



Original Contribution

Frequent attenders to the ED: patients who present with repeated asthma exacerbations[☆]

Shu Fen Lim, MBBS (Monash)^a, Win Wah, MBBS (Yangon), MPH, EMPH^b, Yogeswary Pasupathi, BSc^a, Susan Yap, RN^a, Mariko Siyue Koh, MBBS (S'pore)^c, Keng Leong Tan, MBBS (S'pore)^c, Cass Jwee Cheong Chay, BSc (Statistics)^d, Marcus Eng Hock Ong, MBBS (S'pore), MPH^{*,e}

^a Department of Emergency Medicine, Singapore General Hospital, Singapore

^b Centre for Infectious Disease Epidemiology and Research, Saw Swee Hock School of Public Health, National University of Singapore, Singapore

^c Department of Respiratory & Critical Care Medicine, Singapore General Hospital, Singapore

^d Operations and Performance Management, Singapore General Hospital, Singapore

^e Department of Emergency Medicine, Singapore General Hospital, Singapore Office of Clinical Sciences, Duke-NUS Graduate Medical School, Singapore

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ABSTRACT

Background: Asthma has been reported as one of the main causes of frequent attendance to the emergency department (ED), and many of those visits are potentially preventable. Understanding the characteristics of frequent attender (FA) patients with asthmatic exacerbations will help to identify factors associated with frequent attendance and improve case management. The aim of this study is to describe the characteristics of FA who present multiple times to the ED for asthma exacerbations.

Methods: This study was a retrospective review of cases presented to Singapore General Hospital ED in 2010. Patients who attended the ED for 4 times or more with at least 1 visit attributable to asthma exacerbations in 2010 were included. They were then categorized as FA with multiple exacerbations (FAME) and those with fewer exacerbations. **Results:** Of 105 616 ED patients, 155 patients attending the ED in 2010 were identified as FA with asthma, and 26 (17%) of these patients were classified as FAME, resulting in 213 visits (45% of total visits). Compared with FA with fewer exacerbations group, FAME were more likely to be men ($P = .002$), unemployed ($P < .000$), bad debtors ($P = .045$), substance abusers ($P = .022$), previously known to medical social workers ($P = .002$), and were found to spend a longer amount of time in the ED (>6 hours) ($P = .03$).

Conclusion: We found that a small number of FAME patients accumulated a large number of ED visits and spent a significantly longer time in the ED. This group tended to be males with social, financial, and addiction problems.

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1. Introduction

Asthma, a chronic airway disorder, is a leading cause of morbidity in the world and can often lead to hospitalization and, in some severe cases, death [1]. In Singapore, it affects 1 in 5 children and 1 in 20 adults [2]. Patients with asthma are at risk for a high disease burden in terms of health care needs, personal disability, premature death, and economic costs [2]. The economic burden of asthma on Singapore is reported to be \$US 33.93 million per annum [3]. More than half (58%) of the mean per-patient cost of asthma in Singapore is spent on urgent care as compared with maintenance care [4,5].

The term *frequent attenders* (FAs) is used to describe patients who attend the emergency department (ED) 4 times or more in a year [6]. In Singapore, the number of ED visits has increased by 5% to 10% annually at major public hospitals. In many cases, this has been accompanied by a

crisis of ED overcrowding [7–12]. Respiratory conditions, including asthma, represent an important cause of frequent ED attendance, which consumes substantial health care costs [1,13]. Although asthma ED visits contributed only a small proportion (1%) of total ED visits in 1 national ED survey, many of these visits are potentially preventable [14].

Therefore, understanding the characteristics of FA asthma patients and their ED visits could help to identify factors associated with frequent attendance and improve case management.

In this study, we aimed to characterize the patients who were FA to the ED for asthma exacerbations in 2010, compare FA with multiple exacerbations (FAME) and FA with fewer exacerbations (FAFE), and identify possible contributing factors associated with increased attendance.

2. Materials and methods

2.1. Study setting and design

Singapore is a modern city state with a population of 5.3 million [15]. Singapore General Hospital (SGH) is Singapore's flagship tertiary

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* Corresponding author. Department of Emergency Medicine, Singapore General Hospital, Outram Road, Singapore 169608. Tel.: +65 63213590; fax: +65 62260294.

E-mail address: marcus.ong.e.h@sgsh.com.sg (M.E.H. Ong).

hospital. Each year, SGH Department of Emergency Medicine sees more than 135 000 patients in the emergency care setting.

