

CHOICES AND PREFERENCES IN ASTHMA MANAGEMENT

W C Tan, K S Chia, L G Goh

ABSTRACT

We conducted a questionnaire survey of the management of asthma among doctors in Singapore to determine the trend and range of prescribing habits. Standardised questionnaires were sent to 3,153 medical practitioners registered with the Singapore Medical Council. The overall response rate was 25.3% (797 out of 3,153 doctors). The data were grouped and analysed according to one of 4 respondent-defined groups: (1) non-specialist general practitioners (NS-GP); (2) non-specialists (house officers, medical officers and specialist-in-training) who worked in MOH hospitals (NSMOH); (3) chest specialists; (4) non-respiratory specialists. Patients tended to underestimate the severity of their disease. Inhaled or nebulised beta-agonist was the treatment of choice for acute severe asthma in adults and children for all 4 groups of respondents. In the maintenance treatment for chronic asthma, inhaled and oral beta-agonists and oral theophylline were the mainstay of treatment for adults and children. Nocturnal asthma was similarly treated. The use of inhaled steroids was variably conservative and was reserved for situations where bronchodilators proved inadequate.

Keywords: Asthma management, audit, bronchodilators

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INTRODUCTION

Many countries have reported an apparent increase in the prevalence of asthma⁽¹⁻³⁾. Although more drugs are available in the past decade for the treatment of asthma, the mortality of asthma has shown a paradoxical increase in many countries⁽⁴⁾. This has led to a closer scrutiny of the prescribing habits of doctors and the way asthmatic patients are managed.

In 1984, an asthma questionnaire survey was conducted among all members of the European Society of Pneumology (SEP) and a random sample of non-SEP members in 16 European countries. The results showed that physicians in the different countries differed in their choices and dosing schedules of drugs used in the management of asthma⁽⁵⁾. We conducted a similar questionnaire survey of the management of asthma among doctors in Singapore.

An audit of asthma therapy is important but difficult to assess for several reasons. The definitive diagnosis of asthma is problematic because of the difficulty in defining asthma clearly. The pharmacological management of asthma is a controversial issue^(6,7). Definition of what constitutes mild and moderate asthma are imprecise. Current information is inadequate for setting up exact algorithms for optimal treatment of different categories of severity in asthma.

The purpose of this survey is, therefore, not to determine how physicians should diagnose and treat asthma. Rather the aim is to derive a better understanding of the spectrum of

choices and preferences in the management of asthma. In this study we examined routine practices and identified the similarities and differences in the diagnosis and treatment of asthma among doctors in different practices in Singapore.

METHOD & MATERIAL

The Survey Method

The questionnaire used was similar to that used in the European audit of 1984, with slight modifications for clarity⁽⁵⁾. A copy was sent to all practising doctors. This was achieved by obtaining a list of doctors registered with the licensing body, the Singapore Medical Council. Because of problems of logistics no attempt was made to pre-select only physicians.

The questionnaire is divided into 5 sections: General Information, Diagnosis, Management of Asthma, Asthma Patient Information/Education and Treatment. There are two types of questions in the questionnaire: (a) questions requiring a four point scale, eg "Do you obtain a measurement of lung function each time you see a patient with asthma? Choose one answer: *Never, Sometimes, Often or Always*". (b) questions requiring a ranking of sequence, eg "What do you consider as the correct sequence for treating acute severe episodes? Please give sequence (1 up to 7: you need not select all choices)".

The questionnaires were sent to the doctors in two phases. In the first phase, questionnaires were sent to 3,153 doctors registered with the Singapore Medical Council. The initial set of questionnaires was sent in May 1989 and a lapse of 3 months was allowed for the response. A second set of questionnaire was then sent to each of those who had not responded initially and a further three-month period was permitted for a response.

