CLINICAL AND FINANCIAL CONSEQUENCES OF SETTING UP AN ASTHMA CLINIC AT ST LUKE'S HOSPITAL

M. J. Ebejer, A. Galea Baron, R. Ellul-Micallef, F. F. Fenech

ABSTRACT

The effects of setting up an asthma clinic were assessed in an audit study. A comparison was made between the quality and quantity of medication used by patients before and after attending the asthma clinic. The number and severity of exacerbations during a six month period before and a six month period after attending were also assessed. The cost of treatment before and after was also calculated. In 14% of patients, occupational factors, drugs or underlying lung disease were significant contributors to asthma. The number of acute episodes of severe asthma were reduced from 98 to 47, with hospital admissions falling from 26 to 1. Pulmonary function (%FEV_1) improved in the group as a whole with the number of patients having their best FEV above 80% improving from 44 to 71. In spite of the expense of high cost drugs and the running costs of the clinic there were substantial savings largely from the reduced number of hospital admissions. The calculated annual cost fell from Lm 22,769 to Lm 10,654.

Keywords: Asthma, clinic, exacerbations, medication, audit.

Introducton

Asthma is common, causes significant morbidity and is potentially fatal.[1,2] The prevalence and mortality of asthma are increasing in several countries[3,4] and the impression of most clinicians in Malta is that the same applies to our local population. It is probable that specialist clinics may achieve a higher standard of care which could reverse this trend.[5] Asthmatics admitted to hospital in a ward specialising in respiratory medicine receive better care than those on a general medical wad.[6,7] Direct admission to a specialist respiratory medicine unit has also been shown to reduce mortality by about half when compared to routine admission to general medical wards via the emergency department.[8] It is hoped that specialist clinics might deliver better care while at the same time limit the ever increasing costs.

In August 1991, the Department of Medicine at St Luke's Hospital set up an asthma clinic with two main purposes in mind. The first was to improve patient well-being on the assumption that asthmatics were not getting optimal care in general medical clinics. The second aim was to optimise medication in such a way as to obtain maximum benefit from recently introduced, potent but expensive drugs, and reduce prescriptions of less effective medication. The purpose of this audit, was to try and quantify how far the aims have been achieved and to assess the financial implications.

Comprehensive guidelines on the management of asthma have now been issued by various medical associations.[9] Our clinic began being run on similar principles. Shortcomings uncovered by this audit should therefore be evaluated with these guidelines in mind.

M.J. Ebejer
Lecturer Department of Medicine
University of Malta

A. Galea Baron, Registrar
Chest Clinic, St Luke's Hospital

R. Ellul-Micallef
Professor of Clinical Pharmacology
University of Malta

F.F. Fenech
Professor of Medicine
University of Malta

Method

The medical records of all patients referred to the asthma clinic in the first year of its operation were reviewed. For this purpose, a form was designed to record each patient's characteristics, clinical category of asthma, number of acute exacerbations, medication before and after attending the clinic, inhaler technique, and pulmonary function.

The clinical categories of asthma were defined as follows:

1. *Not asthma.* These were the few patients who on assessment did not in fact have asthma.
2. *Exercise-induced.* Only those patients who were asymptomatic most of the time but developed asthma on exercise were included.
3. *Occupational.* Patients in whom asthma was unequivocally aggravated by to known allergens at work and whose asthma remitted or improved substantially when the exposure ceased.
4. *Drug-induced.* Patients in whom a drug known to cause asthma was temporally associated with symptoms and in whom improvement was maintained when the drug was withdrawn.
5. Associated with *bronchopulmonary disease.* In this category were included those patients whose underlying lung disease antidated their asthma and was clearly separable from it.
6. Associated with *systemic vasculitis.*
7. *Atopic.* Patients who were skin-test positive or who had seasonal conjunctivitis rhinitis associated with asthma.
8. *Non-atopic.* All patients whose asthma could not be placed in the above categories.

Inhaler Technique. This was recorded only if there was a note in the medical records which allowed interpretation so as to classify the technique as useless, inadequate, adequate or excellent.

