack

The appropriateness of treatment in each attack was compared to the BTS/SIGN guidelines for each audit cycle (Figure 4). Overall, 60% (35) of patients were inappropriately treated for their attack severity, with 41% (24) being due to under-treatment. There was a significant increase in under-treatment of attacks in cycle two (17 patients (57%)) compared with cycle one (seven patients (24%)) ( $p=0.007$ ); this was predominantly due to under-treatment of life threatening attacks (15 patients) in cycle two.

Figure 4 - Treatment of acute asthma attack



Inadequate treatment was more commonly due to the failure to initiate intensive care review and omission of intravenous magnesium and ipratropium nebulisers in patients with life-threatening asthma attacks. Treatments included within the BTS guidelines, but not assessed in our audit, are oxygen therapy and continuous beta-agonist nebulisation. Oxygen is not prescribed within our unit, thus it was difficult to assess whether it had been administered and we currently do not have the facilities to provide continuous nebulisation.

### Discussion

Acute asthma is a common and serious cause of hospital admission, particularly in young adults. We demonstrated that receiving physicians are effectively recording many of the indicators required to objectively assess these patients, but then failed to translate these parameters into an accurate assessment of asthma attack severity. Of concern was the consistent under-treatment of acute asthmatics, particularly evident in life-threatening attacks. We documented no adverse outcomes in terms of emergency intubations/ITU admission or mortality in our audit population during the initial 24-hours of hospitalisation. However, it has been previously demonstrated that asthmatics who are under-treated during admission have higher rates of morbidity post-discharge and significantly increased re-admission rates.<sup>7</sup>

Educational intervention failed to improve the management of acute asthma within our unit. Although aimed at the whole medical receiving team, the majority of junior staff participating in the educational programme will have rotated to other posts between the audited periods, so diluting any improvement we may have anticipated. Recent changes in junior doctors' training structure may also mean that the initial assessing physician has less medical receiving experience or knowledge gained via post-graduate examinations. In addition, doctors-in-training most frequently highlight acute medicine as the area in which they lack knowledge and ability.<sup>10</sup>

Our intervening educational programme targeted the medical receiving team, with limited involvement of nursing and other staff. Monitoring for improvement and early identification of a struggling patient is an important aspect in the management of acute asthma - with nurses often best placed to recognise such changes if provided with the relevant knowledge. Nurses and pharmacists are also often more stable members of staff, thus in whom, the effect of educational intervention within the unit could have been more sustained.

Previous studies have utilised admission proformas for acute asthma with good effect,<sup>11,12</sup> an approach our unit is considering. Care Bundles are also being implemented successfully in other critical care situations,<sup>13</sup> providing a means to systematically apply evidence-based treatment and provide ongoing feed-back to the involved team. Such an approach could be utilised in acute asthma, potentially incorporating acute admission care to discharge planning and follow-up.

### Conclusions

Acute asthma is an area of clinical practice with long-standing problems. Our audit demonstrated that, despite recording relevant indicative parameters, receiving teams are still failing to appropriately assess and manage acute asthma. Educational intervention failed to improve clinical practice and more comprehensive strategies are required.

## Acknowledgements

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**Competing interests:** None

### References

- Masoli M, Fabian D, Holt S et al for the Global Initiative for Asthma (GINA); GINA report: Global Burden of Asthma. February 2004 - www.ginasthma.com.
- Burkall CE, Slack R, Godley CC, et al. Scottish Confidential Inquiry into Asthma Deaths (SCIAD), 1994-6. *Thorax* 1999; 54: 978-84.
- Wareham NJ, Harrison BD, Jenkins PF, et al. A district confidential enquiry into deaths due to asthma. *Thorax* 1993; 48: 1117-20.
- British Thoracic Society, Scottish Intercollegiate Guidelines Network (SIGN); British guideline on the management of asthma; *Thorax* 2008;63:iv1-iv121 www.brit-thoracic.org.uk.
- Richards GN, Kolbe J, Fenwick J, et al. Demographic characteristics of patients with severe life threatening asthma: comparison with asthma deaths. *Thorax* 1993; 1105-9.
- Burkall CE, Robertson C, Moran F, et al. Differences in hospital asthma management; *Lancet* 1988; 1: 748-50.
- Pearson MG, Ryland I, Harrison BD. National audit of acute severe asthma in adults admitted to hospital. Standards of care committee, British Thoracic Society. *Qual Health Care* 1995; 4(1): 24-30.
- Harvey S, Forbes L, Jarvis D et al. Accident and emergency departments are still failing to assess asthma severity. *Emerg Med J* 2003; 20: 329-331.
- Gibbons D. An audit of the management of acute asthma in accident and emergency. *Nursing Times* 2005. 101: 55-8.
- Smith GB, Poplett N. Knowledge of aspects of acute care in trainee doctors. *Postgrad Med J* 2002; 78: 335-8.
- Town T, Kwong T, Holst P, Beasley R. Use of a management plan for treating asthma in an emergency department. *Thorax* 1990 Sep; 45(9): 702-6.
- Steurer-Stey C, Grob U, Jung S et al. Education and a standardized management protocol improve the assessment and management of asthma in the emergency department. *Swiss Med Wkly* 2005 Apr 16; 135(15-16): 222-7.
- Gao F, Melody T, Daniels DF et al. The impact of compliance with 6-hour and 24-hour sepsis bundles on hospital mortality in patients with severe sepsis: a prospective observational study. *Critical Care* 2005; 9: 764-70.

# Book Review

## The Foundation Programme for Junior Doctors, Getting In, Getting On and Getting Out

*Ferras Alwan, Rohin Francis, Emma-Jane Smith*

Radcliffe Publishing, Oxford, 2007

This book provides the reader with some much needed information on the medical career pathway. Changes to the training system in recent years have resulted in confusing and often contradictory information filtering through to medical students and Foundation Year 1 trainees. It provides succinct information in an easy-to-read format. It is well laid out with the relevant sections easily identifiable. The move from MDAP to MTAS has resulted in some major changes and these are well explained in chapter 2. The book is suitable for all medical students as well as doctors from the Foundation Programme. Advice and tips on application forms is applicable to those both entering the Foundation Programme and specialist training pathways. Although it can be repetitive at times, this does serve to stress the important details of the application system. The book is well laid out with the important general information prioritised in the initial chapters. Subsequent sections deal with focused areas of the application form and training programmes. It imparts some important knowledge on the specialist training schemes and the non training posts that have recently been implemented. The section dealing with frequently asked questions is also particularly helpful. It explains solutions to many of the common problems that arise in training. Furthermore, the book dedicates a chapter on useful resources and where to seek even more specialist advice. In summary, this is a highly recommended text for all those both embarking and wanting to progress on the newly implemented and often intricate medical training programme.

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