Original Article

A local perspective to asthma management in the accident and emergency department in Malta

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ABSTRACT

Aim: This study was performed to assess the management of adult patients presenting to the Mater Dei Hospital Accident and Emergency (A&E) department with acute asthma. **Subjects and Methods:** Asthmatic patients age 14 or older who presented to A&E department between January and October 2010 with asthma exacerbations were included. Data were collected from the clinical notes and analyzed. **Results:** A total of 244 patients (67.2% females) were included, 126 (51.6%) were admitted, 97 (39.8%) discharged and 21 (8.6%) discharged themselves against medical advice. There was a decline in the presentations between January and July, followed by an upward trend until October ($P = 0.42$). Pulse oximetry was performed in 207 patients (84.8%), arterial blood gases in 133 (54.5%), peak expiratory flow rate in 106 (43.4%) and chest radiography in 206 (84.4%) patients. The respiratory rate was documented in 151 (61.8%), heart rate in 204 (83.6%) and ability to complete sentences in 123 (50.4%) patients. One hundred and ninety six patients (80.3%) were given nebulized bronchodilators, 103 (42.2%) intravenous corticosteroids, 7 (2.87%) oral corticosteroids, 109 (44.7%) oxygen, 28 (11.5%) antibiotics and 9 (3.69%) magnesium. Systemic corticosteroids and antibiotics were more commonly prescribed to patients admitted ($P < 0.001$). **Conclusion:** Management of acute asthma in Malta requires optimization in order to compare with international guidelines.

KEY WORDS: Accident and emergency department, adults, asthma exacerbations

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INTRODUCTION

Asthma has been shown to have prevalence of 7-10% world-wide[1] and 9% in Malta[2] and is a common cause of emergency room visits.[3] Asthma exacerbations require prompt evaluation and treatment to limit morbidity and mortality.[3] Recent studies reveal that management of adult asthma in the accident and emergency (A&E) department setting often differs from that which is recommended in clinical practice guidelines.[4] Common problems include poor adherence to published guidelines, inadequate assessment and recognition of severity and confusion over the use and interpretation of investigations. Others include infrequent measurement of the peak expiratory flow rate (PEFR), insufficient use of systemic steroids, over-reliance on bronchodilators, delayed specialist or intensivist referral and poor follow-up arrangements.[5,6] In view of the absence of local data, the current management of acute exacerbations in a hospital setting was reviewed and compared to international guidelines.

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SUBJECTS AND METHODS

The study was carried out over a period of 43 weeks, between January and October 2010. Approval was obtained from the Chairman of the Department of Medicine, all consultants at the A&E department and admitting consultant respiratory physicians together with the data protection officer at Mater Dei Hospital. Mater Dei Hospital is the only state hospital and secondary referral center present serving the entire population of Malta – 417,617 in 2010.[7] An average of 110,000 patients present to the A&E department per year. The bed capacity is of 949 beds including 20 beds in the intensive care unit. No beds are solely reserved for respiratory

cases. Respiratory teams are readily available during the morning and early afternoon with a respiratory consultant on call for the rest of the time. All patients under the age of 65 admitted with acute asthma are admitted under the care of a respiratory physician. Patients presenting to private hospitals were not included. A number of health centers is available throughout the island where nebulized bronchodilators are readily available. A number of patients with acute asthma present at these centers and were not included in our cohort, unless they were referred to A&E department with persistent or worsening asthma.

All patients 14 years or older who presented to A&E department were included. All A&E notes of the discharged patients were reviewed and patients with asthma exacerbations identified. Patients admitted with asthma exacerbations were identified from a record book kept for medical admissions. Knowledge based on international guidelines was utilized.

The study consisted of recording demographic data, mode of clinical presentation, drug history, management at A&E department and the management plan for all discharged and admitted adult patients presenting to A&E department during the stipulated time with acute asthma exacerbations. Patients' names and identity numbers were not recorded.