Medication. The number of daily maintenance doses of each drug in each patient before and after attending the clinic were recorded. When patients first attended the clinic there were often important changes in drug management. Therefore it was decided arbitrarily to consider treatment as "maintenance", three months after attending the clinic for the first time. For medication used intermittently, the mean daily consumption was estimated where records were inadequate. The use of antibiotics and antihistamines was also recorded. The monetary cost and the consumption of each of the commonly used drugs were calculated for the group as a whole and a comparison made before and after attendance at the asthma clinic.

Pulmonary Function. For the purposes of this study, only the FEV_1 was recorded and expressed as % predicted. For each patient, the value when first seen at the clinic and the subsequent best and worst values were recorded.

Episodes of acute severe asthma. Each acute episode which required the attention of a doctor or the patient's attendance to a clinic or hospital, was recorded with the required therapeutic intervention. It was arbitrarily decided to compare a six month period before with a six month period after attending the clinic. This meant that some patients' records were excluded either because they contained inadequate information before attending or they had not yet been followed up for long enough.

Estimating total costs. The cost of hospital care was calculated according to the Department of Health's budgeting criterion of 60 Maltese Liri per patient per day. The cost of all the staff working regularly in the clinic was taken into account. Their individual salaries were multiplied by the fraction of the time each devoted to the clinic. The cost of performing the pulmonary function test was calculated as the fraction of the total capital expenditure to set up the laboratory taking account that the time it was used for the clinic was 30% of the total and that notional depreciation was 20%.

Results

Patient characteristics and clinical categories (Figures I and II). There were 196 patients referred to the asthma clinic between August 1991 and July 1992. Ten records could not be traced and 21 patients did not have asthma. Of the remaining 165 patients, 82 were men (mean age 35.7 years for men, 42.2 for women).

Inhaler Technique (Table I). All patients on inhalers should have had their inhaler technique checked regularly. Of 163 patients using metered dose inhalers before attending the clinic, only 28 had a note in their records indicating that their inhaler technique was checked by their clinicians, and of these only eight could use it adequately. Of 153 patients on inhalers after attending the asthma clinic only 50 were recorded as checked and of these, 39 could use
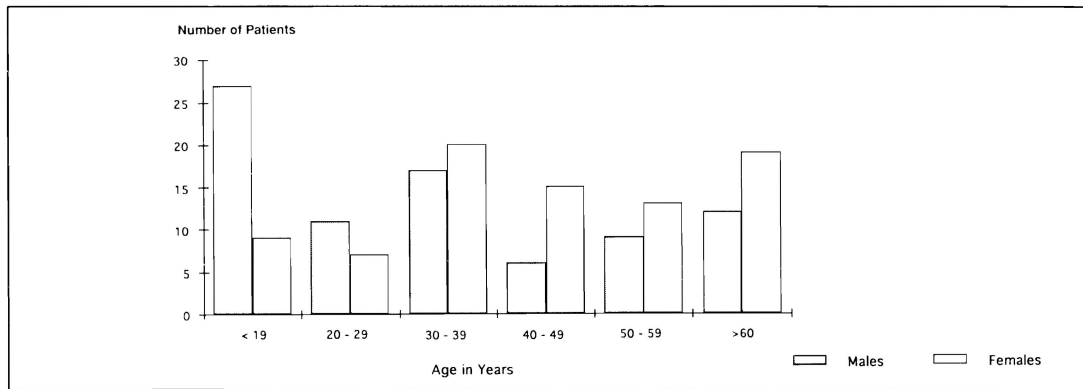
Number of Patients

FIGURE I - Age and sex distribution of patients attending asthma clinic.
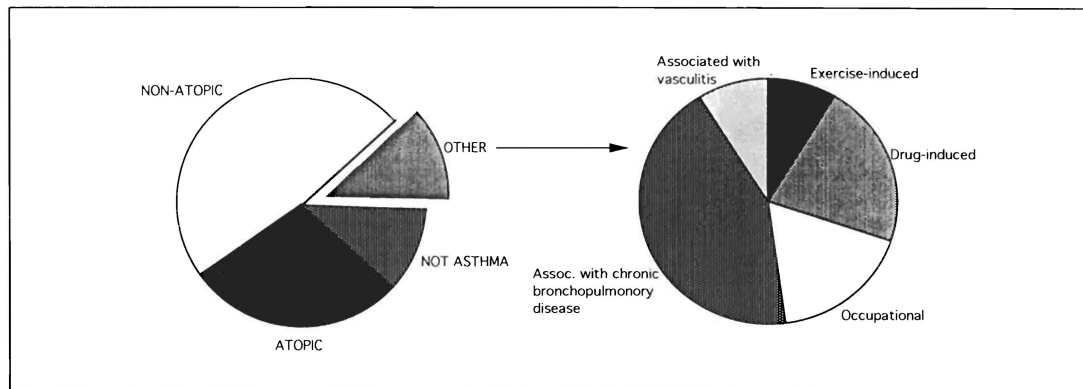
FIGURE II - Clinical Categories of Asthma as defined in text.