Analysis of Data

The details of the returned questionnaires were grouped according to the type of practice of the respondent: (1) non-specialist general practitioners (NS-GPs); (2) non-specialist non-GP (NS-Non-GP) who comprise hospital doctors such as house officers, medical officers and specialists-in training. Specialists are further subdivided into (3) chest specialists (S-C); and (4) non-chest specialists (S-NC).

The analysis was based as far as possible on a 4-point scale for each question. For questions where respondents were required to rank the sequence of drugs, each sequence is given a score and the average score is computed. The lowest score is the first preference.

Department of Medicine
National University Hospital
5 Lower Kent Ridge Road
Singapore 0511

W C Tan, MBBS, MRCP (UK), FRACP, FAMS, MD, FRCP (Edin)
Associate Professor

Department of Community,
Occupational and Family Medicine
National University Hospital

K S Chia, MBBS, MSc (Occ Med), FAMS
Senior Lecturer

L G Goh, MBBS, M Med (Int Med), FCGP (S'pore)
Senior Lecturer

Correspondence to: A/Prof W C Tan

ASTHMA QUESTIONNAIRE
An audit of asthma diagnosis and treatment
(N U S Questionnaire)

GENERAL INFORMATION

- (1) Please state the postal code of your practice
- (2) Sex Male Female
- (3) Your age group 0-10 11-20 21-30 31-40 41-50 51-60 61-70 71-80 81-90 At a home
- (4) Are you a:
a) general practitioner (primarily family practice)
b) general practitioner (primarily company practice)
c) University/government hospital non specialist (HONORARIES/resident)
d) University/government hospital specialist
e) doctor in government polyclinic
f) private specialist
g) others, please specify _____
- (5) If you are a specialist, indicate your speciality:
a) adult chest medicine
b) paediatric chest medicine
c) Others: please specify _____

DIAGNOSIS

- (1) In your diagnosis of asthma please mark the frequency you utilise or request each test
- | | Never | Sometimes | Often | Always |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) allergy testing - skin test | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| - RAST | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) reversibility test (acute response to bronchodilators) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) provocation tests (e.g. exercise, histamine, methacholine, allergen) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) sputum examination | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) chest X ray | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) patient daily record cards for Peak Expiratory Flow Rate | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g) trial course of steroids | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
- (2) Do you obtain information about the home and/or work environment?

MANAGEMENT OF ASTHMA

- (1) In your practice are patients with moderate or severe asthma regularly followed up by a specialist physician?
 Never Sometimes Often Always
- (2) Do you obtain a measurement of lung function each time you see a patient with asthma?

- (3) Do you ask your patients with asthma to keep daily record cards for:
a) symptoms
b) Peak Expiratory Flow Rate

ASTHMA PATIENT INFORMATION/EDUCATION

- (1) Do you tell your adult patients that they have asthma?
(2) Do you tell your asthmatic children or their parents the diagnosis?
(3) a) Do you consider asthma patients underestimate the severity of their disease?
 b) Do you consider asthma patients overestimate the severity of their disease?
(4) Do you give your asthmatic patients information booklets about their disease?
(5) When prescribing an inhaler (metered dose aerosol or powder inhaler) do you, or another trained person, teach the patient the correct use?
(6) Do you subsequently check the inhalers are being used correctly?
(7) Do you think an asthma society should be set up to enable patients to meet, learn about and discuss their disease?

