

ASTHMA IN THE EMERGENCY DEPARTMENT: STRATEGIES BEYOND ACUTE MANAGEMENT PROTOCOLS

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ABSTRACT

Evidence-based guidelines and protocols describe the management of acute asthma in the Emergency Department. However, secondary prevention measures and strategies aimed at reducing Emergency Department re-presentation after discharge from an acute asthmatic exacerbation are generally poorly advocated by clinicians based in the acute-care environment. In this article, we discuss aspects beyond acute management protocols that relate to the acute asthmatic patient presenting to the Emergency Department.

THE BURDEN OF ACUTE ASTHMA IN THE EMERGENCY DEPARTMENT

Exacerbations of acute asthma are a frequent cause of Emergency Department (ED) presentations, resulting in more than two million annual ED visits in the United States, at an average cost of approximately US\$1 500 per visit.¹ Depending on severity, the mainstay of acute asthma management includes inhaled β_2 -agonists, inhaled ipratropium bromide and a systemic corticosteroid. Magnesium sulphate and intravenous salbutamol may be required in severe presentations, whereas the rapidly deteriorating patient may even require mechanical ventilation and the administration of subcutaneous adrenalin. Acute asthma management protocols have been published by both local and international experts.^{2–7}

Since 2003, Emergency Medicine has been registered with the Health Professions Council of South Africa (HPCSA) as a recognised specialty. Over the past decade, almost all tertiary-level care and many secondary-level care hospital EDs have been run by specialist emergency physicians. As a result, the role of the ED clinician has evolved from a 'traffic officer' role – merely directing patients to the appropriate specialty – to more comprehensive patient management. Many individuals presenting with

life-threatening conditions, including exacerbations of acute asthma, are now appropriately managed and discharged from the ED without requiring sub-specialty assessment. The management of acute asthma and other emergencies is included in undergraduate as well as post-graduate emergency medicine curricula;⁸ however, secondary prevention measures have received less emphasis.

Patients who are discharged after initial improvement may subsequently relapse and re-present to the ED within 1–2 weeks. Re-presentation rates of between 4.1% and 18% have been reported.^{9–14} In a single retrospective study, 9.1% of patients who re-presented eventually required hospital admission.¹¹ Factors associated with a greater likelihood of an ED revisit after initial improvement from an acute asthma exacerbation include: age younger than two years, black race, prior diagnosis of persistent asthma, poor socio-economic status, increased healthcare use within the past year,⁹ a history of urgent clinic visits over the previous year, use of a home nebuliser, multiple asthma triggers, the lack of an identifiable primary-care physician,¹⁰ use of a short-acting inhaled β_2 -agonist within six hours of ED presentation, the presence of chest retractions on physical examination, clinician oversight in prescribing an inhaled corticosteroid (ICS) on discharge, not being prescribed

a written action plan,¹² female sex, symptom duration of ≥ 24 h prior to an ED visit, prior use of oral corticosteroids,¹³ any ED visit in the past two years, previous admission for asthma treatment, use of a combined ICS plus a long-acting β_2 -agonist and use of oral corticosteroids at the time of ED presentation.¹⁴

Despite knowing the risk factors and sequelae of ED representation, secondary prevention measures and strategies aimed at reducing ED re-presentation after discharge from an acute asthmatic exacerbation are generally poorly advocated by clinicians based in the acute-care environment.

EDUCATION

South Africa is a country known for its ethnic and cultural diversity, and its language and cultural barriers pose significant difficulties with regard to asthma care.¹⁵ A lack of asthma education has been associated with ED overcrowding and a strain on resources. Together with uncontrolled asthma, a lack of asthma education is one of the major factors leading to frequent ED visits (three or more visits/year).¹⁶ In a prospective study by Al-Muhsen and colleagues, 56.4% of patients reported not receiving asthma education. In this study poor asthma education was associated with both uncontrolled asthma and frequent ED visits. Patients who received asthma education were less likely to stop their ICS therapy when their symptoms improved.¹⁷ In a recent Canadian study, significantly lower rates of both primary care and ED visits were evident in patients who attended an asthma education centre.¹⁸

The ED is reserved for patients who are beyond primary healthcare capabilities. Many patients presenting to EDs can be managed at a lower level of care facility.¹⁹ In one study, approximately 50% of patients with an acute asthma exacerbation stated that they presented to the ED because of convenience, although many could have been managed

TABLE I: ASPECTS OF ASTHMA EDUCATION

Inhaler technique
Adherence to therapy
Symptoms of uncontrolled asthma
Written action plan
Side-effects of medication
Allergic rhinitis treatment
Ongoing allergen and irritant exposures
Avoidance of cigarette smoking
Psychosocial problems (family dysfunction, depression)
Ongoing follow-up

either at home with appropriate use of an action plan or at a lower-level care facility. Therefore, educating patients regarding the use of an asthma action plan and when to present to an ED is paramount in avoiding an unnecessary strain on ED resources.²⁰

Asthma educational strategies in the ED have also been reported to improve follow-up after ED discharge. A meta-analysis that included 825 patients with asthma exacerbations showed that ED-directed educational interventions increased the likelihood of follow-up visits with their primary-care physician after ED discharge.²¹ On the other hand, ensuring a regular follow-up appointment with the primary-care physician can also decrease future repetitive ED visits.²² A lack of asthma education is also more likely to lead to the improper use of an asthma inhaler device.²³ Table I lists aspects of asthma education that may be discussed prior to ED discharge.

