Compliance of Physicians With Documentation of an Asthma Management Protocol

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BACKGROUND: Studies continue to show poor physician compliance with asthma management guidelines in clinical practice. However, standardized protocols specifically designed to be practical and user-friendly improve patient outcomes. OBJECTIVE: To determine the degree of physicians' compliance with the documentation of an asthma management protocol in a university hospital. METHODS: A simple asthma management protocol was designed and applied in our pulmonary clinic and primary care clinic for asthma. The protocol was based on the 1998 Manual for the Management of Asthma, from the Oman Ministry of Health, which follows internationally recognized guidelines. The protocol consisted of 4 sections: clinical history, peak expiratory flow (PEF) data, medication section, and simplified asthma management guidelines. RESULTS: All 30 physicians scheduled to conduct asthma clinics in the pulmonary clinic (14 physicians) and the primary care clinic (16 physicians) agreed to use the protocol. A total of 282 protocol forms were collected: 130 forms from 6 senior physicians and 152 from 24 junior physicians. Documentation of the entire clinical history was 65%, with the senior physicians scoring significantly higher documentation-completion rates (82%) for all components of the history than the junior physicians (50%). Documentation of all PEF data was poor (26%), despite high documentation of the PEF value itself (95%). There were significant differences in documentation of percent-of-predicted PEF between junior physicians in primary care clinic (70%) and other physicians (19%). Documentation of the entire medication section was only 34%. Although documentation of prescribed medicines was high (92%), compliance (48%) and inhaler technique (49%) documentation was low, with similar patterns demonstrated by all physicians. Documentation of the entire protocol by all physicians was low (9%), with junior physicians in the primary care clinic completing 28% of their forms. CONCLUSIONS: Our protocol enabled us to identify opportunities for improvement in documentation of asthma management in both the pulmonary and primary care clinics. The findings highlight the need for regular asthma education programs for all physicians, with a focus on documentation of performance skills such as monitoring of PEF and inhaler technique. *Key words: asthma, management, guidelines, protocol, peak expiratory flow, compliance, inhaler technique.* [Respir Care 2006; 51(12):1432–1440.

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Introduction

With the increasing prevalence of asthma worldwide and evidence of wide variability in standards of asthma management, concerned bodies have issued consensus guidelines at national and international levels.[1,2] Studies continue to indicate poor compliance with these guidelines, by both health-care providers and patients.[3–5] As a result, numerous studies have focused on issues surrounding the gap between evidence-based guidelines and clinical practice.[6–10] Difficulty of access to guidelines,[6] lengthy format,[6,10] alternative information sources,[7] insufficient training of physicians,[8] lack of educational materials,[9] and time limitations[9,10] have all been identified as contributing to poor compliance by health-care providers with published practice guidelines. On the other hand, significant improvements in management have resulted from the use of standardized protocols, specifically designed to be practical and user-friendly.[11–15]

Phase 1 of the International Study of Asthma and Allergies in Children[16] revealed that asthma is common and associated with severe symptoms in Oman.[17,18] In addition, the only published study on asthma management in Oman showed that the majority of physicians providing asthma management failed to demonstrate appropriate metered-dose inhaler (MDI) technique.[19] This highlights the need for prompt recognition of asthma and optimal treatment by health-care providers and patients.[18]

National guidelines for the management of asthma were developed and launched in all regions of Oman in 1998.[20] However, there has been no information on the compliance of health-care providers with these guidelines. We therefore designed a short, simple asthma management protocol and introduced it in the pulmonary clinic and the primary care clinic at Sultan Qaboos University Hospital, with the aim of determining the degree of physician compliance with the documentation of asthma management, thus identifying opportunities for improvement.

Methods

A prospective study was conducted from May to November 2002, with asthmatic patients $\geq$ 13 years old, who presented to the pulmonary clinic or the primary care clinic at Sultan Qaboos University Hospital. The pulmonary clinic is served by pulmonologists, senior residents, rotating junior residents, and a senior respiratory therapist (RT). The primary care asthma clinic is led by one senior family and community health physician assisted by rotating junior residents and the senior RT. The asthma management protocol was designed by the senior RT and reviewed by 2 pulmonologists and a clinical pharmacist, and was consistent with Oman's national Manual for the Management of Asthma in Adults,[20] which follows internationally accepted principles of asthma management. The protocol (Appendix 1) consisted of 4 sections:

1. Clinical history data, comprising family history, duration of symptoms, history of the past 3 months of asthma medication, nebulization and admission history, symptoms, and trigger factors
2. Peak expiratory flow (PEF) data, including the predicted and actual values, the percent-of-predicted value, and the PEF predictions reference chart[21,22]
3. Treatment, including prescribed medications, patient compliance, and inhaler technique
4. Simplified asthma management guidelines reference.