TREATMENT

- Acute Treatment**
- (1) What do you consider as the correct sequence for treating acute severe episodes?
Please give sequence 1 to 7; you need not select all choices
- | | (a) ADULT | (b) CHILD |
|---|--------------------------|--------------------------|
| Parenteral sympathomimetic (e.g. adrenaline) | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled or nebulised anticholinergic (e.g. ipratropium bromide) | <input type="checkbox"/> | <input type="checkbox"/> |
| Parenteral steroid (e.g. hydrocortisone) | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled or nebulised beta-agonist (e.g. salbutamol/Tarbutaline) | <input type="checkbox"/> | <input type="checkbox"/> |
| Parenteral aminophylline | <input type="checkbox"/> | <input type="checkbox"/> |
| Parenteral beta-agonist | <input type="checkbox"/> | <input type="checkbox"/> |
| Others (please name) _____ | <input type="checkbox"/> | <input type="checkbox"/> |
- Chronic Treatment**
in patients whose asthma is stable and is not acutely deteriorating
- (2) How often do you use the following drugs as first line therapy for regular maintenance?
- | | Never | Sometimes | Often | Always | (a) ADULT | (b) CHILD |
|-----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Oral theophylline | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled steroid | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled sodium cromoglycate | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled beta-agonist | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled anticholinergic | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Oral steroid | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Oral ketotifen | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other (please name) _____ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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- (3) What do you consider as the correct order of treatment for (chronic) maintenance therapy of asthma?
Please give order 1 to 10; you need not select all choices
- | | (a) ADULT | (b) CHILD |
|-----------------------------|--------------------------|--------------------------|
| Inhaled beta-agonist | <input type="checkbox"/> | <input type="checkbox"/> |
| Oral beta-agonist | <input type="checkbox"/> | <input type="checkbox"/> |
| Oral theophylline | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled anticholinergic | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled sodium cromoglycate | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled corticosteroid | <input type="checkbox"/> | <input type="checkbox"/> |
| Oral steroid | <input type="checkbox"/> | <input type="checkbox"/> |
| Oral ketotifen | <input type="checkbox"/> | <input type="checkbox"/> |
| Others (please name) _____ | <input type="checkbox"/> | <input type="checkbox"/> |
- (4) In patients with mild/moderate asthma, who cannot satisfactorily use a metered-dose inhaler, (assuming they are available in your clinic) give your order of preference (1 to 4) for an alternative delivery system
- | | (a) ADULT | (b) CHILD |
|---|--------------------------|--------------------------|
| a) a powder inhaler (e.g. rotahaler) | <input type="checkbox"/> | <input type="checkbox"/> |
| b) a metered-dose inhaler plus a spacer | <input type="checkbox"/> | <input type="checkbox"/> |
| c) a nebulised solution | <input type="checkbox"/> | <input type="checkbox"/> |
| d) oral medication | <input type="checkbox"/> | <input type="checkbox"/> |
- (5) If used, what is your recommended metered dose of inhaled beta-agonist per day (number of puffs daily)? (Choose a usual and a maximal dose).
- | | (a) ADULT | (b) CHILD |
|--------------|--------------------------|--------------------------|
| Usual | <input type="checkbox"/> | <input type="checkbox"/> |
| Maximal | <input type="checkbox"/> | <input type="checkbox"/> |
| 0-4 | <input type="checkbox"/> | <input type="checkbox"/> |
| 5-9 | <input type="checkbox"/> | <input type="checkbox"/> |
| 10-14 | <input type="checkbox"/> | <input type="checkbox"/> |
| 15-20 | <input type="checkbox"/> | <input type="checkbox"/> |
| 20 and above | <input type="checkbox"/> | <input type="checkbox"/> |
- (6) If used, what is your recommended metered-dose of inhaled corticosteroid per day (number of puffs daily equivalent to beclomethasone dipropionate 50 micrograms per puff)? (Choose a usual and a maximal dose).
- | | (a) ADULT | (b) CHILD |
|--------------|--------------------------|--------------------------|
| Usual | <input type="checkbox"/> | <input type="checkbox"/> |
| Maximal | <input type="checkbox"/> | <input type="checkbox"/> |
| 0-4 | <input type="checkbox"/> | <input type="checkbox"/> |
| 5-9 | <input type="checkbox"/> | <input type="checkbox"/> |
| 10-14 | <input type="checkbox"/> | <input type="checkbox"/> |
| 15-20 | <input type="checkbox"/> | <input type="checkbox"/> |
| 20 and above | <input type="checkbox"/> | <input type="checkbox"/> |