the inhaler at least adequately; 11 could not, and no decisive action was recorded as having been taken about this. There were no comments in any case-notes about the use of spacer devices.

Number of patients	before	after
using MDI	163	153
Unrecorded	135	103
Excellent use	0	9
Adequate	8	30
Inadequate	11	7
Useless	9	4

TABLE I - Records of patients' inhaler technique before and after attending clinic.

Medication (Tables II and III). The number of patients given inhaled steroid prophylaxis increased from 82 to 147 and those using systemic corticosteroids regularly halved from 34. The number of patients using inhaled bronchodilators increased from 150 to only 160, but there was an overall reduction in consumption.

bronchodilators	before	after
salbutamol inhaler	139	151
salbutamol rotacaps	1	2
salbutamol tablets	20	2
ipratropium bromide	11	2
nebulised B_2 agonists	14	6
theophyllines	81	40
corticosteroids		
beclomethasone inhaler	82	147
beclomethasone rotacaps	1	5
oral steroids	31	17
depo inj. steroids	3	0
other drugs		
antibiotics	11	6
antihistamines	8	7
mucolytics/cough linctus	11	2
cromoglycate inhaler	13	0

TABLE II - Number of patients using the maintenance medication before and after attending clinic.
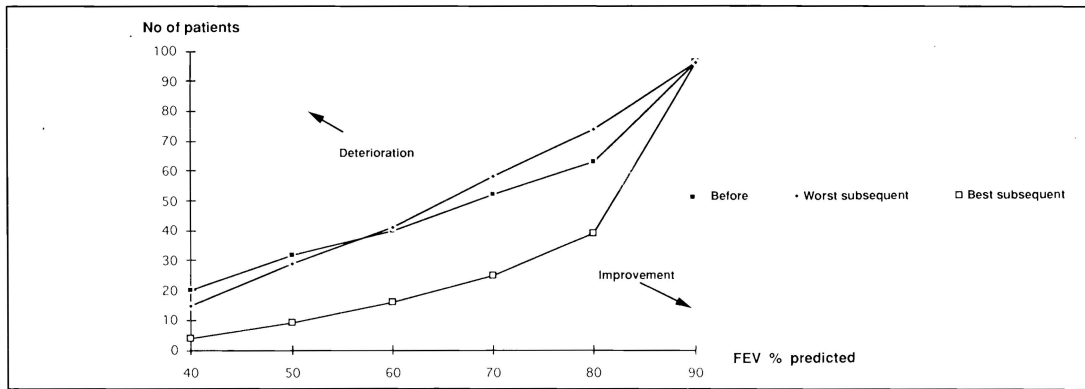
FIGURE III - Cumulative frequencies of pulmonary function (FEV$_1$ %predicted) stratified at 10% intervals, before and after attending the asthma clinic.

Pulmonary Function (Figure III and table IV). Every patient attending the clinic was meant to have pulmonary function testing on each visit. This failed on two occasions only and these were in the early days when the running of the clinic had not yet been taken over by the laboratory. In 26 patients there was only one record because they had yet attended only once; five others defaulted from follow-up. In 35 patients, the FEV$_1$ was measured twice. In 23 of these, it was above 80% predicted and remained in this range; one deteriorated; in 11 patients the FEV$_1$ was below 80% predicted and remained the same or improved by their subsequent visit. The pulmonary function on the remaining 96 patients could be analysed more fully because these patients had had at least two follow-up visits. For convenience, the % predicted FEV$_1$ for these patients is shown in stratified 10% increments. On the first visit, there were 44 patients whose

