ORIGINAL ARTICLE

Oman Medical Journal [2024], Vol. 39, No. 4: e654

Acute Asthma Management in a Tertiary Hospital in Oman

Suhaila Al Farsi and Nasser Al Busaidi*

Department of Medicine, Royal Hospital, Muscat, Oman

ARTICLE INFO

Article history:
Received: 16 November 2023
Accepted: 12 May 2024

Online:
DOI 10.5001/omj.2024.93

Keywords:
Asthma; Emergency Service, Hospital; Oman.

ABSTRACT

Objectives: The quality of asthma management in tertiary hospitals' emergency departments (EDs) is key to sustained asthma control. We assessed the quality of asthma care and adherence to guidelines at the Royal Hospital in Oman. ***Methods***: We conducted a retrospective, observational study examining the medical records of asthma patients who presented to the ED between 1 June 2014 and 1 June 2016. ***Results:*** A total of 217 patients were included in the study. Lack of proper documentation was observed throughout the study. Only 80 patients (59.7% of 134 available records) were on controller therapy and 51 were reported to be compliant. No asthma severity assessment was conducted, and 57 (32.9%) patients experienced respiratory distress. Peak expiratory flow rate measurements were not performed for all patients; chest X-ray was performed for 145 (66.8%) patients, and blood gas analysis for 83 (38.2%). The mean±SD time from the initial assessment to the treatment initiation was 12.0±11.0 minutes. Systemic steroids and nebulizers were used for initial management in 70.5% (n = 153) and 96.3% (n = 209) of patients, respectively. Reassessments at one and two hours following initial assessment were not done for all patients; reassessment records were missing for 50 (54.9%) patients after the first hour, and 50 patients after the second hour. Out of the total sample, 45 (20.7%) patients required hospital admission, with the majority (93.3%) admitted to the medical ward. Post-discharge procedures recommended by guidelines were rarely employed. ***Conclusions:*** There is a serious lack of adherence to asthma management guidelines in the ED. The 2009 Omani Ministry of Health guidelines should be updated, considering the recent updates of Global Initiative for Asthma strategies, adopted as the standard of care, and disseminated with regular monitoring to ensure compliance.

The prevalence of asthma among adults in Oman was estimated to be 7.3% in 2013; of those, 54% had poorly controlled asthma.[1] This poor control usually lead to more frequent asthma-related visits to the emergency department (ED). In 2008, the frequencies of asthma-related hospitalizations and ED visits reported in Oman were 30% and 58%, respectively.[2,3]

The annual updates of the Global Initiative for Asthma (GINA) guidelines are widely available for healthcare professionals; they are also translated into many languages, including Arabic, to ensure accessibility. Numerous assessment and management algorithms are developed according to these guidelines to facilitate the implementation. However, international audits have indicated a major discrepancy between the standard of current medical management of acute asthma in hospitals and that recommended in the guidelines.[4,5]

Numerous studies have revealed that common issues in asthma management include poor adherence to published guidelines, inadequate assessment and recognition of severity, and confusion over the use and interpretation of investigations. Other problems in asthma management include infrequent measurement of the peak expiratory flow rate (PEFR), insufficient use of systemic corticosteroids, overreliance on bronchodilators, a delayed decision for pulmonologist referral or intensive care unit admission, and poor follow-up arrangements.[6–15]

In 2009, the Omani Ministry of Health released a national guideline for the management of asthma referencing the 2008 GINA guidelines and the British Thoracic Society Scottish Intercollegiate Guidelines Network (BTS/SIGN).[16] Nonetheless,

*Corresponding author: ✉enhsa66@yahoo.co; enhsa@hotmail.com

in the Royal Hospital (RH) in Muscat, no guidelines are designated in the ED computerized system or the management of acute asthma. Furthermore, no national audit of acute asthma management in the ED of a tertiary healthcare center has been undertaken in Oman.

Assessment of the quality of asthma care in developing countries is imperative because of the increasing prevalence of this disease, the large associated socioeconomic and psychosocial burdens, and the lack of treatment, which leaves much room for improvement.[4] Therefore, we aimed to determine the current medical management of acute asthma in tertiary hospitals in Oman and whether it is at the standard recommended by the 2017 GINA,[17] BTS/SIGN guidelines, and evidence-based recommendations.

METHODS

This retrospective, observational, single-center study assessed clinical evaluation and management procedures for acute asthma in the ED in the RH between 1 June 2014 and 1 June 2016.