This was a retrospective study of adult patients with a primary or secondary *International Classification of Diseases, Ninth Revision, Clinical Modification*, diagnosis of asthma exacerbations who were treated at the SGH ED in 2010. Ethical approval was obtained from the SingHealth Institutional Review Board.

2.2. Data collection and analysis

Frequent attenders are defined as patients who attended the ED 4 times or more in a year [6]. Patients who sought care in the ED for 4 times or more with at least 1 visit attributable to asthma exacerbations in 2010 were included. They were then further categorized as FAME and FAFE of asthma. We used the median frequency of total FA visits for asthma exacerbations, which was 4 times, as a cutoff point for the subgroups. There is no established cutoff point for asthma exacerbations in clinical guidelines [16], and using sample median to dichotomize continuous variables is a common approach in statistical analysis [17].

Asthma exacerbation is defined as an increase in symptoms resulting in a hospital ED visit (with or without admission) and leading to nebulization, a course of corticosteroid tablets, or increased preventer medication [18]. Exacerbation frequency is recommended to be evaluated as part of routine asthma assessment [18]. Exacerbations are not only a common clinical manifestation in severe asthmatic patients but are also reported to be higher than expected in patients with mild asthma [18].

Electronic case records of each patient visit were extracted and reviewed. All data extracted were double checked by a second

reviewer for accuracy. Data extracted were broadly classified into demographic information, socioeconomic profile, and clinical characteristics of the ED admission. Variables collected for this study included age, sex, ethnicity, medical history, number of chronic diseases, social history, triage class, time spent in the ED, final disposition, length of admission, reattendance of admitted patients to ED, medical status (emergency/nonemergency), and referral.

Data analysis was performed with SPSS version 18 (SPSS, Chicago, IL). χ^2 Test was used to compare categorical factors associated with multiple and fewer frequent presentations for asthma exacerbations. Independent-samples *t* test or Mann-Whitney *U* test was used to compare parametric or nonparametric continuous data. The level of statistical significance was set at $P < .05$. Multivariate logistic regression was done to study the factors associated with frequent attendance for multiple asthmatic exacerbations.

3. Results

The selection process of cases for the study is displayed in Fig. 1. Of 1090 patients with at least 1 attending diagnosis of asthma exacerbations, 155 FA patients attended the ED for 4 or more times contributing to 469 visits. Fig. 2 shows the frequency of visits per unique FA patient for asthma exacerbations throughout 2010. Most FA patients visited the ED for asthma exacerbations only 1 time during the study period. We used the median frequency of visits for asthma exacerbations, as a cutoff point between FAME (asthma exacerbations >4 times in the year) and FAFE (asthma exacerbations ≤ 4 times in the year). Within the FA group, 26 FAME patients (17%) contributed to 45% of the total visits (213 visits), whereas 129 FAFE patients (83%) represented 55% of the total visits (256 visits).