FEV$_1$ was above 80% predicted. This number increased to 71 on follow-up. Given that asthma exacerbations occur in almost all patients, the worst FEV$_1$ readings were also recorded. There were 38 patients whose readings did not drop below 80% predicted. There were 32 patients who on their first visit had pulmonary function below 60%. Only nine of these failed to improve. Of a total of 96 patients there were 29 who during the follow-up period had exacerbations which dropped their FEV$_1$ to below 60%.

	first visit	best	worst
>90%	33	57	22
>80%	11	14	16
>70%	12	9	17
>60%	8	7	12
>50%	12	5	14
<49%	20	4	15

TABLE IV - Pulmonary Function (% predicted FEV$_1$) stratified at 10% intervals, comparing values before attending clinic with the subsequent best and worst values.

Episodes of acute severe asthma (Table V). It was possible to compare a six month period before with a six month period after attending the clinic in 110 patients. There were 67 patients who between them had 98 exacerbations in the period before attending clinic, and in the period after, there were 33 patients who had 47 exacerbations. There were 26 admisssions in 24 patients before, compared with only one admission after. The hospital stay ranged from 1 to 17 days (median 5; 95% confidence limits 2.93 - 6.54). If the type of treatment and requirement for hospitalisation gives an indication as to the severity of the exacerbations then it can be

total daily use of each drug	before	after
salbutamol inhaler (puffs)	630	469
low dose beclomethasone (puffs)	507	862
high dose beclomethasone (puffs)	6	152
theophyllines	159	61
oral steroids	222.5	70
(mg. prednisolone equiv.)		
daily cost in Maltese Liri		
salbutamol inhaler (55c)	1.73	1.29
beclomethasone low dose (69c)	1.75	2.97
beclomethasone high dose (900c)	0.27	6.57
nebulised bronchodilators	11.47	3.50
(salb.75c, ipratr. 24c)		
theophyllines (mean 2.5c)	3.34	1.24
steroids (1c)	0.45	0.14
total daily cost	19.01	15.75

TABLE III - The consumption and unit cost of maintenance medication before and after attending clinic

nebuliser therapy	15 (12)	4	(4)
i.v. aminophylline	11 (3)	2	(2)
prednisolone	46 (28)	40	(26)
hospital admission	26 (24)	1	(1)
total:	98 (67)	47	(33)

TABLE V - Episodes of acute, severe asthma grouped according to main therapeutic intervention comparing 6 months before clinic vs 6 months of follow-up (number of patients in parentheses)

concluded that even though the number of acute exacerbations was only halved, the severity was very much reduced during the period of follow-up in the asthma clinic.

Total costs (Table VI). When the costs incurred in running the clinic and performing pulmonary function were added to the costs of drugs and hospital admissions, and then compared with the costs of treating the same group of patients before the setting up of the asthma clinic, there were large savings in spite of the apparently large capital outlay.

	before	after
drugs	7169	5734
hospital care *	15600	600
staff (one weekday)	-	1220
equipment & lab. **	-	3100
total:	22769	10654

* Calculated on a mean stay of 5 days (95% confidence interval of 6,500 - 17,500
** 20% notional depreciation.

TABLE VI - Comparison of the annual costs (Maltese Liri) based on this study for 165 asthmatics.

Discussion

We identified an association with another disease or an unusual underlying cause for asthma in 14% of our patients. This figure is high because it reflects the bias towards referring the more

complex, the more severe or the asthmatic more resistant to treatment. Nonetheless, identifying these patients allows for a more rational approach to management. It may be argued that our categorisation of patients into various forms of asthma serves little clinical purpose. The main reason for defining the categories was to permit valid comparisons should we undertake more clinical audits at a future date. The reasons for the sex distribution of our asthmatics are unknown. The male preponderance below the age of 30 years may be a reflection of the well known fact that asthma is commoner in young boys. The disease tends to remit more often in young women. Also, more young men are smokers and may have more occupational exposure to potential allergens. Reasons why women seem to outnumber men beyond the age of 40 years may be that more men smoke and so are more likely to be labelled chronic obstructive bronchitics. Late onset asthma especially with rhinitis has been found more commonly in some populations.[10] But, there may be another factor. The four patients we identified as having drug induced asthma were women (two from non-steroidal anti-inflammatory drugs and two from beta-blockers). It is our clinical impression that the consumption of non-steroidal anti-inflammatory drugs is higher in women of this age group.