Cases were identified by reviewing the charts from the Al-Shifa Healthcare Information System in the RH in 2017. The included patients were Omani, ≥ 13 years old, diagnosed with asthma, and presented to the ED in the RH with acute asthma. Patients with a known history of chronic obstructive pulmonary disease, congestive heart failure, bronchiectasis, no history of asthma, interstitial lung disease, or obesity hypoventilation syndrome/obstructive sleep apnea were excluded.

The case report form was generated using information adapted from GINA 2017 and BTS/SIGN guidelines on managing acute asthmatic exacerbations.

The data collected included demographics, medical history, pharmacological management, and follow-up arrangements for discharged patients. Information on the clinical evaluation procedures was also recorded, particularly the use of PEFR measurements, chest X-ray (CXR), and arterial blood gas (ABG) in asthma severity assessment and management.

For CXR interpretation, an abnormal CXR finding was defined as opacification (patchy), diffuse (bilateral), or lobar consistent with infection) or air leakage, such as pneumothorax or pneumomediastinum. Hyperinflation, stable granulomas, or bronchial wall thickening were not considered clinically significant abnormalities.[18]

The data were entered into the EpiData entry client and analyzed using SPSS Statistics (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.)

The study was approved by the RH institutional ethics committee. All research was completed following the tenets of the Declaration of Helsinki. As this was a retrospective study of historically routinely observed information from clinical practice, no informed consent was needed. All the data were documented anonymously and safely stored to ensure the anonymity and confidentiality of the patients' data throughout the study.

RESULTS

A total of 446 patients showing symptoms of acute asthma attack. Of those, 217 met the eligibility criteria and were included in the study. The mean ±SD age was 41.0±17.4 years. Males constituted 30.9% (n = 67) of the study population, and 68.2% (n = 148) were residents of Muscat, Oman.

Only 17 (7.8%) patients had recorded smoking status. Of those, only two were active smokers. Among 134 patients with available information about controller therapy, 80 (59.7%) patients were receiving controller therapy, mainly long-acting beta-agonist therapy (n = 64; 80.0%). Of the 127 patients whose records included information about compliance with controller therapy, 51 (40.2%) patients were compliant. In addition, 53 (24.4%) patients only received rescue therapy [Table 1].

Across the population, the mean body temperature was 36.8±0.7 °C, and only 5.5% (n = 12) of patients had a fever, defined as an axillary temperature of ≥ 38 °C. The mean respiratory rate was 20.3 (3.2) breaths/minute, the mean oxygen saturation level was 96.6 (3.7%), and the mean heart rate was 100.6 (20.8) beats/minute.

A total of 173 patient records contained information regarding respiratory distress; 57 (32.9%) patients experienced respiratory distress. Respiratory distress was mainly assessed clinically, with no mention of severity in the records. Additionally, none of the records had documented PEFR measurements before or during the ED visit.

A total of 145 (66.8%) patients underwent CXR, and 6.9% of those (n = 10) showed evidence of opacification. Blood gas analysis was performed for 83 (38.2%) patients. The mean $PaCO_2$ was

Table 1: Demographics and baseline characteristics of the study population (N = 217).

Variables	n (%)
Age, mean ± SD, year	41.0 ±17.4
Gender	
Male	67 (30.9)
Female	150 (69.1)
Governorate (n = 216)	
Muscat	148 (68.2)
A'Dakhiliyah	12 (5.5)
A'Dhahirah	2 (0.9)
Al Batinah North	13 (6.0)
Al Batinah South	16 (7.4)
Al Buraimi	1 (0.5)
Al Wusta	2 (0.9)
A'Sharqiyah North	8 (3.7)
A'Sharqiyah South	7 (3.2)
Dhofar	7 (3.2)
Smoking status	
Unknown smoking status	200 (92.2)
Documented smoking status	17 (7.8)
Active smoker	2 (11.8)
Past smoker	4 (23.5)
Non-smoker	11 (64.7)
Is information about current controller therapy available?	
Yes	134 (61.8)
No	83 (38.2)
If yes, is the patient on controller therapy (inhaled corticosteroids)? (n = 134)	
Yes	80 (59.7)
No	54 (40.3)
Controller therapy taken in combination with (n = 80)	
LABA	64 (80.0)
LAMA	6 (7.5)
LTRA	15 (18.8)
MX	12 (15.0)
Oral steroid	0 (0.0)
Omalizumab	0 (0.0)
Is information about compliance to controller therapy available?	
Yes	127 (58.5)
No	90 (41.5)
If yes, is the patient compliant with controller therapy? (n = 127)	
Compliant	51 (40.2)
Non-compliant	76 (59.8)

LABA: long-acting beta-agonist; LAMA: long-acting muscarinic antagonists; LTRA: leukotriene receptor antagonist; MX: methylxanthine.