The medication section included a reference list of all asthma inhaler devices available in the hospital pharmacy. Patient compliance was measured by the patient's recall of the prior 3 months of medication use, compared with the medication supply record. Good inhaler technique was defined as accurate completion of all essential steps, and poor inhaler technique as inaccurate completion of one or more essential steps.

Prior to physicians' scheduled duties, the senior RT introduced the protocol individually to every physician in the pulmonary and primary care clinic, with a request to follow the protocol with all their asthma patients over the age of 13 years. If this was accepted, a number was assigned to the physician; the form was filled in with the patient's name, medical record number, sex, age, height, and physician's assigned number; and the form was placed in the patient's file before attendance by the physician. Physicians were not aware of the use of the protocol in the study. Both clinics were provided with a peak flow meter (Mini-Wright, Clement Clarke International, Harlow, Essex, United Kingdom), disposable mouthpieces (SafeT-way, Vitalograph, Buckingham, United Kingdom) and a colored wall poster (designed by the senior RT) of all the inhaler devices.

After each clinic the forms were collected from the patients' files by the RT. Complete documentation was measured as a check mark in the components of the clinical history section, as specific PEF values in each component of the PEF section, as drug dose and frequency in the medication section, and as the letters "G" (for "good"), "P" (for "poor"), or "N" (for "new patient") in the inhaler technique and compliance sections.

Statistical analysis was performed with statistics software (SPSS 10, SPSS, Chicago, Illinois). Comparisons between groups were performed with Fisher's exact test. Differences were considered statistically significant when $p < 0.05$.

Outcome measures are expressed as percentage compliance for the following variables: definition of the areas of the protocol documented by all physicians; definition of critical areas of the protocol documented by all physicians; definition of senior and junior physicians' documentation;

Table 1. Number of Asthma Management Protocol Forms by Different Physician Categories

Category	Number of Physicians (n = 30)	Number (%) of Protocol Forms (n = 282)	Average Number of Protocol Forms Per Physician
Pulmonary Clinic Total	14	224 (79)	16
Pulmonologist	3	52 (18)	17
Senior residents	2	60 (21)	30
Rotating junior residents	9	112 (40)	12
Primary Care Clinic Total	16	58 (21)	4
Consultant	1	18 (6)	18
Rotating junior residents	15	40 (14)	3
Total	30	282 (100)	9

Table 2. Clinical History Section Documentation on the Asthma Management Protocol Forms

	All Physicians (n = 282) (n* and %)	Senior Physicians (n = 130) (n* and %)	Junior Physicians (n = 152) (n* and %)	p	Junior Pulmonary Physicians (n = 112) (n* and %)	Junior Primary Care Physicians (n = 40) (n* and %)	p
Symptoms and trigger factors	282 (100)	130 (100)	152 (100)	1	112 (100)	40 (100)	1
Duration of asthma	209 (74)	111 (85)	98 (65)	< 0.001	74 (66)	24 (60)	0.565
Admission history	262 (93)	126 (97)	136 (90)	0.019	98 (88)	38 (95)	0.240
Family history	213 (76)	115 (89)	98 (65)	< 0.001	70 (63)	28 (70)	0.446
Medication history	270 (96)	129 (99)	141 (93)	0.007	102 (91)	39 (98)	0.290
Nebulization history	263 (93)	128 (99)	135 (89)	0.001	97 (87)	38 (95)	0.241
Entire section filled	182 (65)	106 (82)	76 (50)	< 0.001	53 (47)	23 (58)	0.357

*n = number of asthma management protocol forms

and definition of junior physicians' documentation in the pulmonary and primary care clinic.