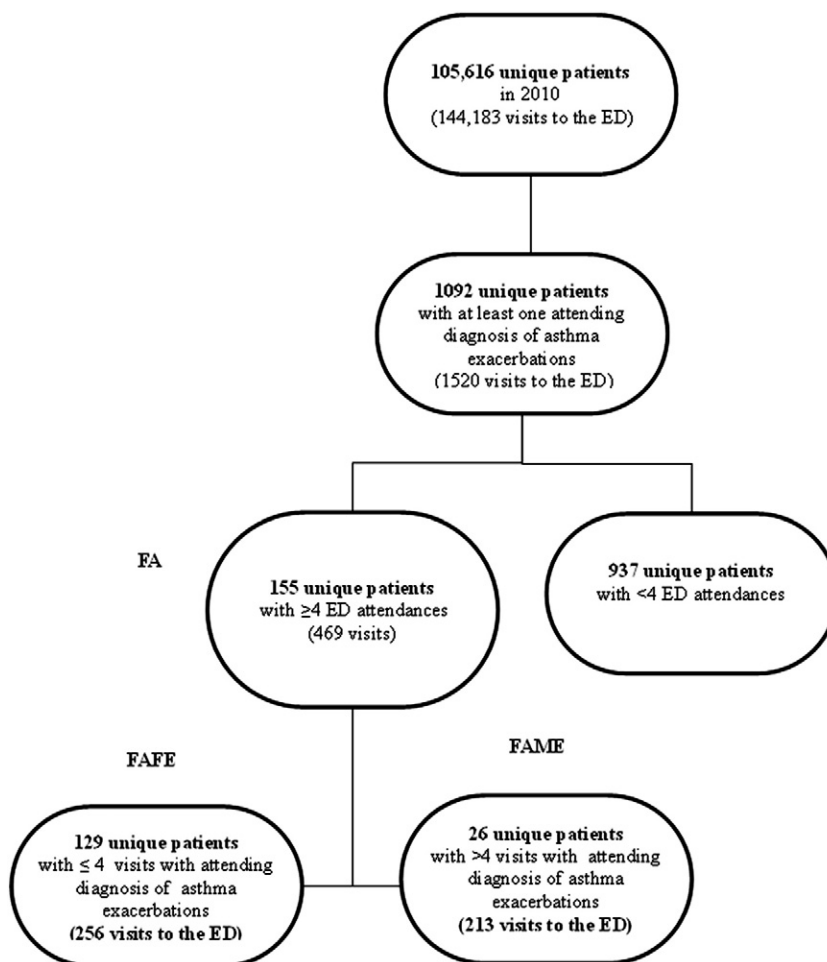


Fig. 1. Flow diagram for selection of cases.

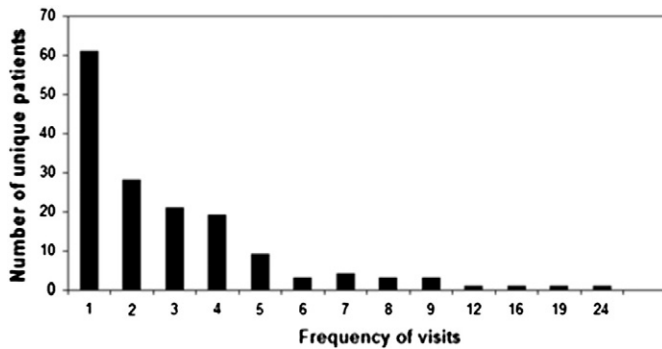


Fig. 2. Frequency of visits to the ED for asthma exacerbations among the study population.

The demographic and socioeconomic characteristics of asthmatic patients stratified by frequency of exacerbations are displayed in Table 1. There was no statistically significant difference with regard to age, ethnicity, medical history, number of chronic diseases, living alone, and drinking status between groups. Frequent attenders with multiple exacerbations group had a significantly higher proportion of patients who were male, unemployed, smokers, known substance abusers, and previously known to medical social workers. Table 1 shows that 90.7% of patients in the FAFE group had a previous medical history of asthma and the rest (9.3%) had newly diagnosed asthma first presenting to the ED.

Table 1

Demographic and socioeconomic characteristics of FAs with asthma as an attending diagnosis according to frequency of asthma exacerbations

Variables	FAFE (≤ 4 visits) (n = 129)	FAME (> 4 visits) (n = 26)	P
No. of visits, median (IQR)	2 (1–3)	7 (5–9)	
Male (%)	62 (48.1)	21 (80.8)	.002 ^a
Age, median (IQR)	46 (25–65)	48.5 (26.75–57)	.933
Ethnicity (%)			
Chinese	40 (31.0)	10 (38.5)	.280
Malay	32 (24.8)	3 (11.5)	
Indian	51 (39.5)	10 (38.5)	
Others	6 (4.7)	3 (11.5)	
Medical history (%)			
None	1 (0.8)	0 (0.0)	.652
Asthma	117 (90.7)	26 (100.0)	.105
Hypertension	47 (36.4)	7 (26.9)	.353
Diabetes	27 (20.9)	4 (15.4)	.519
Heart disease	35 (27.1)	6 (23.1)	.669
Stroke	7 (5.4)	0 (0.0)	.224
Alimentary disease	35 (27.1)	8 (30.8)	.705
Renal disease	9 (7.0)	0 (0.0)	.165
Mental disorder	12 (9.3)	5 (19.2)	.139
Cancer	5 (3.9)	2 (7.7)	.393
Epilepsy	3 (2.3)	0 (0.0)	.432
COAD/COPD	11 (8.5)	1 (3.8)	.415
Others	69 (53.5)	16 (61.5)	.452
No. of chronic diseases (%)			
≤ 3	85 (65.9)	16 (61.5)	.671
> 3	44 (34.1)	10 (38.5)	
Social history (%)			
Bad debtor	30 (23.3)	11 (42.3)	.045 ^a
Smoker	28 (21.7)	12 (46.2)	.009 ^a
Unemployed	3 (37.5)	5 (62.5)	<.001 ^a
Previously known to MSW	1 (0.8)	3 (11.5)	.002 ^a
Lives alone	3 (2.3)	2 (7.7)	.158
Heavy drinker ^b [19]	1 (0.8)	1 (3.8)	.206
Known substance abuser	5 (3.9)	4 (15.4)	.022 ^a

Abbreviations: COAD/COPD, chronic obstructive airway disease/chronic obstructive pulmonary disease; MSW, medical social worker; IQR, interquartile range.