Table 2: Clinical presentation on initial assessments (N = 217).

Variables	n (%)
Vital signs on initial assessment, mean ± SD	
Temperature, °C	36.8 ± 0.7
Heart rate, beats/min	100.6 ± 20.8
Respiratory rate, breaths/min	20.3 ± 3.2
Respiratory distress (n = 173)	57 (32.9)
Oxygen saturation, %	96.6 ± 3.7
Assessments done during the ED visit	
CXR	145 (66.8)
Collection of blood gases	83 (38.2)
Arterial blood gas analysis	44 (53.0)
Venous blood gas analysis	39 (47.0)
Assessments results	
Opacification on CXR (n = 145)	10 (6.9)
$PaCO_2$, mean ± SD, mmHg	37.2 ± 8.0
PaO_2, mean ± SD, mmHg	56.1 ± 25.8
Hypoxemia (SpO_2 < 90%) (n = 83)	6 (7.3)
Normal $PaCO_2$ (35–45 mmHg) (n = 83)	33 (39.8)
Hypercapnia ($PaCO_2$ > 45 mmHg) (n = 83)	14 (16.9)
pH, mean ± SD	7.4 ± 0.4
Acidosis (pH < 7.35) (n = 83)	5 (6.0)

Data presented as mean ± SD unless otherwise indicated. ED: emergency department; CXR: chest X-ray; $PaCO_2$: partial pressure of carbon dioxide; SpO_2: saturation of peripheral oxygen.

83 (38.2%) mmHg, 33 (39.8%) had normal $PaCO_2$ (defined as 35–45 mmHg), and 16.9% had hypercapnia (defined as $PaCO_2$ > 45 mmHg). The mean PaO_2 was 56.1±25.8 mmHg, and the mean pH was 7.4±0.4. More details on the initial assessments performed in the ED and their clinical findings are shown in Table 2.

Patients waited for a mean of 3.9±6.4 hours before presenting to the ED. However, the time from initial assessment to starting management was 12.0 ± 11.0 minutes. Upon initial assessment, 70.5% (n = 153) of the patients received systemic steroids, while 96.3% (n = 209) received nebulizers. Of the latter, 87.6% (n = 183) received a combination therapy of nebulized short-acting beta-agonist (SABA) and short-acting muscarinic antagonist (SAMA). Patients who did not receive SABA at the initial assessment (n = 15; 6.9%) received it in the first hour (n = 2), the second hour (n = 3), or at the final assessment (n = 1). Patients who did not receive systemic steroids at the initial assessment (n = 64; 29.5%) were administered this treatment mainly within the first hour (n = 10). Other medications given in the ED included antibiotics (n = 42; 19.4%) and magnesium sulfate (n = 19; 8.8%).

Patients requiring respiratory support were either provided high-flow nasal cannula oxygen therapy (n = 40; 18.4%) or noninvasive ventilation (n = 4; 1.8%). More information on the characteristics of

Table 3: Medical management of acute asthma in the emergency department (ED) (N = 217).

Variables	n (%)
Waiting time before presenting to the ED, mean ± SD, hours	3.9 ± 6.4
Time from initial assessment to initiating management, mean ± SD, minutes	12.0 ± 11.0
Length of stay in the ED, mean ± SD, hours	2.5 ± 1.5
Systemic steroid given at the initial assessment	
Yes	153 (70.5)
No	64 (29.5)
Timing of giving systemic steroid if not at the initial assessment (n = 64)	
First hour	10 (15.6)
Second hour	4 (6.3)
At final assessment	3 (4.7)
Undocumented	47 (73.7)
Nebulized medication given at the initial assessment	
Yes	209 (96.3)
No	8 (3.7)
Type of nebulized medication given at the initial assessment (n = 209)	
SABA	19 (9.1)
SAMA	7 (3.3)
SABA + SAMA	183 (87.6)
Timing of giving SABA if not at the initial assessment (n = 15)	
First hour	2 (13.3)
Second hour	3 (20.0)
At final assessment	1 (6.7)
Undocumented	9 (60.0)
Other medications given during ED stay	
Antibiotics	42 (19.4)
Magnesium sulphate	19 (8.8)
Respiratory support and oxygen delivery	
HFNC oxygen therapy	40 (18.4)
NIV	4 (1.8)
None	173 (79.7)
Characteristics of patients receiving HFNC (n = 40)	
Tachypneic (respiratory rate > 30 BPM)	5 (12.5)
Respiratory-distressed	21 (52.5)
With normal oxygen saturation (> 95%)	17 (8.5)
Characteristics of patients receiving NIV (n = 4)	
Severely tachypneic	2 (50.0%)
Respiratory-distressed	4 (100%)
With normal oxygen saturation	3 (75.0%)
Hypercapnia	0 (0.0)