Results

All physicians scheduled to conduct asthma clinics in the pulmonary or primary care clinic agreed to use the protocol for all their asthma patients ≥ 13 years old. There were a total of 282 patient encounters (224 in the pulmonary clinic and 58 in the primary care clinic) by the 30 physicians (14 physicians in the pulmonary clinic and 16 in the primary care clinic, Table 1). Three new patients were seen in the pulmonary clinic and 9 new patients in the primary care clinic. On average, each physician had 9 patient encounters, but senior physicians had a much higher number per physician, compared to the rotating residents. The average number of patient encounters per resident in the primary care clinic was particularly low (less than 3).

Table 2 shows the extent of documentation of the clinical history components. There was 65% documentation for the entire section, with senior physicians scoring significantly higher documentation rates for all components than junior physicians (82% vs 50%, $p < 0.001$). The low documentation rate by junior physicians was primarily associated with the family history and duration-of-symptoms items. However, documentation of symptoms and trigger factors was 100% among all physicians.

Table 3 shows the documentation of PEF data. Although documentation of the PEF value itself was high among all physicians (95%), this was in contrast to documentation of the percent-of-predicted value (27%), which required a simple calculation based on the actual and predicted values. In addition, there were significant differences in completion of percent-of-predicted values between junior physicians working in the primary care clinic and both junior physicians working in the pulmonary clinic and all senior physicians (70% vs 19%, $p < 0.001$). The overall low documentation rate of the entire PEF section (26%) was thus driven by the low documentation of the percent-of-predicted value.

Table 4 shows the documentation of prescribed medications, compliance, and inhaler technique. All physicians, irrespective of level of experience or location of practice, had similar documentation rates for the components of this section. Although the documentation of prescribed medications was high (92%), the documen-

Table 3. Peak Expiratory Flow Section Documentation on the Asthma Management Protocol Forms

	All Physicians (n = 282) (n* and %)	Senior Physicians (n = 130) (n* and %)	Junior Physicians (n = 152) (n* and %)	p	Junior Pulmonary Physicians (n = 112) (n* and %)	Junior Primary Care Physicians (n = 40) (n* and %)	p
Actual PEF value	269 (95)	125 (96)	144 (95)	0.777	104 (93)	40 (100)	0.111
Predicted PEF value	203 (72)	84 (65)	119 (78)	0.012	84 (75)	35 (88)	0.120
Actual and predicted PEF values	202 (72)	83 (64)	119 (78)	0.008	84 (75)	35 (88)	0.120
Percent-of-predicted value	75 (27)	26 (20)	49 (32)	0.022	21 (19)	28 (70)	< 0.001
Entire section filled	72 (26)	23 (18)	49 (32)	0.006	21 (19)	28 (70)	< 0.001

*n = number of forms
PEF = peak expiratory flow

Table 4. Medication Section Documentation on the Asthma Management Protocol Forms

	All Physicians (n = 282) (n* and %)	Senior Physicians (n = 130) (n* and %)	Junior Physicians (n = 152) (n* and %)	p	Junior Pulmonary Physicians (n = 112) (n* and %)	Junior Primary Care Physicians (n = 40) (n* and %)	p
Prescribed medications	260 (92)	123 (95)	137 (90)	0.186	104 (93)	33 (83)	0.070
Inhaler technique	138 (49)	65 (50)	73 (48)	0.811	53 (47)	20 (50)	0.854
Compliance	135 (48)	74 (57)	61 (40)	0.006	43 (38)	18 (45)	0.573
Compliance and inhaler technique	103 (37)	50 (39)	53 (35)	0.538	36 (32)	17 (43)	0.252
Entire section filled	96 (34)	49 (38)	47 (31)	0.083	33 (30)	14 (35)	0.553

*n = number of forms

Table 5. Critical Areas Section Documentation on the Asthma Management Protocol Forms

	All Physicians (n = 282) (n* and %)	Senior Physicians (n = 130) (n* and %)	Junior Physicians (n = 152) (n* and %)	p	Junior Pulmonary Physicians (n = 112) (n* and %)	Junior Primary Care Physicians (n = 40) (n* and %)	p
Symptoms and trigger factors	282 (100)	130 (100)	152 (100)	1	112 (100)	40 (100)	1
Actual and predicted values	202 (72)	83 (64)	119 (78)	0.008	84 (75)	35 (88)	0.120
Medication Section							
Prescribed medication	260 (92)	123 (95)	137 (90)	0.186	104 (93)	33 (83)	0.070
Compliance and inhaler technique	103 (37)	50 (39)	53 (35)	0.538	36 (32)	17 (43)	0.252
All of the above	70 (25)	30 (23)	40 (26)	0.581	27 (24)	13 (33)	0.304

*n = number of forms

tation of compliance and inhaler technique was low (37%), resulting in a low rate for the entire section (34%).