Analysis of the data was performed using the Statistical Package for the Social Sciences (SPSS®). Statistical analysis of the results was performed using Pearson Chi-square test and *t*-test. A *P* value of <0.05 was considered to be statistically significant.

RESULTS

A total of 244 patients, 164 females (67.2%) and 80 males (32.8%) were included. The mean age was 44 ranging between 14 and 95 years. Of these, 126 patients (51.6%) were admitted, 97 (39.8%) were discharged and 21 (8.6%) discharged themselves against medical advice. The admission rate for females and males was 57.6% and 39.2% respectively ($P = 0.007$). There was a statistically significant difference ($P = 0.002$) between the age of those admitted (mean 48, range 14-95) and those discharged (mean 40, range 14-82). There was no significant difference in the admission and discharge rate across the months ($P = 0.42$). One patient (0.41%) was referred to A&E department by a respiratory physician, 2 (0.82%) patients by a general physician, 96 (39.3%) by a general practitioner (GP) and 142 (58.2%) were self-referred. The trend in the number of admissions and discharges per month with asthma exacerbations can be seen in [Figure 1] and the times of presentation are seen in Figure 2.

On presentation to the A&E department, 189 patients (77.5%) were using regular inhaled bronchodilators at the time of the exacerbation, 77 (31.5%) were using regular inhaled corticosteroids (ICS), 104 (42.6%) had received nebulized bronchodilators at the auxiliary health centers within a few hours prior to presentation, 48 (16.4%) were prescribed antibiotics and 44 (18%) were on oral corticosteroids previously prescribed by their GP. Compliance to treatment could not be calculated as it was often not documented. One hundred and forty seven patients (60.2%) had symptoms suggestive of a respiratory tract infection. Sixty one patients (25%) were current smokers and 31 (12.7%) were ex-smokers. Forty two patients (17.2%) were febrile at presentation with 69% of these patients admitted ($P = 0.028$). The respiratory rate was documented in 151 patients (61.8%), the heart rate in 204 (83.6%) and a record on the ability to complete sentences in 123 (50.4%), by A&E department staff. Pulse oximetry (SpO_2) was performed in 207 patients (84.8%), arterial blood gases (ABGs) in 133 (54.5%), a PEFR in 106 (43.4%) and a chest radiograph in 206 (84.4%). A radiological infiltrate suggestive of pneumonia was reported in 12 patients (6%). A white cell count (WCC)

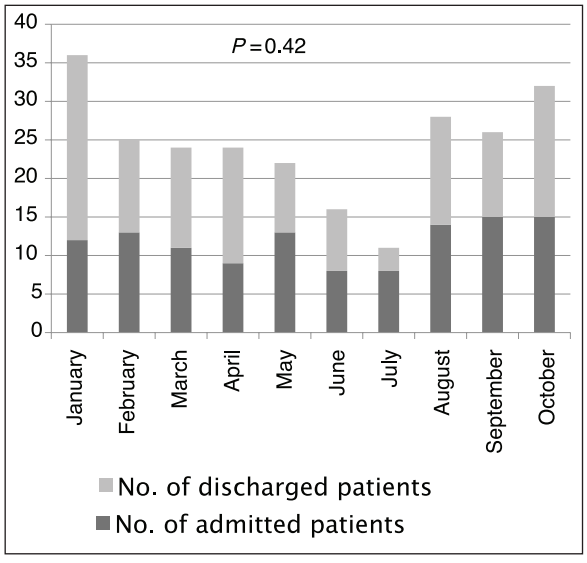

Figure 1: Number of patients presenting to the accident and emergency department with asthma exacerbations per month