SABA: short-acting beta agonist; SAMA: short-acting muscarinic antagonist; HFNC: high-flow nasal cannula; NIV: non-invasive ventilation.

Table 4: Post-management procedures (N = 217).

Variables	n (%)
Admission	45 (20.7)
Type of admission (n = 45)	
Medical ward	42 (93.3)
High dependency unit	2 (4.4)
Intensive care unit	1 (2.2)
Reasons for admission* (n = 45)	
Resuscitation with IV fluids	8 (17.8)
Respiratory distress on initial assessment	24 (53.3)
RR > 30 BPM	4 (8.9)
HR > 120 BPM	18 (40.0)
Saturation < 90%	9 (20.0)
$PaCO_2$ > 35 mmHg	10 (22.2)
Consolidation on CXR	3 (6.7)
Recent frequent presentation to the ED	16 (35.6)
Discharge	172 (79.3)
Medications prescribed upon discharge (n = 172)	
Inhaled steroid	45 (26.2)
LABA	19 (11.0)
LAMA	1 (0.6)
LTRA	1 (0.6)
MX	1 (0.6)
Oral steroid	112 (65.1)
Antibiotics	76 (44.2)

**Patients could have been admitted for more than one reason.*
IV: intravenous; RR: respiratory rate; HR: heart rate; $PaCO_2$: partial pressure of carbon dioxide; CXR: chest X-ray; ED: emergency department; LABA: long-acting beta agonist; LAMA: long-acting muscarinic antagonists; LTRA: leukotriene receptor antagonist; MX: methylxanthine.

patients receiving either respiratory support or the management of acute asthma in the ED is shown in Table 3. The level of documentation of reassessment after initial assessment and management was poor. Fifty (54.9%) patients had no reassessment records at one hour, another 50 had no reassessment documentation at two hours, and three (3.2%) had no reassessment documentation at the final assessment.

Forty-five (20.7%) patients were admitted to the hospital, of which 42 (93.3%) were admitted to the medical ward. None of the admitted patients underwent PEFR measurements before admission or discharge. The main reasons for admission were respiratory distress at the initial assessment (n = 24; 53.3%), tachycardia (n = 18; 40.0%), and prior frequent presentation to the primary healthcare facility (n = 16; 35.6%).

Among the 172 (79.3%) discharged patients, medications were stepped up for only eight (4.7%) patients, inhaler technique was checked in one patient, and a self-management plan was given for one patient. Only five (2.9%) patients were referred to a pulmonologist. More details on post-management procedures in the ED are shown in Table 4.

DISCUSSION

Proper long-term management and appropriate therapeutic interventions are the mainstays for preventing asthma complications and controlling its socioeconomic burden; evidence-based guidelines aim to provide clear plans to achieve these goals. However, their application at the country level may be compromised by considerations such as educational barriers, healthcare delivery systems, and the country's resources.[5] The need to explore the utilization of asthma guidelines in Oman to address the gaps in asthma management and decrease its national burden was outlined in a study describing the characteristics of asthma patients receiving outpatient care in a tertiary hospital (Sultan Qaboos University Hospital (SQUH) in Oman).[19]

Our results, however, differ from those reported by Al-Rawas et al.[19] Only 59.7% (n = 80) of our patients were taking inhaled corticosteroids (ICS), while 94.2% of the SQUH patients used ICS. This difference may be attributable to the lack of documentation in our ED (38.2% of patient records did not contain information about the patients' controller therapy before the ED visit) and to the fact that most SQUH patients had moderate persistent asthma.