INHALER TECHNIQUE

The National Heart, Lung and Blood Institute (NHLBI) asthma guidelines recommend that providers confirm correct inhaler technique and impart asthma education at every interaction. Appropriate inhaler choice and correct technique are described in Table II.^{6,7,24} Improper asthma inhaler device use has been associated with poor asthma control and frequent ED visits.²³ The results of a recent systematic review

TABLE II: AGE-RECOMMENDED CHOICE AND TECHNIQUE OF INHALER DEVICE^{6,7,24}

AGE GROUP	PREFERRED DEVICE	TECHNIQUE OF USING PMDI
Adults, adolescents and children older than six years	Pressurised metered dose inhaler (pMDI) with a spacer* or a dry powder inhaler (DPI) device.	1. Remove cap from the mouthpiece of the inhaler and shake well. 2. If using the pMDI for the first time or when using after more than seven days, prime the device by releasing one puff into the air. 3. Attach inhaler to the back of the spacer and facemask. 4. Hold upright, with thumb below the base and finger on top of the canister. 5. Stand or sit upright and fully exhale through the mouth. 6. Place the mouthpiece of the spacer between the teeth and seal the lips tightly around it. 7. As subject starts breathing in slowly through their mouth, press down once on the inhaler. 8. Keep breathing in as slowly and deeply as possible, holding the breath for at least 10 seconds or as long as possible (one-breath method). Alternatively, if unable to execute the above, then inhale and exhale five times slowly through the spacer (standard method). 9. Wait about 15–30 seconds between puffs for short-acting β_2-agonist.
4–5 years	pMDI with a valved spacer and mouthpiece.	Repeat steps 1–7 as described above, then encourage the child to take 5–10 tidal breaths.
0–3 years	pMDI with a valved spacer and face mask. A nebulizer with a face mask may be considered in children who are unable to use a spacer device effectively.	1. Remove cap from the mouthpiece of the inhaler and shake well. 2. Attach inhaler to the back of the spacer. 3. Place the face mask tightly over the child's mouth and nose, ensuring a good seal. 4. Press down once on the inhaler. 5. Allow and encourage the child to take 5–10 tidal breaths. 6. Ensure that the valve is moving while the child is breathing.

* Use of a spacer device when using a pMDI improves drug delivery and reduces the risk of the side-effects related to inhaled corticosteroids (ICS).
Note: Devices and techniques described in the lower age categories may also be considered in older age groups.

concluded that inhaler technique was poor among children globally. When all included studies were assessed, correct technique was found in 0–57%, 0–89% and 0–35% of papers that studied usage of a metered dose inhaler (MDI) without a spacer, an MDI with a spacer and a dry powder inhaler (DPI), respectively. Authors also reported asthma education to be an effective strategy in improving inhaler technique.²⁵ Another systematic review in adults showed a compliance rate of inhaler use on only 20–73% of days and inhaler technique was correct in approximately half of the patients who were included in the review.²⁶ Therefore, clinicians must review and educate patients on correct inhaler technique prior to discharge after an acute asthmatic exacerbation.

WRITTEN ACTION PLAN

Current guidelines recommend that all patients with asthma receive a written action plan, irrespective of severity.⁶ However, only 10–25% of patients with asthma do receive a written asthma action plan.²⁷ Lieu and colleagues noted that patients who were prescribed a written asthma management plan were half as likely to visit an ED or require hospitalisation compared to those who lacked a plan.²⁸ The most common reason among providers for failure to prescribe a written action plan is a lack of time.²⁹ A recently published review found that patients generally are inconsistent in their use of written asthma action plans even when they are recommended by healthcare providers.³⁰ Likely reasons include forgetfulness or misplacement of the action plan document. As a result, mobile phone applications have been developed to improve the accessibility and use of asthma action plans.³¹ A review of a patient's understanding and use of a written action plan is absolutely essential prior to discharge after an acute asthma exacerbation.