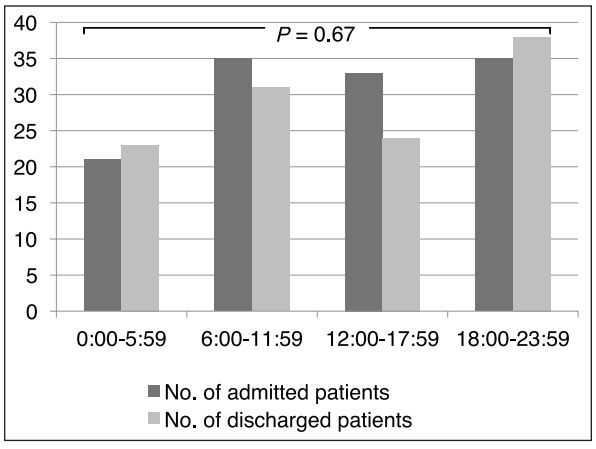

Figure 2: Number of patients versus time of presentation to the accident and emergency department

was available in 165 patients (67.6%), which was elevated in 30.2% of admitted patients and in 12.7% of discharged patients ($P = 0.1$).

In the A&E department, 196 patients (80.3%) were treated with nebulized bronchodilators, 109 221 (44.7%) were given oxygen, 103 (42.2%) intravenous corticosteroids, 7 (2.87%) oral corticosteroids, 28 (11.5%) were given antibiotics and nine (3.69%) required intravenous magnesium. The oxygen dose concentration administered was infrequently documented. There was a statistically significant difference between systemic corticosteroid administration at the A&E department and the admission rate ($P < 0.0001$), but not for antibiotic administration ($P = 0.076$).

On discharge from the A&E department, 32 patients (27.1%, $n = 118$) were referred for follow-up to a respiratory physician and 26 patients (22%, $n = 118$) were referred to their GP.

Figure 3 compares antibiotics and systemic corticosteroids prescribed to patients admitted or discharged. Antibiotics were prescribed to 51% and systemic corticosteroids to 63% of patients. Oxygen saturation monitoring was ordered in 54 (42.9%) and PEFR monitoring in 40 (31.7%) of admitted patients and intravenous corticosteroids were prescribed in 69% of admitted patients. Figure 4 compares clinical features recorded on patients admitted or discharged and [Figure 5] compares investigations performed on such patients. Of patients who had an elevated WCC ($n = 53$), 39 patients were admitted and 14 were discharged ($P = 0.1$). Statistical analysis of blood gas results and SpO_2 were unreliable since there was no standardization as to when these investigations were performed in relation to oxygen therapy and timing of treatment.