Additionally, 40.2% of our patients fully complied with the controller treatment, compared to 25.6% in the SQUH cohort.[19] Such low compliance rates were thought to be due to the lower perceived need for ICS therapy by the patients or the patients' cultural beliefs preventing them from using medications—especially inhalers—regularly. This effect was also observed in a regional study by Al-Jahdali et al.[20] These patients held many false beliefs and misconceptions about bronchial asthma as a disease and the role of ICS, such as its potential to lead to addiction, compromising patients' adherence to medications. Self-reported adherence questionnaires can be utilized to capture such misbeliefs, ensure patients' understanding of their treatment regimen, and monitor their adherence.[21]

Poor documentation was observed during the ED visit and before hospital admission and discharge. Consequently, no records on patients' asthma control levels were available before their presentation to the ED. Although most patients were residents of Muscat and their primary healthcare records were accessible to the ED physicians, there was also no documentation of the previous best PEFR. Inadequate documentation in the ED is linked to patient overcrowding, increased rates of interruptions, and time pressure.[22] Including a preformatted chart customized for acute asthma assessment and management has been shown to enhance the documentation of medical history and assessment procedures in the ED; hence, a similar approach should be incorporated in Omani hospitals.[23]

The GINA guidelines recommend that the PEFR be measured at the initial assessment; additionally, the 2009 Omani guidelines for asthma management advise measuring the PEFR of all asthma patients upon evaluation.[16] However, these guidelines were not followed in the ED. Hence, proper classification of asthma severity was not performed, which may have strongly compromised management decisions. Serial PEFR measurements assess the severity of airway obstruction and objectively demonstrate the patient's response to therapy, guiding physicians to appropriate treatment, the need for admission or discharge, and the possibility of relapse.[4,24] Moreover, PEFR meters are less expensive, easier to use, and more portable than spirometers and should be made available in all EDs.[25] Omani 2009 guidelines still recommend spirometry over PEFR meter usage given the variability in reference values observed for the latter;[16] however, these approaches have been found equally appropriate for screening and monitoring asthma.[26] Interestingly, several studies in Europe and Africa also revealed that < 50% of patients underwent PEFR measurement, demonstrating that its importance is underestimated in ED settings worldwide.[7,8,10] In contrast, vital signs documentation—a duty allocated to nurses—was performed for almost all patients included in our study.

According to the GINA and 2009 Omani guidelines, routine CXR is not recommended for acute asthma because it is only useful in a few cases.[4,16] Studies have established that there is a very low possibility of abnormality in acute asthma.[18,27] Our findings were consistent with this observation; 66.8% (n = 145) of the patients underwent CXR, but only 6.9% (n = 10) had an abnormality.

Similarly, arterial or venous blood gas testing is only recommended in the presence of severe airflow obstruction, particularly if the forced expiratory volume in 1 second or the peak expiratory flow is < 40% of the predicted value or if the patient has

a suboptimal response to first-line therapy.[16,17] In our study, blood gas analysis was performed for 83 (38.2%) patients. The PEFR and forced expiratory volume in 1 second were not measured for all these patients, and the reason for performing blood gas analysis is unknown. Only 6.0% (n = 5) of these patients had acidosis, defined as a pH < 7.35, and 16.9% had hypercapnia, defined as a pH > 45 mmHg.

Therefore, our results support the findings of previous studies in which routine ABG and CXR showed low yields of abnormal results, which is also in line with the currently employed guidelines. Thus, it is safe to reduce CXR and ABG utilization to improve ED efficiency.

Regarding initial management at the ED, a more prominent trend toward adherence to the Omani guidelines was observed. A total of 70.5% of the patients received systemic steroids at the initial assessment, following the guideline recommendations of administering either IV systemic corticosteroid or oral prednisolone in cases of mild attacks.[16] Moreover, 87.6% of our patients received nebulized SABA and SAMA regardless of the severity, which aligns with the BTS/SIGN recommendations for acute asthma management.[28] Nonetheless, recent updates to the GINA guidelines discouraged the use of SABA alone as a reliever therapy because SABA overreliance is linked to an increased risk of exacerbations and an increased risk of asthma-related deaths.[29] The 2019 GINA guidelines and subsequent updates recommend adding ICS to SABA treatment to reduce these risks.[30] These guidelines necessitate a corresponding update to the Omani asthma management guidelines; ICS use is not indicated for the initial management of asthma exacerbations in the latest guidelines.[16]

Over half of our patients did not have any reassessments recorded despite the recommendation in the GINA and 2009 Oman guidelines of patient status reassessment one hour after the initial assessment and at regular intervals, regardless of exacerbation severity, until a clear response to treatment has occurred or a plateau has been reached.[4,16] A lack of proper monitoring was also noted in similar studies in the UK and Europe.[10,31]

