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Childhood asthma in the Emergency Department: An audit

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ABSTRACT

Introduction: The prevalence of asthma has been rising, particularly in younger age groups. In the 12-month period from February 2012 there were 28 deaths due to asthma in children under 18 in the United Kingdom, the majority of which were preventable. The purpose of this audit was to determine how effective our Emergency Department is at managing children presenting with acute asthma.
Method: We undertook a retrospective audit of 50 consecutive presentations to Huddersfield Royal Infirmary Emergency Department between 1 August 2013 and 31 March 2014 that met the inclusion criteria. Whether each patient had initial vital signs, timely initial management, vital signs after initial management, and appropriate further management were audited.
Results: The majority of patients were male; mean age was 8.5 years. There were deficiencies in measurements for systolic blood pressure (14%), conscious level (30%), and peak flow (46%). Most patients received the correct dose of β_2 agonist (96%) and oral or IV steroid (82%). Approximately 50% had further vital signs recorded. Thirty-six per cent were discharged with the correct dose of prednisolone.
Conclusion: Certain aspects of the management of childhood asthma are being overlooked. We have suggested an improved integrated care pathway that we feel will improve the deficiencies highlighted.
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1. Background

Over the past 50 years the prevalence of asthma, particularly in developed countries, has been on the rise. This increase is particularly pronounced in younger age groups, which in turn has greater associated economic burden. According to World Health Organization (WHO) statistics, there are approximately 235 million people worldwide who suffer from asthma, and it is the most common chronic disease in childhood (World Health Organization, 2013). It is estimated that the prevalence of asthma increases by 50% each decade (Braman, 2006), with current worldwide prevalence thought to be between 5% and 10% (Al-Jahdali et al., 2013). However, symptom prevalence varies considerably between countries; generally speaking, asthma is more prevalent in developed countries but more severe in developing countries (Lai et al., 2009). Although mortality rates are falling overall, there are still approximately 180,000 deaths annually worldwide attributable to asthma (Braman, 2006).

In Europe, there are thought to be approximately 30 million people suffering from asthma, with around 15,000 deaths annually (Asthma UK, 2013). The United Kingdom has one of the highest prevalences of asthma not only in Europe, but also in the world, with approximately 5.4 million people suffering from asthma (Royal College of Physicians, 2014). Of these, over 1.1 million are children (NHS Choices, 2012). This not only places a huge financial burden on the National Health Service (NHS), but also has significant psychological and economic implications for sufferers and their families. In children, asthma can cause considerable distress and can be responsible for many missed school days and reduced participation in social activities. Furthermore, in England, 69% of parents or guardians of asthmatic children report having to take days off work as a result of their children's asthma, and 13% report having lost their jobs (Braman, 2006). In line with worldwide trends, asthma mortality rates in the United Kingdom are relatively low. In the 12-month period from February 2012 there were 65,316 hospital admissions due to asthma of which 25,073 (38.4%) were children. Of these admissions there were 195 deaths due to asthma, of which 28 were children under the age of 18 (14.4%) (Royal College of Physicians, 2014). The majority of deaths that do occur are preventable and efforts are being made to further reduce mortality rates, with national campaigns such as 'Inhalers in Schools' (Asthma UK, 2014).

The British Thoracic Society (BTS) defines asthma in children as the presence of more than one symptom of wheeze, difficulty in breathing, chest tightness, and cough (British Thoracic Society, 2012). These symptoms are usually most pronounced at night and early in the morning. The specific underlying causes of asthma are still somewhat unclear, but are thought to be multi-factorial. The three primary factors contributing to airway narrowing are thought to be bronchial muscle contraction, mucosal swelling and inflammation, and increased mucus production (Longmore et al., 2010).

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Children with asthma often have a family history of atopy, and frequently suffer from other associated diseases such as eczema, hay fever, and food allergies.

Asthma is a leading cause in children for attendance to the Emergency Department. However, in the vast majority of cases, the child will already have an established diagnosis of asthma and the reason behind the presentation is an acute exacerbation of asthma despite treatment. Reasons behind these exacerbations include viral infections, bacterial infections, pollution, allergies, second hand cigarette smoke, and psychological factors such as stress. In a recent study it was found that 92.9% of asthma deaths in children were due to potentially avoidable factors (such as under-assessment of asthma severity, problems with routine management with a failure to follow guidelines, and lack of patient education); the study also found that the majority of deaths in children occurred during the summer months with 64.3% dying between March and September (Royal College of Physicians, 2014). This suggests that deaths due to asthma occur as a direct result of exacerbating factors with associated atopic disorders being more prevalent in the summer months.