^a Statistically significant ($P < .05$).

^b Heavy or binge drinker: 5 or more drinks per episode for men and 4 or more drinks per episode for women over a week [19].

Table 2 shows the characteristics of both study groups by ED visits. There was no statistically significant difference in triage class, final disposition of patients, length of admission, reattendance to ED, medical status, and referral condition between the 2 groups. Median time spent in ED among FAME group was significantly longer (38 minutes) than the FAFE group ($P = .027$; 95% confidence interval, 0.05–0.75) [20]. The proportion of FAME visits that spent more than 4 hours in the ED (34.7%) was significantly higher compared with FAFE (23.2%) ($P = .020$). A higher percentage of FAME visits were admitted to the emergency observation ward, and less than half of FAFE and FAME visits required admission. Multivariate analysis showed that male and unemployed were significantly more likely to have asthma exacerbations more than 4 times a year (Table 3).

The duration of admission of FA patients ranged from 1 to 94 days with median 2 days (interquartile range, 1–4). There was no significant seasonal variation in the number of visits by FA asthmatic patients throughout the year.

4. Discussion

We found that compared with FAFE, FAME represented a smaller proportion of the total number of unique asthma patients. However, their accumulated visits contributed around half of the total number of visits of asthma FAs. Previous studies have shown heavy ED users to

Table 2

Characteristics of study groups according to ED visits

Variables	FAFE (≤ 4 visits) (n = 256 visits)	FAME (> 4 visits) (n = 213 visits)	P
Triage class (%)			
P1	45 (17.6)	33 (15.5)	
P2	150 (58.6)	144 (67.6)	.105
P3	61 (23.8)	36 (16.9)	
Time spent in ED (%)			
Median time, h (IQR)	2.52 (1.72–3.79)	2.88 (1.83–5.14)	.027 ^a
≤ 2 h	84 (33.1)	64 (30.0)	
> 2 h and ≤ 4 h	110 (43.3)	75 (35.2)	.025 ^a
> 4 h and ≤ 6 h	31 (12.2)	29 (13.6)	
> 6 h	29 (11.4)	45 (21.1)	
Final disposition (%)			
Admitted	99 (38.7)	73 (34.3)	
Discharged	129 (50.4)	96 (45.1)	
Absconded	2 (0.8)	3 (1.4)	
At-own-risk discharged	11 (4.3)	10 (4.7)	.053
EOW then discharged	8 (3.1)	23 (10.8)	
EOW then admitted	6 (2.3)	5 (2.3)	
EOW then at-own-risk discharged	1 (0.4)	2 (0.9)	
EOW then absconded	0 (0.0)	1 (0.5)	
Length of admission (%)			
No. of days, median (IQR)	2.5 (1–4)	2 (1–3)	.154
≤ 3 d	74 (70.5)	61 (78.2)	.240
> 3 d	31 (29.5)	17 (21.8)	
Reattendance of admitted patients to ED (%)			
≤ 24 h	1 (1.0)	5 (6.4)	.105
> 24 h and ≤ 48 h	3 (2.9)	5 (6.4)	
> 48 h and ≤ 72 h	3 (2.9)	1 (1.3)	
> 72 h	98 (93.3)	67 (85.9)	
Medical status (%)			
Emergency	89 (34.8)	76 (35.7)	.836
Nonemergency	167 (65.2)	137 (64.3)	
Referral (%)			
Outpatient polyclinics/general practitioners	28 (10.9)	14 (6.6)	.099
Hospital specialist outpatient clinics	78 (30.5)	77 (36.2)	.193
Medical social work	1 (0.4)	1 (0.5)	.896
Other department physician	0 (0.0)	1 (0.5)	.272
Other hospital	2 (0.8)	5 (2.3)	.164
No referral	153 (59.8)	125 (58.7)	.813

Abbreviations: P1, resuscitation and critically ill patients; P2, major emergencies (nonambulant); P3, minor emergencies (ambulant); EOW, emergency observation ward.

^a Statistically significant ($P < .05$).