Only 6–13% of patients with acute asthma generally require hospital admission.[32] In our study, 20.7% of patients were admitted. This finding may indicate low long-term asthma control; however, definite conclusions cannot be drawn considering the lack of proper documentation. On another note, most reasons for admission reported in our study were based on clinical status at presentation (e.g., respiratory rate and oxygen saturation), while the 2009 Oman guidelines recommend determining the need for admission according to the patient's response to initial treatment rather than asthma severity at initial assessment.[16]

Commonly recommended interventions for decreasing the risk of relapse after discharge include medication adjustment, referral to specialists for follow-up, review of inhaler technique, and patient education.[4,16,32] The implementation of these recommendations was found to be suboptimal in our study. Only 65.1% (n = 112) of our patients were prescribed a course of oral corticosteroids upon discharge, although administering oral corticosteroids for 5–7 days is reported to be associated with reduced relapse rates in the week after discharge.[6]

Only 26.2% (n = 45) of discharged patients were prescribed ICS, which is against the GINA and Omani guidelines for most acute asthma patients.[16,17] Moreover, ICS therapy is reported to decrease the risk of relapse and, in turn, ED visits.[33] In previous studies, under-prescription of ICS was attributed to their unavailability and higher costs;[34] however, underuse may also be connected to a lack of knowledge of updated guidelines.

While the GINA guidelines recommend stepping up controller therapy for 2–4 weeks after discharge,[4] only 4.7% of discharged patients had their medications stepped up. However, 44.8% (n = 77) of discharged patients had no records about their controller medications, which may have prevented the ED physician from prescribing medications due to the risk of overlapping with existing therapy. Hence, the lack of proper documentation may have hindered the delivery of appropriate care for those patients.

The GINA guidelines also recommend referral of patients to their healthcare provider or a pulmonologist within one week for regular follow-up until good symptom control and personal best lung function are achieved.[4] Consistently, the Omani guidelines recommend follow-up within 48 hours in the primary healthcare center for discharged patients from the ED.[16] These recommendations were also overlooked in RH, where only 2.9% of patients were referred to a pulmonologist upon discharge.

Furthermore, only one patient underwent an inhaler technique check in our ED, suggesting that most patients will continue to experience inadequate asthma control. Al-Rawas et al,[19] assessed inhaler technique using a qualified respiratory therapist who used a uniform protocol[35] revealing that only 30.4% had adequate technique.

Additionally, only one discharged patient in our study was given a self-management plan. Providing such plans is recommended to control symptoms and minimize the exacerbations risk and healthcare utilization.[4] Although this practice is generally under-executed and only a small proportion of discharged patients are reported to receive such plans in the National Health Interview Survey data and previous studies,[8,36] our study demonstrated severely limited adherence to this recommendation. This lack of adherence may be related to the nature of ED visits, which do not allow for the proper collection of detailed patient education.[37] Addressing such gaps in designated asthma management procedures may significantly improve asthma care. Moreover, more research is needed to assess the reasons underlying nonadherence to Omani guidelines regarding discharge recommendations.[16]

Overall, the observed clear deficiencies in acute asthma management in the ED can be attributed to several factors. These include a lack of awareness of existing guidelines, noncompliance with international and local guidelines, and insufficient communication among various personnel involved in ED management. Specifically, there are notable gaps in reporting dynamics between junior physicians and their superiors and a lack of effective communication channels between ED physicians and primary care physicians in RH. To overcome these shortcomings, the designated authorities (e.g., Oman Emergency Society, Oman Respiratory Society, and Primary Health Care Society) should liaise to develop updated guidelines for Omani settings. Moreover, efforts should be directed toward delivering proper, regular training to ED personnel on guideline updates; an organizational culture that allows proper patient management within the ED should also be established.

The main limitation of our study was the retrospective chart review of cases; it was found that there was poor documentation of the history, assessment, and management of patients with acute asthma. This lack of comprehensive documentation made it challenging to ascertain the actual care given to patients and what was omitted; moreover, it made it difficult to identify any potential gaps in the treatment process. As a result, the findings of our study may be limited by the incomplete and inconsistent information available in the medical records. Additionally, data on different variables were unavailable, hindering the complete visualization of the patients' ED visits.