Our study has shown that in our circumstances specialist care for asthma reduces morbidity substantially while at the same time allows patients' pulmonary function to improve. Our record keeping still needs to be improved upon. This was reflected in the very poor recording of inhaler technique which is considered essential if for no other reason but to remind the clinician to check it regularly and correct it, and if found to be persistently inadequate, to prescribe an alternative drug delivery device. The other defect in our care was the remarkable lack of use of spacer devices. These have been shown to improve delivery from metered dose inhalers, reduce oropharyngeal side effects and systemic absorption and allow more patients to take inhaled therapy where previously their poor technique had precluded this.[11] These two points were corrected immediately. It would require another audit to quantify to what extent their use has been instituted and whether or nor benefits have resulted.

Systemic corticosteroids are very cheap and extremely effective therapy for asthma if used judiciously. Unfortunately, their many serious side-effects limit their long-term use. However,

they are very useful in the short term to prevent relapse or if instituted early to abort a more serious attack of acute asthma.[12,13] The clinic managed to halve the number of patients previously on long-term systemic corticosteroids. Many patients were receiving several drugs of limited or dubious efficacy, such as antihistamines, antitussives and several theophylline preparations. With an improvement in the patients' clinical condition, the number of such items was greatly reduced.

The benefits were not achieved without an initial increase in cost. However, we have shown that in the longer term, such investment in patient care not only benefits the patients in very tangible ways but actually relieves the health service from pressure in emergency units and hospital beds, both of which are far more expensive to provide. As others,[5] we have demonstrated net financial savings.

Acknowledgments

References:

1. Rea HH, Scragg R, Jackson R, Beaglehole R, Fenwick J and Sutherland DC. A case control study of deaths from asthma. Thorax 1986; 41: 833-9.

2. Mitchell EA. International trends in hospital admission rates for asthma. Arch Dis Child 1985; 60: 376-8.

3. Burney PGJ. Asthma deaths in England and Wales 1931-85: evidence for a true increase in asthma mortality. J Epidemiol Community Health 1988; 42: 316-320.

4. Burney PGJ. Asthma mortality in England and Wales: evidence for a further increase 1974-1984. Lancet; 1986, ii: 323-6.

5. Mayo PH, Richman J, Harris HW. Results of a program to reduce admissions for adult asthma. Ann Intern Med 1990; 112: 864-71.

6. Bucknall CE, Robertson C, Moran F, Stevenson RD. Differences in hospital asthma management. Lancet 1988; i: 748-50.

7. Baldwin DR, Ormerod LP, Mackay AD, Stableforth DE. Changes in hospital management of acute severe asthma by thoracic and general physicians in Birmingham and Manchester during 1978 and 1985. Thorax 1990; 45: 130-4.

8. Crompton GK, Grant IWB, Bloomfield P. Edinburgh emergency asthma admission service: report on 10 years' experience. BMJ 1979; 2: 1199-201

9. Guidelines on the management of asthma. Statement by the British Thoracic Society, the British Paediatric Association, the Royal College of Physicians of London Research Unit, the King's Fund Centre, the National Asthma Campaign, the Royal College of General Practitioners, the General Practitioners in Asthma Group, the British Association of Accident and Emergency and the British Paediatric Respiratory Group. Thorax 1993; 48: 2, supple. S1-S24.

10. Gregg I. Epidemiological aspects in Asthma, Clark TJH and Godfrey S, eds. 1983, London, 519pp.

11. Newman SP, Moran F, Pavia D, Little F, Clarke SW. Deposition of pressurised suspension aerosols inhaled through extension devices. Am Rev Respir Dis. 1981; 124: 317-20.

12. Fiel SB, Swartz MA, Glanz K, Francis ME. Efficacy of short-term corticosteroid therapy in outpatient treatment of acute bronchial asthma. Am J Med 1983; 75: 259-62.

13. Chapman KR, Verbeek PR, White JG, Rebuck AS. Effect of a short course of prednisone in the prevention of early relapse after the emergency room treatment of acute asthma. N Eng J Med 1991; 324: 788-94.