Table 3

Multivariate analysis of factors associated with FA patients who had asthma exacerbations more than 4 times a year (FAME)

Variables	Adjusted OR	95% CI	P
Male	4.16	(1.44–12.04)	.009 ^a
Unemployed	8.81	(1.82–42.58)	.007 ^a
Previously known to MSW	7.62	(0.67–86.31)	.101
Smoking	2.5	(0.92–6.76)	.072
Known substance abuse	0.89	(0.14–5.68)	.906

Abbreviations: OR, odds ratio; 95% CI, 95% confidence interval.

^a Statistically significant ($P < .05$).

be a vulnerable population with high rates of alcohol and drug use, psychiatric disorders, chronic medical conditions, and serious illnesses [21–23]. In this study, FAME group was more likely to be men from poor socioeconomic background with problems such as unemployment, living alone, and substance abuse. Lack of finance for medications, psychosocial issues, poor understanding of their disease, lack of concern for their general health, and a lower desire to be responsible for initiating changes in medication could explain poor self-management of asthma and multiple ED visits for asthma exacerbations. However, the significant effect of socioeconomic factors on frequent attendance in the study might be partially explained by the fact that asthma is more prevalent and severe in the lower socioeconomic group [24].

Previous studies reported that frequent utilization of health services for asthma was linked to the severity and undertreatment of asthma, avoidance coping behavior, lack of asthma education, and uncontrolled asthma [25–29]. In this study, FAME ED visits were significantly longer than those of FAFE, and a greater proportion of FAME visits were admitted to the emergency observation ward. This finding could indicate FAME had poorly controlled or more difficult-to-treat asthma possibly due to nonadherence to treatment and follow-up or their high-risk behavior such as substance abuse and smoking or other socioeconomic reasons.

Asthmatic patients requiring an ED visit were reported to have a significantly higher risk of future exacerbations independent of demographic and clinical factors, asthma severity, and asthma control [27]. In this study, most ED visits requiring admission lasted at the hospital for only 1 day. This implies that a large proportion of visits by the FA asthmatic patients do not necessarily need emergency or inpatient care and could possibly be better managed in the community.

Outpatient treatment program focusing on self-management educational strategies and the use of written asthma action plan, facilitating asthma specialist and high continuity of outpatient care, have been shown to reduce asthma-related ED visits and admissions [26,30,31]. Asthma care pathways could use asthma nurses at the ED to provide asthma education and counseling including written asthma action plans, proper usage of medications/inhalers, and follow-up plans with asthma specialists.

The introduction of case management teams has also been shown to reduce ED visits and costs and improve social and clinical outcomes [32]. Community-based case managers could link patients with their regular medical provider (general practitioner or specialist outpatient clinics) and help to address nonmedical and nonurgent medical issues using predetermined, standardized protocols, follow-up treatment, and compliance plans [33,34]. Community-based action plans for FA asthma patients could address the unique health, socioeconomic, emotional, and environmental factors that FAME are facing.

We found FA asthma ED visits contributed to a minor proportion of total ED visits in this study (0.14%). In relation to ED overcrowding, 1 previous study showed an association with longer ED length of stay by more than 1 hour in patients who got discharged with asthma [35]. In our study, both FAME and FAFE groups stayed more than 2 hours in the ED, and a significantly higher number of FAME spent more than 4 hours in the ED.

Limitations of this study include the small sample size of 155 patients, which could explain nonsignificant statistical results. A more comprehensive study with a larger sample size is planned for the future. The study is also limited by the method of data collection, which is dependent on subjective entry of diagnosis into the computer system by admitting ED physicians. The retrospective nature of the study has limited the ability to examine how the contributing factors interact with baseline disease status and to ascertain compliance to medications or follow-ups. Generalizability of this study to population at large could be limited due to the small sample size, selected review of case records from 1 hospital ED (with possibly more high-risk FA groups), and possible exclusion of mild cases from community settings.

5. Conclusion

This study provided evidence that a small number of FAME accumulated a large number of ED visits and spent a significantly longer time in the ED. We found that this group tended to be males with social issues, especially financial and addiction problems. Interventions are needed to target this high-risk group. Early identification of these patients, improved quality of treatment, asthma education at the ED, and continuity of outpatient follow-up with self-management treatment strategies could result in fewer ED admission and hospitalizations.

Conflict of interest statement

All the authors have neither commercial nor personal associations or any sources of support that might pose a conflict of interest in the subject matter or materials discussed in this manuscript.

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