CONCLUSION

Our study highlights a serious deficiency in implementing national and international guidelines for managing bronchial asthma in the ED. We suggest that the 2009 Ministry of Health guidelines be updated and disseminated around Oman. In addition, workshops and seminars should be conducted to highlight the magnitude of poor asthma control and the importance of implementing the guidelines.

Disclosure

The authors declared no conflicts of interest. AstraZeneca GCC has funded the medical writing and editorial support of this article.

Acknowledgments

Medical writing and editorial support were provided by DATACl in Contract Research Organization and were funded by AstraZeneca GCC. We would like to thank the following doctors whom helped in data collection: Dr. Jihad Al Kharbooshi, Dr. Areej Al Batrani, Dr. Noor Al Zubaidi, Dr. Wijdan Al Balushi, and Dr. Shamsa Al Harthy

REFERENCES

1. Al-Busaidi NH, Habibullah Z, Soriano JB. The asthma cost in Oman. Sultan Qaboos Univ Med J 2013 May;13(2):218-223.
2. Al-Busaidi N, Soriano JB. Asthma control in Oman: national results within the asthma insights and reality in the Gulf and the Near East (AIRGNE) study. Sultan Qaboos Univ Med J 2011 Feb;11(1):45-51.
3. Khadadah M, Mahboub B, Al-Busaidi NH, Sliman N, Soriano JB, Bahous J. Asthma insights and reality in the Gulf and the near East. Int J Tuberc Lung Dis 2009;13(8):1015-1022.
4. Bateman ED, Hurd SS, Barnes PJ, Bousquet J, Drazen JM, FitzGerald M, et al. Global strategy for asthma management and prevention: GINA executive summary. Eur Respir J 2008;31(1):143-178.
5. Bousquet J, Clark TJ, Hurd S, Khaltaev N, Lenfant C, O'byrne P, et al. GINA guidelines on asthma and beyond. Allergy 2007 Feb;62(2):102-112.
6. Aldington S, Beasley R. Asthma exacerbations? 5: assessment and management of severe asthma in adults in hospital. Thorax 2007;62(5):447-458.
7. Backer V, Harving H, Søes-Petersen U, Ulrik CS, Plaschke

P, Lange P. Treatment and evaluation of patients with acute exacerbation of asthma before and during a visit to the ER in Denmark. Clin Respir J 2008;2(1):54-59.