Table 5 shows the documentation in 3 critical areas of the protocol (symptoms and trigger factors; actual and predicted PEF; and prescribed medication and compliance and inhaler technique), which was low for all physicians (25%). Complete documentation of the entire protocol by all physicians was also low (9%), although junior physicians in the primary care clinic completed 28% of their protocol forms (Table 6).

Discussion

Although there is international consensus on the key elements of asthma management,[1,2] asthma guidelines themselves are bulky documents unsuitable for day-to-day use in the practice setting. To address this limitation, a variety of preprinted forms, flow sheets, guideline reminders, and pro formas have been designed to provide physicians with a concise format for practical guidance and documentation of patient management and to audit clinical practice.[11–15] Our simple protocol included 2 practice points

Table 6. Overall Completion of Documentation on the Asthma Management Protocol Forms

	All Physicians (n = 282) (n* and %)	Senior Physicians (n = 130) (n* and %)	Junior Physicians (n = 152) (n* and %)	p	Junior Pulmonary Physicians (n = 112) (n* and %)	Junior Primary Care Physicians (n = 40) (n* and %)	p
All sections	26 (9)	11 (9)	15 (10)	0.837	4 (4)	11 (28)	< 0.0001

*n = number of forms

that were lacking in many formats.[11–15] Guidance on calculating the predicted PEF value was given by the 2 nomograms in the protocol, which assist in the determination of asthma severity. The protocol also provides a formulary list that links available drugs and specific inhaler devices. The protocol must provide timely and up-to-date information for rotating physicians unfamiliar with brands in the local institution.

Our objective was to measure physicians' documentation of asthma management steps, and our findings were consistent with previous reports that found incomplete physician documentation compliance,[20,23–25] particularly in the sections relating to PEF[11,12,14] and inhaler technique.[12,14] In our study, the high documentation rate of the PEF values (95%) may have been facilitated by providing peak flow meters and disposable mouthpieces to the clinics, and this indicates that nearly all physicians measured the PEF for each patient. These results compare favorably with the 94% rate in an accident and emergency department[11] and the 71% rate reported in a pediatric study in a general district hospital.[14] However, even when both actual and predicated values were documented, few physicians (27%) documented percent-of-predicted values, which compares with a 62% documentation rate in an accident and emergency department.[11] Our low documentation rate in the pulmonary clinic and by senior physicians (19%), may be due to reliance on clinical experience and comparisons of serial PEF values, as most of the patients were on follow-up and had previously recorded values. Time limitation and absence of a convenient calculator are other possible factors. Conversely, the high documentation rate (70%) among junior residents in the primary care clinic who had had less experience with asthmatic patients may have been because they used the PEF protocol as a "road map."

PEF measurement is recommended as an integral part of asthma management by all the management guidelines and is used in the definition of asthma severity that guides treatment.[1,2] However, the opinion of physicians on the role of PEF commonly differs from standards proposed in recognized guidelines, and the use of a peak flow meter is not perceived as a routine test in clinic practice.[26–28] This ambivalence is also reflected in protocol designs that require documentation of selected PEF values rather than all PEF values.[13–15] One study protocol that required data entry of actual PEF values alone reported that the majority of primary care clinicians incorrectly classified asthma severity based on symptoms and PEF variability.[13] It may be that omission in the protocol of any of the PEF data points contributes to the inappropriate classification of severity. Computer-based clinical decision-support systems that incorporate forcing functions may improve clinician performance.