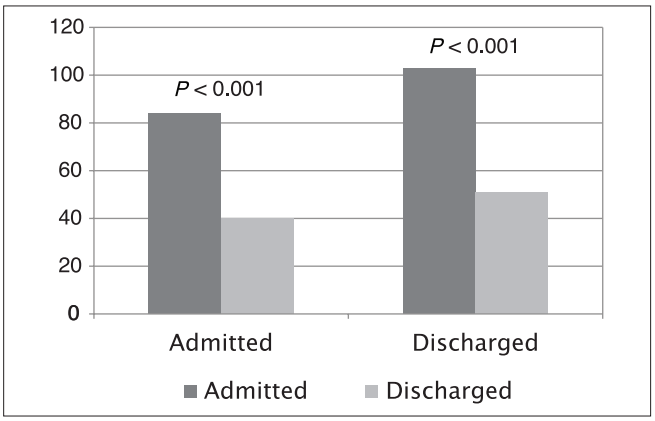

Figure 3: Comparing treatment prescribed to the admitted and discharged patients

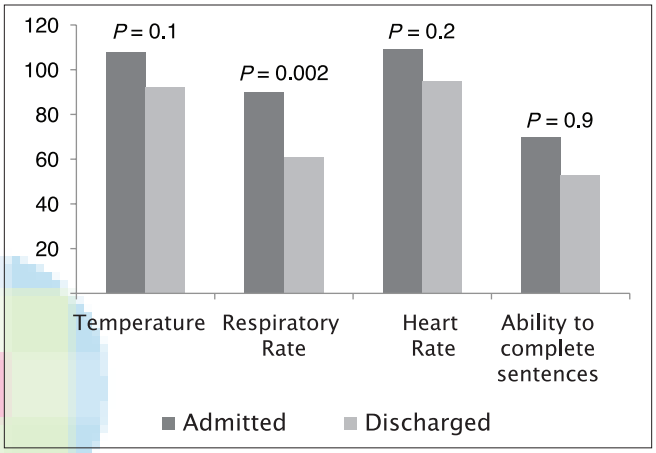

Figure 4: This graph compares the percentages of admitted (n=126) or discharged (n=118) patients whose clinical features were present and documented

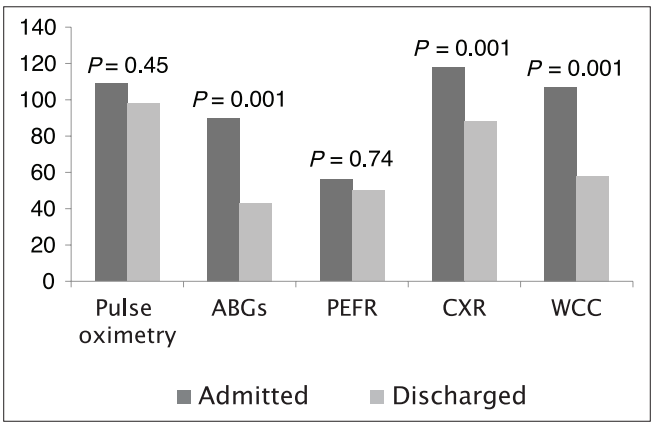

Figure 5: Compares the percentages of admitted (n=126) or discharged (n=118) patients in whom these investigations were performed

DISCUSSION

Hospitalizations and A&E department visits account for a large proportion of the health-care cost burden of asthma.[8] Clinical evidence demonstrates that management of acute asthma in the emergency room entails crucial decisions that could determine the clinical outcome.[9] Progression in the severity of an acute asthma attack can occur very rapidly. Therefore, close monitoring of patient progress is critical to identify patients most likely to have a severe course of illness.[10]

Presentation time to the A&E department was highest between 8 am and 12 pm, which indicates that the onsets of patients' symptoms were most likely to have occurred in the earlier hours of the morning. The downward trend in the number of presentations between January and July followed by an upward trend is in keeping with increased presentations during colder temperatures and more frequent respiratory tract infections, but unlikely to be due to allergen exposure. A majority of patients who presented in July were admitted suggesting worse exacerbations possibly explained by non-compliance to asthma medications during better weather conditions.

The severity of the exacerbation determines the treatment administered.[11] The general appearance of patient, including difficulty in speaking, respiratory rate and heart rate form the basis of the clinical assessment of severity.[5] Indices of severity, particularly PEFR, pulse rate, respiratory rate and pulse oximetry, should be monitored during treatment.[11] In our A&E department, such vital signs were not always checked or documented. This seems to be a problem internationally since similar studies show that the heart rate was measured in 72%[12] and 50%[13] and a respiratory rate in 16%[12] and 27%[13] of patients. Locally, patients discharged home were less likely to have had their heart and respiratory rates checked possibly because these patients appeared to be objectively better. However, this is not justified. In fact, an increasing heart rate is closely correlated with increasing severity of asthma.[6] These parameters are crucial though not solely important. Lung function tests are the basis for assessment of the severity of the asthmatic attack[5] used to measure changes in expiratory airflow. Without unduly delaying treatment, a baseline PEFR or forced expiratory volume in one second (FEV_1) measurements should be made before treatment is initiated.[11] Locally, a PEFR was performed in <50% despite peak flow meters being readily available and documentation of whether it was carried out pre- or post-treatment was poor. Neither was PEFR calculated as the percentage predicted for patients' sex, height and age. The importance of PEFR seems to be underestimated at our A&E department. In a study by Linares *et al*., PEFR was monitored in 20% of patients,[13] whilst in another study, it was performed in 60% on admission, 58% on discharge and 47% on both occasions.[12] One might argue that patients who are distressed would be unable to perform spirometry or PEFR. However, Silverman *et al*. demonstrate conclusively that most adult patients seen for severe asthma exacerbations in an A&E department can successfully perform criteria-specific acceptable and reproducible spirometry maneuvers.[14] PEFR is mentioned on any guideline as an objective measure leading to the decision of whether a patient should be admitted or discharged.