8. Desalu OO, Adeoti AO, Ogunmola OJ, Fadare JO. Quality of acute asthma care in two tertiary hospitals in a state in South Western Nigeria: a report of clinical audit. Niger Med J 2016;57(6):339-346.
9. Fitzgerald JM, O'Byrne PM, McFetridge JT, Demuth D, Allen-Ramey FC. Pulmonary function testing in the emergency department and medications prescribed at discharge: results of the multinational acute asthma management, burden, and outcomes (MAMBO) study. Prim Care Respir J 2010 Jun;19(2):155-162.
10. Gouder C, Micallef J, Asciak R, Preca JF, Pullicino R, Montefort S. A local perspective to asthma management in the accident and emergency department in Malta. Lung India 2013 Oct;30(4):280-285.
11. Linares T, Campos A, Torres M, Reyes J. Medical audit on asthma in an emergency department. Allergol Immunopathol (Madr) 2006;34(6):248-251.
12. Rowe BH, Bota GW, Clark S, Camargo CA, Multicenter Airway Research Collaboration Investigators. Comparison of Canadian versus American emergency department visits for acute asthma. Can Respir J 2007 Sep;14(6):331-337.
13. Salmeron S, Liard R, Elkharrat D, Muir JF, Neukirch F, Ellrodt A. Asthma severity and adequacy of management in accident and emergency departments in France: a prospective study. Lancet 2001 Aug;358(9282):629-635.
14. Mahadevan M, Jin A, Manning P, Lim TK. Emergency department asthma: compliance with an evidence-based management algorithm. Ann Acad Med Singap 2002 Jul;31(4):419-424.
15. Grunfeld A, Beveridge RC, Berkowitz J, FitzGerald JM. Management of acute asthma in Canada: an assessment of emergency physician behaviour. J Emerg Med 1997;15(4):547-556.
16. Oman Respiratory Society. Guidelines for the management of asthma. Second Edition. 2009 [2016 January 16]. Available from: https://www.moh.gov.om/en/web/general-directorate-of-primary-health-care/resources.
17. Global Initiative for Asthma. GLOBAL strategy for asthma management and prevention 2017 update. 2017 [2019 March 23]. Available from: https://ginasthma.org/archived-reports/.
18. Gentile NT, Ufberg J, Barnum M, Mchugh M, Karras D. Guidelines reduce x-ray and blood gas utilization in acute asthma. Am J Emerg Med 2003 Oct;21(6):451-453.
19. Al-Rawas OA, Jayakrishnan B, Ben Abid F, George J, Baddar SA, Al-Riyami BM. Management and control of asthma in patients attending a specialist centre in Oman. Sultan Qaboos Univ Med J 2009;9(2):132-139.
20. Al-Jahdali H, Anwar A, Al-Harbi A, Baharoon S, Halwani R, Al Shimemeri A, et al. Factors associated with patient visits to the emergency department for asthma therapy. BMC Pulm Med 2012 Dec;12:80.
21. Nassar RI, Saini B, Obeidat NM, Basheti IA. Development and validation of the adherence to asthma medication questionnaire (AAMQ). Pharm Pract (Granada) 2022;20(2):2673.
22. Lorenzetti DL, Quan H, Lucyk K, Cunningham C, Hennessy D, Jiang J, et al. Strategies for improving physician documentation in the emergency department: a systematic review. BMC Emerg Med 2018 Oct;18(1):36.
23. Robinson SM, Harrison BD, Lambert MA. Effect of a preprinted form on the management of acute asthma in an accident and emergency department. J Accid Emerg Med 1996 Mar;13(2):93-97.
24. Henderson SO, Ahern TL. The utility of serial peak flow measurements in the acute asthmatic being treated in the ED. Am J Emerg Med 2010 Feb;28(2):221-223.
25. Nowak RM, Pensler MI, Sarkar DD, Anderson JA, Kvale PA, Ortiz AE, et al. Comparison of peak expiratory flow and FEV1 admission criteria for acute bronchial asthma. Ann Emerg Med 1982 Feb;11(2):64-69.
26. Mamyrbekova S, Iskakova G, Faizullina K, Kuziyeva G, Abilkaiyr N, Daniyarova A, et al. The diagnostic accuracy of spirometry versus peak expiratory flow test for follow-up of adult asthma patients at primary care level. Allergy Asthma Proc 2022 Sep;43(5):e58-e64.
27. Sherman S, Skoney JA, Ravikrishnan KP. Routine chest radiographs in exacerbations of chronic obstructive pulmonary disease: diagnostic value. Arch Intern Med 1989 Nov;149(11):2493-2496.
28. James DR, Lyttle MD. British guideline on the management of asthma: SIGN clinical guideline 141, 2014. Arch Dis Child Educ Pract Ed 2016 Dec;101(6):319-322.
29. Zeitouni MO, Al-Moamary MS, Coussa ML, Riachy M, Mahboub B, AlHuraish F, et al. Challenges and recommendations for the management of asthma in the Middle East and Africa. Ann Thorac Med 2022;17(2):71-80.
30. Global Initiative for Asthma. Global strategy for global strategy for asthma management and prevention. 2019 [2021 February 3]. Available from: https://ginasthma.org/archived-reports/.
31. Davies BH, Symonds P, Mankragod RH, Morris K. A national audit of the secondary care of "acute" asthma in Wales–February 2006. Respir Med 2009 Jun;103(6):827-838.
32. Hodder R, Lougheed MD, Rowe BH, FitzGerald JM, Kaplan AG, McIvor RA. Management of acute asthma in adults in the emergency department: nonventilatory management. CMAJ 2010 Feb 9;182(2):E55-E67.
33. Sin DD, Man SF. Low-dose inhaled corticosteroid therapy and risk of emergency department visits for asthma. Arch Intern Med 2002 Jul;162(14):1591-1595.
34. Tadesse S, Beyene Z. Contributing factors for underutilization of inhaled corticosteroids among asthmatic patients attending at Adama hospital medical college, Adama, Ethiopia. J Asthma Allergy 2020 Sep;13:333-341.
35. Hilton S. An audit of inhaler technique among asthma patients of 34 general practitioners. Br J Gen Pract1990 Dec;40(341):505-506.
36. Zahran HS, Bailey C, Garbe P. Vital Signs: asthma prevalence, disease characteristics, and self-management education — United States, 2001–2009. Am J Transplant 2011;11(7):1535-1538.
37. Chan M, Gray M, Burns C, Owens L, Jaffe A, Homaira N. Assessment of variation in care following hospital discharge for children with acute asthma. J Asthma Allergy 2021 Jul;14:797-808.