Documentation of prescribed medication by all physicians was high (92%), which may have been facilitated by the colored wall chart of inhaler devices and the comprehensive formulary in the protocol. In other studies there have been incomplete data[11,13] or no data[12,14,15] on prescribed medications. However, in our study the overall documentation rate of inhaler technique assessment was only 48%, and this compares with 44% in an accident and emergency department.[11] Reasons for our incomplete documentation may include unavailability of placebo inhaler, patient's device left at home, format of this section of the protocol, perception that follow-up patients have adequate inhaler ability, or reliance on the RT or clinical pharmacist. In a general district hospital, inhaler technique documentation was frequently missing, as this was perceived to be an area of nursing care,[14] whereas in a primary care setting, inhaler technique documentation improved 10-fold on introduction of a physician-owned flow sheet.[13] Since the ability to correctly use an MDI can be lost,[29,30–33] we concur with respiratory teams that promote frequent checking of inhaler technique by the physician as a mandatory investment of physician time.[14,31] Checking takes just 1 minute and can guide subsequent management steps toward retraining, change of device, or step up or down of asthma therapy. In a recent study we identified that only 20% of physicians demonstrated appropriate MDI technique, with general practitioners and accident and emergency physicians scoring significantly lower than internists and pediatricians.[19] Studies have repeatedly shown that the majority of physicians who provide asthma management and counseling do not demonstrate correct inhaler technique.[32–36] Although all our medical students participate in a group demonstration of inhaler technique and receive a flow-chart that lists the correct steps for all inhaler devices, that awareness does not survive the pas-

sage of time into the practice setting. We therefore plan to incorporate the inhaler flow-chart into the protocol.

The clinical history section was generally well documented. There was 100% documentation of symptoms and trigger factors by all physicians, and this compares with 94% symptoms documentation in an accident and emergency department[11] and 99% symptom severity documentation by pediatricians in a general district hospital.[14] In our protocol, data entry for family history and duration of asthma (76% and 74%, respectively) may have been overlooked, and central repositioning of the data format may correct this omission. Medication history was well documented (96%), and this compares with 95% in an accident and emergency department[11] and 100% in a district general hospital.[14] Although two thirds of the clinical history sections were completely documented, critical areas were documented in only one quarter of the forms, and the entire protocol in only 9% of the forms. It is not clear whether clinical confidence, perception of value, lack of time or resources, protocol format, documentation fatigue, calculated noncompliance, or a combination of these factors were reasons for this incomplete documentation adherence.

Benefits of the protocol include speed of data entry, legibility, and ease of data retrieval. More than half of the protocol's size is taken by guideline reminders, and on first sight this may convey the impression of a lengthy document. However, the protocol was well accepted by junior residents in the primary care clinic, and these physicians continued to request the form after the conclusion of the study. A positive response to the introduction of a protocol has been noted in other studies,[13,14] and we conclude that the form fulfilled a useful function in providing a "road map" of management steps. Popularity spread to the medical students, and the protocol was incorporated as a learning and assessment tool in the undergraduate and graduate medical programs. Additionally, areas of practice skills, such as use and interpretation of the peak flow meter readings, together with inhaler technique counseling, are now included as examinable components in all our national and international objective structured practical examination assessments. Recently, the protocol served as an audit standard in certification processes, and there are plans to use the protocol for accreditation schemes.

The major limitation of this study was that it measured physicians' documentation compliance rather than the actual standards of asthma management. The study did not identify interventions that may have been made by other health-care providers, such as patient instruction on environmental control practices and training of inhaler technique, nor did it determine the appropriateness of prescribed therapy. Eight (20%) of the 40 patients seen by junior physicians in the primary care clinic were new patients and would not have had previous use of inhaler devices. This distorts the importance of the documentation of inhaler technique and compliance for this group. It would have been useful to compare documentation rates before and after introduction of the protocol, and to survey the physicians' opinions on the introduction of the protocol. Although our tertiary-care setting is not representative of the country, the study did serve to establish a standard for audit processes, and parts of the protocol can be used as an indirect measure of the level of service offered (eg, scope of formulary).

We have updated the clinical history section to include the use of shisha pipe, tobacco, and passive smoking. Shisha smoking has become popular, as it is thought to be a healthy form of smoking. Continuity of patient care is facilitated by provision of multiple data entry columns that support ease of physician review of patient management through consecutive clinic attendances. The formulary in the clinical history and medication sections has been updated, and the inhaler wall chart is now in the protocol. We have also added a chart of inhaler steps for each device, with guidance for the physician on essential steps that must be performed accurately (Appendix 2). Inhaler technique and patient adherence now appear before the medication section, together with diagnosis of asthma severity. Although counseling on inhaler use and environmental control management can require considerable time, these have been added to a new section for the patient's management plan. We are considering a change from the A4 format into a "tourist map" format, with all sections displayed at a glance. As the protocol was well received by junior physicians in the primary care clinic, we plan to introduce and explain the revised protocol to physicians in local primary care clinics, with audits of patients' outcomes before and after implementation of the protocol. Finally, since our patients move freely between different primary care clinics, we are considering patient ownership of the protocol, to be brought by the patients to whichever clinic they visit.