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- (7) If your patients develop early morning nocturnal symptoms (and fall in peak expiratory flow, if measured) what would be your order of treatment to prevent the symptoms?
Please give order 1 to 10; you need not select all choices
- | | (a) ADULT | (b) CHILD |
|-------------------------------------|--------------------------|--------------------------|
| Daytime doses of: | | |
| Inhaled beta-agonist | <input type="checkbox"/> | <input type="checkbox"/> |
| Theophylline | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled steroids | <input type="checkbox"/> | <input type="checkbox"/> |
| Antihistamines | <input type="checkbox"/> | <input type="checkbox"/> |
| Oral steroids | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled anticholinergic | <input type="checkbox"/> | <input type="checkbox"/> |
| Standard Bedtime dose of: | | |
| Inhaled beta-agonist | <input type="checkbox"/> | <input type="checkbox"/> |
| Oral sustained-release beta-agonist | <input type="checkbox"/> | <input type="checkbox"/> |
| Oral sustained-release theophylline | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled anticholinergic | <input type="checkbox"/> | <input type="checkbox"/> |
| Theophylline suppositories | <input type="checkbox"/> | <input type="checkbox"/> |
| Sedative e.g. benzodiazepine | <input type="checkbox"/> | <input type="checkbox"/> |
| Increased bedtime dose of: | | |
| Sustained-release theophylline | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled beta-agonist | <input type="checkbox"/> | <input type="checkbox"/> |
| Inhaled anticholinergic | <input type="checkbox"/> | <input type="checkbox"/> |
| Oral sustained-release beta-agonist | <input type="checkbox"/> | <input type="checkbox"/> |
- (8) How often do you use desensitisation for allergic asthma?
 Never Sometimes Often Always

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RESULTS

Response Rate

The description of the study population and the distribution of the response according to the types of employment are shown in Table I. The overall response rate was 25.3% (797 out of 3,153 doctors to whom the questionnaires were sent). The distribution of respondents is not representative of the doctors in Singapore. The best response was from the doctors working in hospitals and outpatient clinics within the Ministry of Health (30.3%).

Diagnosis

Beta Agonist Reversibility Test

The majority of chest physicians *often* (67%) used the beta agonist reversibility test in the diagnosis of asthma; the majority of GPs (54%) and non-respiratory specialists (52%), and a third of non-GPs *never* used them. Table II shows the proportion of doctors who *often* utilise the respective tests.

Bronchial Provocation Test

The majority of non specialists, both GPs and non-GPs (83% and 62%, respectively) and non-chest specialists (67%) *never* used tests of bronchial hyperresponsiveness for the diagnosis of asthma. The majority of chest specialists (86%) used this test with varying frequency (Table II).

Peak Flow Rate Records

Most NS-non-GPs (69%) and non-chest specialists (51%) and

all chest specialists used peak flow records infrequently, and the majority of GPs (71%) *never* used them.

Trial Course of Steroids

Most doctors *sometimes* used a trial course of steroids for the diagnosis of asthma: Chest specialists (93%); NS-GPs (72%); NS-Non-GPs (57%); non-chest specialists (53%).

Skin Tests, RAST Test and Chest Radiographs

The majority of doctors (72% to 88%) with the exception of chest specialists *never* used skin testing or RAST (specific serum IgE) in the diagnosis of allergy in asthma. Most doctors in all four groups *often* or *always* obtain a work history and *often* perform chest radiographs to exclude other diseases and complications.

Management

Monitoring

The majority of chest specialists (60%), but only a minority of GPs (7%), NS-non-GPs (18%), and non-chest specialists (16%) measured lung function at each visit. All four groups of doctors seldom asked their patients to record their daily symptoms or to record peak expiratory flow at home.

Patient Education

Most doctors would inform their patients of the diagnosis of asthma. Information booklets were infrequently distributed by all four groups of doctors (11 to 33%), though the doctors overwhelmingly supported the concept of an Asthma Society (83% to 94%).