Oxygen saturation of <92% predicts the need for hospitalization and the Global Initiative for Asthma (GINA) guidelines recommend that this should be closely monitored, preferably by pulse oximetry.[11] Locally, the majority of patients had at least one reading in both admitted and discharged patients, but regular monitoring was infrequent despite being non-invasive, painless, easily performed and not time consuming. In two similar international audits, pulse oximetry was performed in 72%[12] and 93%[13] of patients. It was not possible to determine any statistically significant difference between the admitted and discharged patients due to lack of standardization as to when it was checked in relation to treatment administration. Lack of pulse oximetry should not prevent the use of oxygen.[15] ABG analysis should follow if there is concern that the patient is not improving,[11] if the data is thought to be unreliable[6] or for oxygen saturations of <92% on room air [5] whilst the patient is kept on supplemental oxygen.[11] In our A&E department, ABG acquisition was often carried out haphazardly and frequency was similar to an international audit.[13] Locally, ABGs were taken more frequently in the admitted patients indicating their use in the more severe cases. Oximetry provides real-time, continuous measurements, whereas ABGs are monitored only intermittently and the samples take time to process.[6] Hence, every A&E department officer should justify ABG sampling.

According to the GINA guidelines, a chest X-ray (CXR) is not routinely required in adults, but should be carried out if a complicating cardiopulmonary process is suspected, in patients requiring hospitalization, those not responding to treatment and where a pneumothorax may be difficult to diagnose clinically.[11] There is a tendency locally, as is the case internationally,[13] to take CXRs unnecessarily with practically all admitted patients having one done. Despite being non-invasive, one must avoid exposing patients to unnecessary radiation thereby reducing healthcare costs.

The aims of treatment during an exacerbation are to relieve airflow obstruction and hypoxemia as quickly as possible and to plan the prevention of future relapses. The primary therapies for exacerbations include repetitive administration of rapid-acting inhaled bronchodilators, early introduction of systemic glucocorticosteroids and oxygen supplementation.[13]

Inhaled β-agonists given in high doses act quickly to relieve bronchospasm.[15] Bronchodilators were administered to the majority mostly in the nebulized form. Some who did not receive bronchodilators at A&E department most likely had improved after presently receiving bronchodilators at the auxiliary health centers or GPs. The addition of ipratropium bromide to inhaled β-agonist therapy is recommended since it provides an increase in the bronchodilator response in severe asthma [5] although this is controversial according to other studies[16] It is recommended that a dose of systemic corticosteroids should be administered within the first hour of treatment for acute asthma for all but mild attacks[6] since they markedly reduce the need for hospital admission.[5] The local administration rate (45%) is less when compared to 60% in a Canadian cohort and 68% in an American cohort[17] and to 80%,[13] 82%,[18] and 60%[19] in other studies. Oxygen therapy should be titrated against pulse oximetry to maintain satisfactory oxygen saturation[11] and should only be prescribed in severe asthma with hypoxia to achieve saturations greater than 92%.[5] Despite being so frequently used and so readily available, its use was documented in 50% of our cohort, which creates doubt over whether this reflects its actual use. In a study, Linares *et al*. document its use in 60% of patients.[13] Documentation of the oxygen concentration utilized was also lacking in our study. When unresponsive to bronchodilator therapy or in life-threatening or near fatal asthma intravenous

magnesium sulphate use must be considered.[15] In a systematic review, it was concluded that most A&E department physicians accept its efficacy, but despite this, its use remains uncommon, as is the case in our study. Emergency physicians appear to appropriately restrict its use to patients with severe acute asthma.[20] Both ipratropium bromide and intravenous magnesium have been shown to reduce hospitalizations for moderate to severe exacerbations.[21]