Conclusion

Our asthma management protocol enabled us to identify opportunities for improvement in documenting asthma management in both pulmonary and primary care clinics. Although the documentation of clinical history was incomplete, parts of the protocol that required additional performance skills, such as monitoring of peak flow and inhaler technique, showed a great need for improvement. The findings highlight the need for regular asthma education programs for physicians.

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Appendix 1

Asthma Management Protocol

1. Clinical History Section:

Name: **Family History Yes / No**

MRN: **Duration of Symptoms……..**

Please tick (√) or (X) when appropriate.

A. What asthma medication is the patient currently taking?
a. Nothing ( ) b. Inhaled short acting ß2 agonist ( ) c. Long acting ß2 agonist ( )
d. Inhaled steroids ( ) e. Oral steroids ( ) f. Theophylline ( )
g. Oral salbutamol ( ) h. Other ( )……

B. Has the patient ever used a nebulized bronchodilator? ( )
if (√) , specify frequency (……)

C. Has the patient ever been admitted for asthma? ( )
if (√) , specify number of admissions to (ward …….. ICU……..)

Date:	Please tick (√) or (X) when appropriate
1. Does the patient have:	
a. Cough (when patient does not have common cold)	
b. Phlegm production	
c. Breathlessness	
d. Chest tightness	
e. Wheeze	
2. Are the symptoms worse:	
a. At night	
b. With exercise	
c. With influenza or common cold	
d. When exposed to specific trigger factors such as, (dust, smoke, foam, pollens, incense, etc..)	
e. on taking specific ‡medications, please specify ……..	
f. During specific times of the year (winter, humidity, etc)……..	
3. Do the symptoms respond to asthma therapy?	

‡*Some medication may cause respiratory symptoms:*

1. Beta blocker 2. ACE inhibitors (Captopril, Cilazapril, Lisinopril) 3. Additives in inhalers 4. NSAIDs

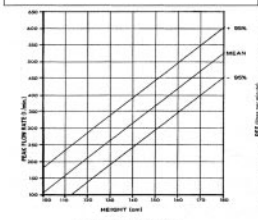
2. Peak Expiratory Flow Rate Section:

Age:

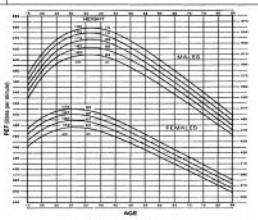
Height:

Gender: **Male** ☐ **Female** ☐

Test	Date
Predicted value	
Actual value	
% of Predicted	



PEF in normal children



PEF in normal adult

Predicted (PEF) equation[1]
Boys between 5 and 18 : PEF= 5.288z-422.76
Girls between 5 and 18 : PEF= 5.278z-422.34
Where y is the age in years and z is the height in cm.

Predicted (PEF) equation[2]
Male PEF= exp[0.544ln(y)-0.0151y-74.7/z+5.48]
Female PEF= exp[0.376ln(y)-0.0120y-58.8/z+5.63]

Peak Expiratory Flow Rate Reading Guidelines

Asthma Classification	Predicted	§Variability
Intermittent	80%	< 20%
Mild	80%	20% -30%
Moderate	60% - 80%	30%
Severe	< 60%	> 30%

§*Variability is between the night & morning readings*

References

1. Godfrey S, Kamburoff PL, Nairn JR. Spirometry, lung volumes and airway resistance in normal children aged 5 to 18 years. Brit J Dis Chest 1970;64(1):15-24.
2. Nunn AJ, Gregg I. New regression equations for predicting peak expiratory flow in adults. BMJ 1989;298(6680):1068-1070.