The management of asthma over the past 50 years has changed for the better with implementation of national and local guidelines, as well as advancements in drug treatments and applied research (Royal College of Physicians, 2014). This has in turn led to improved quality of care for patients and has contributed towards the relatively low mortality. However, the fact remains that a vast majority of asthma deaths are due to avoidable factors with studies suggesting that up to 75% of deaths could have been prevented (Royal College of Physicians, 2014). Monitoring of asthma tends to be done in a primary care setting, but when treatment fails to control symptoms patients will often present to the Emergency Department rather than to their general practitioner. Therefore it is arguable that the Emergency Department is an ideal setting to look at ways of improving care for acute exacerbations of asthma. The Emergency Department at Huddersfield Royal Infirmary is large with approximately 80,000 new attendances each year, of which 30% are children; in an average week roughly 1500 patients are seen (Calderdale and Huddersfield NHS Foundation Trust, 2013).

In 2002 the College of Emergency Medicine (CEM) set a clinical standard for the treatment of asthma in children in the Emergency Department, as shown in Table 1 (College of Emergency Medicine, 2013), since then local trusts have created their own childhood asthma integrated care pathways (ICP). Both BTS and CEM emphasise the importance of measuring oxygen saturation, heart rate, respiratory rate, and peak flow in children over the age of 5 presenting with an acute asthma attack. Failure to properly measure and assess the severity of an exacerbation has been shown to contribute towards asthma deaths in children. The National Review of Asthma Deaths found that a poor recognition of severity was found to be an important avoidable factor in 29% of children in secondary care (Royal College of Physicians, 2014). There are specific cut off points used to determine patients who require admission and those who are safe to discharge: however, these depend on the aforementioned vital signs being measured correctly and in a timely fashion.

An ICP is a structured multidisciplinary document that incorporates best evidence recommendations with a view to reducing unnecessary clinical variation and providing the best possible care (Campbell et al., 1998). The purpose of an asthma ICP is to highlight the optimum sequencing and timing of interventions by a multidisciplinary team (Edwards and Fox, 2008).

Numerous previous studies have shown that the implementation of an integrated pathway results in a decreased length of hospital stay and decreased costs; some studies also showed improved clinical outcomes (Cunningham et al., 2008; Edwards and Fox, 2008; Kelly et al., 2000).

The purpose of this audit was to determine how effective an Emergency Department at a large district general hospital is at adhering to the CEM clinical standards for the management of children presenting with an acute asthma attack. On doing a literature search, there is a dearth of similar studies involving children with asthma in the Emergency Department, particularly in the United Kingdom. Furthermore, CEM has yet to publish the results of this current nationwide audit. The studies or audits that do exist tend to focus on the management of asthma in adults in the Emergency Department. An audit in Spain, which evaluated the management of children with acute asthma in an Emergency Department, found that there were deficiencies in determining the degree of severity of the asthma attack, poor background history, and inadequate recording of respiratory rate and peak flow (de Mingo Alemany et al., 2009). Another audit, performed at an Emergency Department at a university teaching hospital in the USA, found that although there was adequate recording of pulse oximetry and administration of β-agonists, improvements were required in the administration of steroids and measurement of peak flow (Ly and Dennehy, 2007). A further audit, conducted at a Paediatric Emergency Department at a children's hospital in Sudan, found that the primary deficiencies were in the measurement of peak flow and oxygen saturations, as well as poor documentation of background history and administration of steroids on discharge (Ibrahim et al., 2012).

2. Methods

2.1. Data collection

The study included 50 consecutive presentations to Huddersfield Royal Infirmary Emergency Department between 1 August 2013 and 31 March 2014. The population studied included children between the ages of 5 and 16 who presented with moderate or severe asthma. Those who presented with life threatening symptoms, or those with a peak flow (PEFR) of greater than 75% of their normal or predicted value (i.e. those with mild asthma), were excluded. Likewise, those who fell outside the age range set out in the inclusion criteria were also excluded. Records were obtained using the Emergency Department Information System (EDIS). Data were only obtained from the information entered in the electronic records. Information on paper, such as on early warning score charts, was excluded.

Table 1
College of Emergency Medicine standards for the management of asthma in children (College of Emergency Medicine, 2013).

	Moderate	Severe
Oxygen prescribed	Maintain saturations >92%	Maintain saturations >92%
Vital signs	See Table 2	See Table 2
β_2 agonist +/– ipratropium	Two to 10 puffs via spacer (or salbutamol 2.5–5 mg or terbutaline 5–10 mg by nebuliser); increase by two puffs every 2 min up to 10 puffs depending on response	Ten puffs via spacer or salbutamol 2.5–5 mg or terbutaline 5–10 mg by nebuliser; add 250 μg ipratropium (5 μg/kg) via spacer or nebuliser if poor response
Steroid	Oral prednisolone 30–40 mg (over 5 years) or 20 mg (2–5 years)	Oral prednisolone 30–40 mg (over 5 years) or 20 mg (2–5 years); IV hydrocortisone 4 mg/kg if vomiting
Drug on discharge	Oral prednisolone 30–40 mg for up to 3 days	Oral prednisolone 30–40 mg for up to 3 days

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