Response to treatment may take some time and patients should be closely monitored using clinical as well as objective measurements. Treatment should continue until measurements of lung function return to their previous best or otherwise before a decision to admit or discharge can be made. The GINA guidelines recommend that patients with pre-treatment FEV_1 or PEFR <25% or post-treatment FEV_1 or PEFR <40% predicted or personal best, usually requires hospitalization. Patients with post-treatment lung function of 40-60% predicted or more may be discharged.[11] Some patients respond rapidly to aggressive therapy and they can be discharged quickly while others require admission for more prolonged treatment. This poses a major challenge in the A&E department.[2] Only about 6-13% of affected patients require admission to hospital[6] as shown in a study with admission rates of 11% and 21%.[16] Our elevated admission rate of 51.6% could be an overestimate as milder cases tend to visit the health centers with only the more severe cases reaching A&E department. Another two studies document admission rates of 35.2%[18] and 54.2%.[19] Antibiotics should not be routinely prescribed as bacterial (as opposed to viral) infections seldom provoke exacerbations and their routine prescription does not influence outcome.[5] The discharging doctor should ensure that patients are discharged on regular ICS and that their inhaler technique is checked.[11] Locally there was under-prescription of ICS, with other international studies showing inferior results of 20%,[1] 11%[17] and 16.2%.[22] Doctors are also encouraged to prescribe a 7 day course of oral steroids as this improves outcome with a fourfold reduction in relapse rate in the following week,[5] and reduction in admission rates,[23] along with continuation of bronchodilator therapy.[11] Their use should be encouraged locally though similar international studies show similar values.[12,17,22] Ipratropium bromide is unlikely to provide additional benefit beyond the acute phase. [11]

Prior to discharge, instructions to contact primary health-care professional or an asthma specialist and follow up within a few days of discharge should be given.[11] Local data reveals that <50% of patients were advised to have such a follow-up. Similar studies report referral for follow-up in 12.8%[17] and 86.2%.[22] Prospective data indicate that patients discharged from A&E department for follow-up with specialist care do better than patients returned to routine care.[11] The reason for presentation to A&E department should be addressed, with the aim of directing patients toward primary health-care services in the community during a similar exacerbation together with exploring possible actions to prevent future emergency presentations.[15] To reduce the risk of relapse, optimizing management after discharge should be a high priority.[6] There is strong evidence to support the role of action plans detailing how to prevent and manage future exacerbations.[6] In similar studies, it was concluded that the assessment and treatment was often suboptimal,[12] management diverged from guideline recommendations and there was underuse of corticosteroids and inappropriate admission rates according to severity[9] as appears to be the problem locally.

Limitations of this audit include lack of documentation, especially in the management plan of discharged patients. At times, this gave uncertainty if treatment was actually given, but not documented. The audit deals with asthmatic patients presenting to A&E department; however, we are aware that many attend health centers where nebulized bronchodilator treatment and doctor assessment is readily available.

CONCLUSION

The implementation of a local guideline should aid to define the severity of the exacerbation, optimize treatment, whilst avoiding unnecessary admissions and hence reducing healthcare costs. A proforma sheet would also help improve documentation.

Presentation to A&E department is a good opportunity to educate patients about their condition, identify pitfalls in their management and help prevent future presentations to A&E department.

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The publication and implementation of a local guideline on asthma management at the A&E department should lead to an improvement, which can be assessed by another study.

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