3. Medication Section:

Medication	Device	Strength	Date Dose & Frequency
Beclomethasone	MDI	50µg/inhalation	
Beclomethasone	MDI	250µg/inh	
Budesonide	Turbuhaler®	100µg/inh	
Budesonide	Turbuhaler®	200µg/inh	
Budesonide	Turbuhaler®	400µg/inh	
Symbicort® (Budesonide+Formoterol)	Turbuhaler®	80µg/4.5µg	
Symbicort®	Turbuhaler®	160µg /4.5µg	
Fluticasone	Diskus®	50µg/inh	
Fluticasone	Diskus®	100µg/inh	
Fluticasone	Diskus®	250µg/inh	
Salmeterol	Diskus®	50µg/inh	
Seretide® (Fluticasone+Salmeterol)	Diskus®	250µg/50µg	
Seretide®	Diskus®	500µg/50µg	
Sod.cromoglycate	MDI	5mg/inh	
Salmeterol	MDI	25µg/inh	
Formoterol	Aerolizer®	12µg/ cap	
Formoterol	Turbuhaler®	9 µg/ inh	
Salbutamol	MDI	100µg/inh	
Salbutamol	Rota cap®	200µg/cap	
Salbutamol	Rota cap®	400µg/cap	
Salbutamol	Inh Solution	5mg/mL	
Salbutamol	Syrup	2mg/5mL	
Salbutamol	Tablets	2mg	
Prednisolone	Tablets	1mg /tab	
Prednisolone	Tablets	5mg /tab	
Prednisolone	Tablets	25mg/tab	
Theophylline	SR Tablets	200mg, 300mg	

Inhaler Technique: Good (G), Poor (P), New Patient (N)	
MDI, Spacer with (MP or Mask)	
Turbuhaler®	
Aerolizer®	
Diskus®	
Rotahaler®	
Compliance: Good (G), Poor (P), New Patient (N)	

***New Patient** = First time on asthma medication or using inhaler devices*

4. Asthma Management Guidelines Section:

Step 1	**Intermittent** **Symptoms < 1 time / week** **Night symptoms ≤ 2 / month**	Inhaled short acting ß2 agonist; Salbutamol (100-200µg) PRN
Step 2	**Mild persistent** **Symptoms ≥ 1 time / week** **Night symptoms: > 2 / month**	Inhaled short acting ß2 agonist; Salbutamol (100-200µg) PRN + **Inhaled steroids (standard dose)** **Beclomethasone or Budesonide (100-500µg) twice daily or Fluticasone (50-200µg) twice daily**
Step 3	**Moderate** **Daily attacks** **Night symptoms: >1 / week**	Inhaled short acting ß2 agonist; Salbutamol (100-200µg) PRN + **Inhaled steroids (high dose)** **Beclomethasone or Budesonide ($800-2000 µg) daily in divided doses or Fluticasone (400-1000 µg) daily in divided doses** + Inhaled long acting ß2 agonist Salmeterol (50µg) twice daily or Formoterol caps (12 µg) twice daily or Formoterol turb (9µg) twice daily
Step 4	**Severe** **Continuous symptoms** **Frequent night symptoms** **Limited physical activity**	Inhaled short acting ß2 agonist; Salbutamol (100-200µg) PRN + **Inhaled steroids (high dose)** **Beclomethasone or Budesonide ($800-2000 µg) daily in divided doses or Fluticasone (400-1000 µg) daily in divided doses** + Inhaled long acting ß2 agonist Salmeterol (50µg) twice daily or Formoterol caps (12 µg) twice daily or Formoterol turb (9µg) twice daily + Oral theophylline and prednisolone

Step Up ↑

If control is not achieved, consider step up, But first review:
a. Inhaler technique
b. Compliance
c. Trigger factors
Patients persisting in step 4, should be referred to a chest specialist

Step Down ↓

Review treatment every 3 to 6 months.
If control is sustained for at least 3 months, a gradual stepwise reduction in treatment should be considered.