All doctors felt that their patients more often underestimated than overestimated the severity of their condition. In particular, underestimation seems most frequent among the patients of chest specialists (60%).

On the use of inhalers, most doctors (70% to 100%) would initially instruct their patients on the method of use, though a smaller percentage (53% to 100%) would perform subsequent checks on the accuracy of inhaler techniques.

Treatment

1) Acute Asthma

In the treatment of severe episodes of acute asthma in adults and in children, inhaled or nebulised beta agonist heads the sequence of therapy for all the respondents. The second and subsequent choices differ between the groups of doctors. The second choice among general practitioners is a parenteral sympathomimetic such as adrenaline for adult patients. Parenteral aminophylline is the second or third choice for all respondents in the treatment of acute asthma in adults and in children. Parenteral corticosteroids are the second choice for chest physicians and third choice for non-specialists but are fourth and fifth choices among the S-NC specialists and general practitioners respectively (Table III).

2) Chronic Treatment

a) Order of Drug usage for chronic maintenance in asthma

Inhaled beta agonists, oral beta-agonists and oral theophylline are the unanimous first three choices in all groups of doctors for adults and children alike. Disease modifying drugs such as disodium chromoglycate and inhaled steroids, (including ketotifen for children), are prescribed only after bronchodilators have failed to control symptoms (Table IV).

b) Preferences for an alternate delivery system and recommended dosages for inhaled beta-agonist and inhaled steroid

In adults and children who cannot satisfactorily use a metered dose inhaler, the preferred alternative is a spacer for chest specialists (S-C) and doctors-in-training (NS-Non-GPs) or oral medication for general practitioners (NS-GP). Nebulisers are preferred over powder inhalers which are the least popular among all four groups of doctors.

Table I - Description of Study Population

Type of Employment	Number (%)	Response Rate% (No.)
Government	1,307 (41.5)	30.3 (396)
University	251 (7.9)	22.7 (57)
Private	1,487 (47.1)	22.7 (337)
Others	5 (0.2)	20.0 (1)
Not Working	103 (3.3)	5.8 (6)
Total	3,153 (100)	25.3 (797)

Table II - Percentage of Respondents who "often" use the following Diagnostic Tests for Asthma

Tests	Non-Specialists		Specialists	
	GPs(No.)	Non-GPs(No.)	Chest(No.)	Others(No.)
β Reversibility	24 (64)	36 (107)	67 (10)	23 (41)
Provocation	0.8 (2)	4 (12)	21 (3)	6 (10)
PER Records	6 (16)	32 (95)	47 (7)	22 (39)
Skin Test	0.4 (1)	0.3 (1)	7 (1)	6 (11)
RAST	9 (23)	10 (23)	21 (3)	12 (20)
Steroid Test	14 (36)	13 (38)	60 (9)	9 (15)

Table III - Sequence of Drug Used in the Treatment of Acute Severe Asthma in Adults*

Sequence of Use	Non-Specialists		Specialists	
	GPs	Non-GPs	Chest	Others
1st	Inhβ2	Inhβ2	Inhβ2	Inhβ2
2nd	SCArden	IV Aminop	IVSteroid	IV Aminop
3rd	IV Aminop	IV Steroid	IV Aminop	SCArden
4th	IMβ2	IprBr	IprBr	IV Steroid
5th	IV Steroid	SCArden	IMβ2	IMβ2
6th	IprBr	IMβ2	SCArden	IprBr

* Similar results are found in the treatment of childhood asthma

Key Inh β2 : Inhaled β2 Agonist ; SC Arden : Subcutaneous Adrenaline ;
Ipr Br Ipratropium Bromide; IV Aminop : IV Aminophylline;
IM β2 : Intramuscular β Agonist

The recommended doses of inhaled beta-agonist and inhaled steroid prescribed for daily maintenance for adults were mainly fewer than 9 puffs a day from a metered dose inhaler (MDI), and the maximum prescribed dose usually did not exceed 14 puffs daily. Chest specialists (S-C) and doctors in training (NS- Non-GPs) gave larger usual and maximum doses to their patients than NS-GPs and S-NC (Tables V and VI). A very similar pattern was observed for the child.