PEAK-FLOW METER

Guidelines recommend the use of home-based peak-flow devices to self-monitor asthma control.^{6,7} Hence the correct technique of using a peak-flow meter must be reviewed prior to ED discharge. In a US-based study, Ayala and colleagues found that less than 10 per cent of providers actually questioned patients regarding peak-flow meter use. Patients who were followed up one month later were significantly more likely to monitor their therapy with a peak-flow meter when the subject was broached during the medical visit.³²

Buist and colleagues, in a study that included 296 adults, questioned the value of home-based peak-flow monitoring. The authors concluded that this form of monitoring did not confer additional benefit over symptom monitoring in adult subjects with moderate to severe asthma who were appropriately educated with regard to the management of asthma.³³

CORTICOSTEROID THERAPY

A short course of an oral corticosteroid after an acute asthma exacerbation has been associated with a reduction in acute asthma relapse.³⁴ Current local guidelines recommend a

three-day course in children not requiring hospitalisation⁴ and a 7- to 14-day course in adults³ and in children in whom the acute asthma attack has not completely resolved.⁴ However, in adults a 5–7 day course may be sufficient,^{6,35,36} whereas, with regard to the paediatric age group, Altimimi and colleagues demonstrated that a single dose of 0.6 mg/kg of dexamethasone administered orally showed equivalent efficacy to 1 mg/kg of prednisolone taken twice a day for five days in the setting of mild to moderate asthma.³⁷

Patients presenting to EDs with an acute asthma exacerbation may be non-adherent or may have never been initiated on appropriate long-term ICS therapy.¹² In addition to improved symptom control, long-term ICS therapy has been associated with lower frequencies of acute asthma exacerbations and a decrease in ED visits.³⁸ Therefore, a visit to the ED may signal poor asthma control and should prompt the attending clinician to probe for any underlying reasons and implement strategies to improve future control.

A Cochrane review published in 2012 that included 909 patients found no short-term benefit when prescribing a combination of an ICS together with a systemic corticosteroid on ED discharge for acute asthma.³⁹ Although no short-term benefit was shown with ICS, the long-term benefits are undisputed. Therefore, in addition to prescribing short-term systemic corticosteroids, ED clinicians must review adherence and dosing of controller therapy or establish such therapy as a long-term standard of care.³⁸

With regard to temporary high-dose ICS therapy, the overall evidence is inconsistent.³⁹ A prospective study reported no benefit with up to an eight-fold temporary increase in the dose of ICS, although there was a trend towards a reduction in the mean total symptom score at the end of the study.⁴⁰

MANAGING ASSOCIATED ALLERGIC RHINITIS

Prior to discharge after an acute exacerbation, patients should be evaluated for the presence of rhinitis and treated appropriately. According to the united airway disease concept, both asthma and rhinitis affect the respiratory tract mucosa and are manifestations of the same disease process.⁴¹ The Allergic Rhinitis and Its Impact on Asthma (ARIA) guidelines, which are endorsed by the World Health Organisation (WHO), underline the role of allergic rhinitis (AR) as a risk factor for poorly controlled asthma.⁴² AR is an independent risk factor in both atopic and non-atopic individuals for the subsequent development of asthma.⁴³ AR is very common in patients with asthma.⁴⁴ A systematic review that examined the prevalence of co-morbid AR reported a point prevalence of AR between 24% and 94% and a lifetime prevalence between 50% and 100% among adults with asthma in Europe and the United States.⁴⁵ Clinically diagnosed AR has been associated with significantly worse asthma control.⁴⁶ Nasal steroids combined with inhaled steroids have been proved to reduce bronchial responsiveness to a methacholine challenge in subjects with asthma. This strategy has also been associated with a

reduction in ED visits for asthma exacerbations.^{47,48}

FOLLOW-UP

Follow-up rates after an ED visit are generally low and range from 22% to 52%.⁴⁹ A study conducted in a low-income urban setting reported that telephone coaching and monetary incentives significantly increased follow-up rates.⁵⁰ A follow-up with an asthma specialist or at a specialised asthma clinic is more likely to reduce ED revisits when compared to a follow-up with a primary-care provider. This was confirmed in a systematic review that included ten randomised control trials. The authors strongly recommended that a follow-up appointment be made prior to ED discharge and that the patient be reminded telephonically several days later. They further strongly recommended that the follow-up visit take place within one week of the ED visit.⁵¹

CONCLUSION

Acute-care clinicians must pay more attention to issues beyond acute asthma management protocols. Beside improving overall patient outcomes, these strategies also have an impact on ED overcrowding and resource constraints. Prior to discharge, patients must be initiated on a short course of an oral corticosteroid, receive long-term inhaled controller therapy, have their inhaler technique evaluated and where necessary corrected, receive adherence and allergen-avoidance counselling, receive a written action plan, be initiated on therapy for co-morbid AR and be booked for a scheduled appointment at an asthma clinic. All of these strategies can be implemented easily in the acute-care environment by the provider team prior to ED discharge.

DECLARATION OF CONFLICT OF INTEREST

The authors declare no conflict of interest.

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