Appendix 2

Assessment of Inhaler Technique

Observe patient's technique & for each step put a √ or X in appropriate column
Good technique (G) = all essential steps (E) performed accurately
Poor technique (P) = one or more essential steps (E) performed inaccurately * Common problem step

MDI + Spacer with facemask (AEROCHAMBER®)		
1E		Remove MDI cap
2E		Insert upright MDI into aerochamber®
3E		Hold MDI & aerochamber® together, shake vigorously
4E		Place mask over mouth & nose…
5E		…and press gently to seal
6E		Depress canister once
7E		Inhale….
8*		…through open mouth…
9		…for 5 breaths
10		For a 2nd dose wait 20-30 seconds
11E		…then repeat steps 3-8
12		Remove MDI from aerochamber®
13		Replace cap of MDI

METERED DOSE INHALER (MDI) •		
1E		Remove MDI cap
2E*		Hold inhaler upright & shake vigorously
3		Exhale slowly & completely
4E		Insert upright MDI between teeth & close lips
5E*		Inhale steadily & deeply through mouth whilst…
6E*		…immediately depressing canister for
7E*		…one depression
8		Remove inhaler keeping lips closed
9		Hold breath for 5-10 seconds
10		Breathe normally
11		For a 2nd dose wait 20-30 seconds,
12E		…then repeat steps 2-10
13		Wipe mouthpiece of MDI
14		Replace cap of MDI

AEROLIZER® (Formoterol)		
1E		Remove the aerolizer® blue cover
2		Hold the base of the aerolizer firmly
3E		Open aerolizer® by turning the mouthpiece clockwise
4E		Remove one capsule from foil strip
5E		Place the capsule in the inhaler slot in base of aerolizer
6E		Close aerolizer® by twisting mouthpiece anticlockwise
7E*		Hold aerolizer® upright & press blue buttons at base (listen for the clicking sounds of capsule piercing)
8		…then release the blue buttons
9E		Insert mouthpiece between teeth & close lips around it
10E		Inhale steadily & deeply through mouth
11		Remove aerolizer® keeping lips closed
12		Hold breath for 5-10 seconds
13		Breathe normally
14E		Open aerolizer® & check capsule is empty
15E		If necessary repeat steps 9-13 till capsule is empty
16E		Remove empty capsule & close aerolizer®
17		Wipe mouthpiece with clean dry tissue
18		Replace blue cover

TURBUHALER® (Salbutamol, Budesonide, & *Symbicort®*)		
1E		Unscrew cover
2		Exhale slowly & completely away from mouthpiece
3E*		Hold turbuhaler® **upright**
4E		Turn the coloured grip as far as it will go…
5E*		…then turn back till click sound is heard
6E		Insert mouthpiece between teeth & close lips around it
7E		Inhale forcefully & deeply through mouth
8		Remove turbuhaler® keeping lips closed
9		Hold breath for 5-10 seconds
10		Breathe normally
11		For a 2nd dose wait 20-30 seconds
12E		…then repeat steps 2-10
13		Wipe mouthpiece with clean dry tissue, replace cover

MDI + spacer with mouthpiece *VENTOLIN® or BECOTIDE® + VOLUMATIC®*		
1E		Connect the two parts of the volumatic®
2E		Remove cap from MDI
3E*		Shake inhaler vigorously
4E		Hold inhaler upright & insert MDI into volumatic®, opposite mouthpiece
5		Exhale slowly & completely
6E		Insert volumatic® mouthpiece between teeth, close lips
7E		Depress canister once
8E		Inhale slowly & deeply through mouth
9		Remove volumatic® keeping lips closed
10		Hold breath for 5-10 seconds
11		Breathe normally
12		For a 2nd dose wait 20-30 seconds
13E		…then repeat steps 5-11
14		Remove MDI from volumatic®
15		Replace cap of MDI
16		Disconnect the two parts of the volumatic®

DISKUS® (Fluticasone, Salmeterol, & *Seretide®*)		
1		Hold the outer case in one hand and…
2*		…place your other thumb on the thumbgrip
3E		Push thumbgrip away as far as it will go until it clicks
4		Exhale slowly & completely away from mouthpiece
5		Hold diskus® with mouthpiece facing you
6E*		…slide lever away as far as it will go until it clicks
7E*		Insert mouthpiece between teeth & close lips around it
8E*		Inhale steadily & deeply through mouth
9		Remove diskus® keeping lips closed
10		Hold breath for 5-10 seconds
11		Breathe normally
12		To close diskus® put your thumb in the thumbgrip
13		…& slide it backwards till you hear a click
14		For a 2nd dose wait 20-30 seconds
15E		…then repeat steps 1-12 (* load 2nd dose!)
16		Wipe mouthpiece with clean dry tissue
17		To close diskus® repeat steps 12 & 13

- MDI closed mouth technique is preferred to ensure consistent approach & facilitate compliance