3) Nocturnal Asthma

Nocturnal asthma was defined as the presence of early morning symptoms with falls in peak expiratory flow, if measured. Respondents were offered 16 options, subdivided into daytime

Table IV - Order of Treatment for (Chronic) Maintenance Therapy of Asthma.

Sequence of Use	Non-Specialists		Specialists	
	GPs	Non-GPs	Chest	Others
1st	Inh β 2	Inh β 2	Oral β 2	Inh β 2
2nd	Oral β 2	Oral β 2	Oral β 2	Oral β 2
3rd	Theophy	Theophy	Theophy	Theophy
4th	Inh Steroid	Inh Steroid	Inh Steroid	IDSG
5th	Ipr Br	IDSG	Ipr Br	Inh Steroid
6th	IDSG	Ipr Br	Oral Steroid	Ipr Br

Key Inh β 2 : Inhaled β 2 Agonist Oral β 2 : Oral β Agonist
 Theophy : Theophylline Inh Steroid: Inhaled Steroid
 Ipr Br : Ipratropium IDSG : Disodium Cromoglycate

Table V - Recommended Inhaled Beta-Agonists in Adult (Usual & Maximum) (%)

Parameter	Non-Specialists				Specialists			
	GPs		Non-GPs		Chest		Others	
	Usual	Max*	Usual	Max.	Usual	Max.	Usual	Max.
0-4 puffs	63.3	5.6	0.4	2.6	18.2	0.0	56.6	4.1
5-9 puffs	33.5	50.6	35.6	27.7	81.8	18.2	39.4	43.3
10-14 puffs	2.8	32.1	60.7	43.9	0.0	63.6	3.0	37.1
15-20 puffs	0.4	9.6	3.3	22.5	0.0	18.2	1.0	12.4
\geq 20 puffs	0.0	2.0	0.0	3.3	0.0	0.0	0.0	3.1

* Max. = Maximum

Table VI - Recommended Inhaled Steroid in Adult (Usual & Maximum) (%)

Parameter	Non-Specialists				Specialists			
	GPs		Non-GPs		Chest		Others	
	Usual	Max*	Usual	Max.	Usual	Max.	Usual	Max.
0-4 puffs	69.7	15.4	0.4	8.5	18.2	0.0	60.5	6.8
5-9 puffs	28.6	55.7	55.6	44.7	81.8	27.3	36.0	52.3
10-14 puffs	1.7	20.2	39.9	32.1	0.0	54.5	2.0	27.3
15-20 puffs	0.0	7.9	3.6	12.2	0.0	9.1	1.0	11.4
\geq 20 puffs	0.0	0.9	0.4	2.4	0.0	9.1	0.0	2.3

* Max. = Maximum

Table VII - Sequence of Drug Usage for Nocturnal Asthma in Adults

Sequence of Use	Non-Specialists		Specialists	
	GPs	Non-GPs	Chest	Others
1st	Inh β 2 (am)	Inh β 2 (am)	Inh β 2 (pm)	SR β 2 (pm)
2nd	SR β 2 (pm)	SR Theo (pm)	Inh β 2 (am)	Theo (pm)
3rd	SR Theo (am)	SR β 2 (pm)	SR Theo (pm)	SR Theo (H)
4th	SR Theo (pm)	SR Theo (H)	SR Theo (H)	SR β 2 (am)
5th	SR β 2 (H)	SR β 2 (H)	Inh Steroid (am)	Inh β 2 (pm)
6th	Inh β 2 (H)	Inh β 2 (H)	Ipr Br (pm)	Inh β 2 (H)

Key Inh β 2 : Inhaled β 2 Agonist am : Daytime Dose
 SR β 2 : Sustained Release Oral β 2 pm : Bedtime Dose
 SR Theo: Sustained Release Theophylline H : High Bedtime Dose

and bedtime doses, and high bedtime doses. The results showed that inhaled or sustained-release beta-agonists or sustained-release theophylline given at bedtime in standard doses or in high doses, form the mainstay of treatment for nocturnal asthma. Only chest specialists considered inhaled steroid as a treatment option for nocturnal asthma. The results are summarised in Table VII. The results for the treatment of nocturnal asthma in children showed an identical pattern.

4) Desensitisation

The respondents to this question numbered 268 NS-GPs, 285 NS-Non-GPs, 10 chest specialists and 118 non-chest (S-NC). This form of treatment was unanimously unpopular: 91% GP; 88% NS-MOH; 70% chest physicians; 86% non-chest specialists never used it in the treatment of asthma. Only a small number from each group had used this method: 24 NS-GPs; 33 NS-Non-GP; 3C-S; and 16 NC-S.

DISCUSSION

This study revealed several interesting and pertinent findings. First, the management of asthma among different groups of doctors was generally consistent despite some differences in the prescribing habits of doctors according to the types of practice. Second, bronchodilators still formed the mainstay of treatment in acute and chronic asthma. Third, there is no evidence that beta-agonists were over-prescribed. Overall, there was a conservative use of corticosteroids in the treatment of acute and chronic asthma.

The overall response was 25%, lower than we had hoped. One possible explanation for this low response could be the sensitive nature of an audit whatever the subject. Hence, the results are likely to be biased and therefore had to be interpreted with due caution. However, the bias is likely to be towards those who see asthmatic patients regularly. Although our findings cannot be claimed to be strictly representative of views of doctors in Singapore, the study goes some way to showing general trends and patterns in the diagnosis and management of asthma among doctors in Singapore.

The differences observed in the frequencies in which different tests were used in the diagnosis of asthma could be explained by the differences in the nature of the practice. This is likely to be reflected in greater disease severity of the patients and the greater availability and ease of execution of complicated tests in specialist- and hospital-practices. For example, chest specialists and doctors in training are more likely than general practitioners to document beta-agonist and steroid reversibility, bronchial provocation tests for the diagnosis of asthma and to record baseline lung function at each outpatient clinic.

Inhaled beta-agonist appeared to be the unanimous first-line treatment in both acute and chronic asthma. The key role of beta-agonist in acute asthma is well-established and widely accepted. The regular use of bronchodilators other than for symptom relief in chronic asthma is controversial^(6,7). Several epidemiological reports on asthma deaths have persistently linked the circumstantial, excessive use of beta-agonist to the increased mortality. Several recent experimental studies have further increased this concern by showing a paradoxical increase in bronchial hyperresponsiveness with long-term regular use of bronchodilators in patients with asthma⁽⁷⁾.

In this context, two relevant findings in this study deserve emphasis. Although the results of this study did not indicate an overall excessive dose prescription of inhaled beta-agonist by physicians, they did show that all types of bronchodilators of different formulations are used sequentially before resorting to specific disease-modifying therapy. Furthermore, it would seem that our patients also tended to underestimate the severity of their disease.

Medical audit is heavily dependent on published data and

consensus views⁽⁸⁾. A critical analysis of this questionnaire audit is hampered by a lack of general agreement on the best form of treatment for chronic asthma. Nevertheless, a partial consensus has resulted in preliminary guidelines which advised the use of beta-agonist solely for symptom relief of bronchospasm and advocated early use of disease-modifying drugs, in particular inhaled corticosteroids⁽⁹⁻¹¹⁾. The results of this study are therefore pertinent and timely and suggested that we should modify our prescribing habits towards this consensus.

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The Secretariat
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c/o Department of Obstetrics & Gynaecology
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